

Academic success of CU medical students : the formal and informal secondary education group

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Phulklongtan M. Academic success of CU medical students : the formal and informal secondary education group. Chula Med J 1995 Sep; 39(9): 661-675

Medical student selection is a requirement contributing to educational and professional success so a number of criteria are examined herein. Three alternatives were used for recruitment : the Ministry of University Affairs, the university quota and Faculty of Medicine special admissions. This study involved only the CU medical students who were enrolled in academic years 1987-1992 by the Ministry of University Affairs. The subjects were categorized into a formal education group and an informal secondary education group. The enrollment of the second group of students was noted to increase every year. In 1992, the number of those students was approximately 75%. And the average age of every class in group 2 was one year less than the students in the first group. The overall average entrance scores of each subject area was higher than 60 %. A comparative study of the grade point average between these two groups indicated that the cumulative grade point average of the informal secondary education group was higher than in the other group in every academic year of pre-clinical and clinical study, but there was no difference in the grade point average of each semester during the clinical year. The entrance scores in four subjects (English, biology, mathematics and chemistry) significantly correlated with academic achievement. Stepwise regression enabled simultaneous consideration of the predictors and their relative importance, and the addition of the entrance scores in

biology and English increased the ability to account for variance in predicting achievement from the first to the fourth year of study. Those findings of academic selection revealed some significant and essential variables of the entrance examinations. Requirements for determining overall admission criteria should be further studied. The efforts of reducing test bias and encouraging focus more on the qualitative elements of applicants may be of concern, and a combination of selected criteria should be developed for the appropriate weighed subjective factors so that the results can described as accurate and useful information.

Key words : *Medical student selection, Entrance examination, Academic predictors*

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Received for publication. July 22, 1995.

มาลี พูลคลองตัน. การติดตามผลการศึกษานิสิตคณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย หลักสูตรมัธยมศึกษาตอนปลายและจบหลักสูตรการศึกษานอกโรงเรียน. จุฬาลงกรณ์เวชสาร 2538 กันยายน; 39(9): 661-675

การคัดเลือกนิสิตแพทย์เพื่อให้ได้ผู้ที่เหมาะสม สามารถเรียนได้จบหลักสูตรและเป็นแพทย์ที่ดีตามเป้าหมาย จำเป็นต้องอาศัยการประเมินคุณลักษณะหลายประการประกอบกัน ในปัจจุบันมีการคัดเลือก 3 วิธีคือ สอบผ่านทบวงมหาวิทยาลัย มหาวิทยาลัยรับโดยตรง และโครงการพิเศษของสถาบัน ในส่วนการคัดเลือกผ่านทบวงมหาวิทยาลัยพบว่าผู้สอบผ่านเข้าเรียนได้มีทั้งกลุ่มผู้เรียบจบการศึกษาสายสามัญประเภทหลักสูตรมัธยมศึกษาตอนปลาย และหลักสูตรการศึกษานอกโรงเรียน โดยที่นิสิตกลุ่มหลังสามารถสอบเข้าเรียนได้เป็นจำนวนมากขึ้นทุกปี จากการศึกษาข้อมูลนิสิตแพทย์รุ่นปีการศึกษา 2530-2535 ปรากฏว่ามีนิสิตกลุ่มดังกล่าวเกือบร้อยละ 75 ในปีการศึกษา 2535 โดยเฉลี่ยจะมีอายุน้อยกว่านิสิตกลุ่มจบหลักสูตรมัธยมศึกษาตอนปลายประมาณ 1 ปี ผลการสอบคัดเลือกเข้ามหาวิทยาลัยแต่ละปีมีค่าคะแนนเฉลี่ยไม่น้อยกว่าร้อยละ 60 ทุกหมวดวิชา การเปรียบเทียบสัมฤทธิ์ผลทางการเรียนจากค่าเฉลี่ยผลการเรียนเป็นรายปีและรายเทอมตลอดหลักสูตรของนิสิตทั้ง 2 กลุ่ม พบว่าอันดับคะแนนเฉลี่ยสะสมผลการเรียนของนิสิตกลุ่มจบหลักสูตรการศึกษานอกโรงเรียนมีค่าสูงกว่าทุกปีการศึกษา ทั้งในระดับปริคlinikและคลินิก และเมื่อเปรียบเทียบค่าเฉลี่ยผลการเรียนเป็นรายเทอมไม่พบความแตกต่างในช่วงการศึกษาภาคคลินิก เมื่อวิเคราะห์ตัวพยากรณ์ผลการเรียน โดยใช้คะแนนสอบคัดเลือกทุกวิชาเป็นตัวแปรอิสระ ปรากฏว่าคะแนนสอบวิชา ภาษาอังกฤษ ชีววิทยา คณิตศาสตร์ และเคมี เป็นตัวทำนายผลการเรียนตลอดหลักสูตรของนิสิตทุกรุ่นได้อย่างมีนัยสำคัญทางสถิติ และผลการวิเคราะห์ถดถอยพหุคูณพบว่าคะแนนสอบวิชา ชีววิทยา และภาษาอังกฤษ เป็นตัวแปรร่วมกันอธิบายความแปรปรวน แต้มเฉลี่ยสะสมผลการเรียนได้ดีที่สุด ในช่วงการศึกษานิสิตปีที่ 1-4 ผลที่ได้จากการศึกษาครั้งนี้ทำให้ได้ข้อมูลบ่งชี้ความสำคัญของตัวแปรการคัดเลือกในหลายประเด็น การศึกษาองค์ประกอบอื่น โดยเฉพาะด้านคุณภาพและการกำหนดน้ำหนักความสำคัญของตัวแปรเหล่านั้น ร่วมกับการสอบด้านวิชาการให้เหมาะสม อาจช่วยให้ได้ข้อมูลภาพรวมการคัดเลือกที่ถูกต้อง เป็นจริง และยุติธรรม ต่อไป

The purpose of medical student selection is to determine potentiality during undergraduate studies according to anticipated professional success. Various criteria for selection have been set up so that the recruitment is separated into three alternatives given by the Ministry of University Affairs, the university quota and the Faculty of Medicine special admissions. Even though, process of admission to each program is different, academic demand is the priority in terms of the materials to be covered as specified in each subject area. Other aspects that influence the success of the professional have not been applied to selection. The study of those variables that determine the students' success is on-going continuously. As recommended by the Sixth National Conference on Medical Education, the selection criteria needs to be reviewed, and only the subjects which are important: Thai, English and social sciences etc. should be taken into consideration.

Determination of essential information about the general qualifications of prospective medical university students is still lacking. Therefore, this study is intended to find the variables or combination of variables that can most effectively predict the quality and desirable characteristics of graduates. The longitudinal data of two Chulalongkorn University medical student groups enrolled by the Ministry of University Affairs in the formal and informal programs of secondary school education was compared. The findings attempt to provide the most significant variables which are useful for future consideration of academic selection criteria.

Objectives

1. Study of six classes of the CU medical students who enrolled in the academic years of 1987-1992.
2. Descriptive study about the effectiveness of entrance examinations as a whole and in each subject area.
3. Comparative study of two groups of medical students achievements during their undergraduate study.
4. Investigate the relationships of the entrance test scores to grade point average and cumulative grade point average from the first semester to the last semester of the medical program.

Materials and Methods

A total 579 medical students who enrolled in the academic years 1987-1992 were the subjects of this study. The subjects were divided into two groups, based on the secondary education program. One group was composed of 243 students who studied in the formal education program (group 1) and the other 336 students were in the informal education program (group 2).

Data was collected in two parts, the biography and educational background of the students as recorded in the student's admission questionnaires, and the students academic achievement as recorded in the educational service unit of the Faculty of Medicine.

Data and statistical analysis were performed on the Chulalongkorn University main-frame computer using the SPSS-X programme.

The analysis were divided into three parts; the descriptive statistics for previous background data, One-Way Analysis of Variance statistic used to determine the significance of any difference between the mean of the students' grade scores, and the multiple correlation coefficient between the grade scores and the entrance scores.

Results

1. The students' previous background information, illustrated by tabular distribution and the central value of the data, is summarized as follows :

1.1 Medical students enrolled in the years 1987-1992, included 376 male (64.94%) and 203 female (35.06%) students Table 1 shows that the number of female students increased almost every year.

Table 1. Percentage of Medical students enrolled in 1987-1992 classify by gender.

Enrolment Year	Male		Female		Total Student
	No.	Percent	No.	Percent	
1987	73	76.84	22	23.16	95
1988	62	63.27	36	36.73	98
1989	58	61.05	37	38.95	95
1990	64	65.98	33	34.02	97
1991	60	63.83	34	36.17	94
1992	59	59.00	41	41.00	100
Total	376	64.94	203	35.06	579

Table 2 shows the distribution of an almost equal number of students in both sample groups (group 1 and group 2) who enrolled in 1987-1988. After that year, the number of the

students in group 2 increased rapidly so that the percentage of the students in group 2 in the year 1992 was approximately 75.

Table 2. The distribution of Medical Students categorized by secondary school program.

Enrolment	Formal school students (group 1)				Informal school student (group 2)			
	Male	Female	Total students		Male	Female	Total students	
			No.	Percent			No.	Percent
Year								
1987	35	13	48	50.53	38	9	47	49.47
1988	32	19	51	52.04	30	17	47	47.96
1989	18	24	42	44.21	40	13	53	55.79
1990	25	18	43	44.33	39	15	54	55.67
1991	22	11	33	35.11	38	23	61	64.89
1992	17	9	26	26.00	42	32	74	74.00
Total	149	94	243	41.97	227	109	336	58.03

1.2 The average age of the medical students in group 1 was one year more than the average age of the students in group 2.

The minimum age of the students in both groups was mostly over 15 and 16 years old. The range of the students age is described in table 3.

Table 3. The descriptive about age of medical students at the admission period.

Enrolment	The average age of students		The range of students'age	
	group 1	group 2	group 1	group 2
Year				
1987	18.2	16.6	16.5-20.2	14.11-18.6
1988	18.2	17.4	16.8-20.0	15.7 -19.5
1989	18.0	17.3	16.5-19.6	15.11-19.9
1990	18.2	17.0	16.5-19.9	15.3 -19.2
1991	18.2	17.0	16.10-22.4	15.0 -19.4
1992	18.4	17.2	17.3-21.1	15.1 -23.2

1.3 The mean average of entrance scores was higher than 60% per subject. The scores obtained in Physics and English was the

highest, being more than 70% by average, as presented in table 4.

Table 4. Statistics describing distribution of the entrance scores in 1987-1992.

Entrance Year	Mathematics			Chemistry			Physics		
	Mean	SD	SE	Mean	SD	SE	Mean	SD	SE
1987	80.08	8.50	0.88	71.44	4.45	0.46	80.31	7.09	0.74
1988	60.36	10.06	1.02	80.73	5.57	0.57	77.78	8.09	0.82
1989	61.71	9.03	0.93	74.42	6.39	0.66	73.72	6.95	0.72
1990	62.04	10.25	1.04	60.97	6.94	0.71	71.43	7.12	0.72
1991	73.36	8.90	0.92	68.48	5.11	0.53	76.43	6.87	0.71
1992	67.16	10.94	1.09	64.37	5.83	0.58	70.34	8.79	0.88

Entrance Year	Biology			General			English		
	Mean	SD	SE	Mean	SD	SE	Mean	SD	SE
1987	70.45	5.37	0.56	68.90	4.05	0.42	75.26	6.41	0.66
1988	66.97	5.59	0.57	60.76	4.97	0.50	72.93	7.31	0.74
1989	57.00	5.51	0.57	65.27	5.25	0.54	71.83	9.52	0.98
1990	65.29	5.62	0.57	58.27	4.60	0.47	72.22	8.81	0.90
1991	62.09	5.52	0.57	59.96	4.56	0.47	72.47	8.16	0.84
1992	61.89	6.03	0.60	65.61	5.40	0.54	70.58	9.15	0.92

2. The comparison of students academic achievement, student grade point average (GPA) and cumulative grade point average (GPAX) both in basic sciences in pre-clinical courses for the former three years and in the clinical sciences in the clinical courses during the latter three years was selected to be the dependent variables. The findings revealed that:

2.1 The analytical comparisons of the students GPAX from the first year to the sixth year while at the Faculty of Medicine, was conducted using the Analysis of Variance procedure. The mean difference of GPAX in each academic year of the students in group 1 and group 2 was compared through the F-test. The results indicated that the average GPAX of both groups in

each class was greater in the first year. The F ratio of group 1 and group 2 was significant at the 0.05 point and 0.01 point. (F= 3.13,4.59)

2.2 The comparison of the students GPAX mean by the t-test was entirely different because the mean GPAX of the students in group 2 was significantly greater than the other

group in every academic year from the first year to the sixth year. The students in group 2 obtained GPAX means over 3.00 (the GPAX range was 3.05-3.44) and in the other group the GPAX mean was more than 3.00 only in the first year and the last year of study. These data is presented in table 5.

Table 5. Means and Statistics in the comparison of students GPAX in each academic year.

Students cohort	year 1		year 2		year 3		year 4		year 5		year 6		
	Mean	t	Mean	t	Mean	t	Mean	t	Mean	t	Mean	t	
1987	group 1	3.12		2.19		2.88		2.91		2.90		3.00	
	group 2	3.44	3.85***	3.27	4.00***	3.24	4.14***	3.26	4.32***	3.23	4.52***	3.29	4.32***
1988	group 1	3.10		2.92		2.87		2.88		2.92		3.03	
	group 2	3.39	3.25**	3.21	3.41**	3.17	3.46**	3.16	3.50**	3.16	3.29**	3.25	3.33**
1989	group 1	2.89		2.83		2.82		2.91		2.96			
	group 2	3.12	2.49**	3.05	2.44*	3.06	2.81**	3.10	2.32*	3.12	2.13*		
1990	group 1	3.17		2.94		2.92		2.94					
	group 2	3.33	2.24*	3.17	2.91*	3.15	2.74**	3.14	2.56*				
1991	group 1	3.19		2.97		2.90							
	group 2	3.43	3.83***	3.29	4.44***	3.24	4.40***						
1992	group 1	3.10		2.86									
	group 2	3.36	2.49*	3.21	3.33***								

*p < .05 **p < .01 ***p < .001

2.3 To examine the academic achievement in each semester, the student GPA was selected as the dependent variable. The pre-clinical period for the first three years (first through sixth semesters) and the clinical period for the latter three years (seventh through twelfth

semesters) grade average was compared between the two groups. The results are in table 6 and indicate that the mean GPA of the students in group 2 was more than in the other group in every semester of the pre-clinical period.

Table 6. Means and Statistics in the comparison of students GPA in the pre-clinical period.

Students cohort	semester 1		semester 2		semester 3		semester 4		semester 5		semester 6		
	Mean	t	Mean	t	Mean	t	Mean	t	Mean	t	Mean	t	
1987	group 1	3.19		3.06		2.69		2.71		2.79		2.79	
	group 2	3.46	3.06***	3.43	4.08***	3.08	3.76***	3.12	3.84***	3.22	3.82***	3.15	3.63***
1988	group 1	3.16		3.05		2.76		2.73		2.72		2.82	
	group 2	3.43	3.10**	3.34	2.91**	3.02	2.77**	3.03	3.09**	3.06	2.88**	3.15	3.34**
1989	group 1	2.19		2.87		2.78		2.78		2.81		2.78	
	group 2	3.12	2.06**	3.11	2.37*	3.01	2.45**	2.96	1.81*	3.07	2.49*	3.08	2.78**
1990	group 1	3.10		3.25		2.73		2.70		2.81		2.95	
	group 2	3.25	1.90*	3.40	1.88*	2.30	2.65*	3.03	3.17*	3.02	1.93	3.17	2.21*
1991	group 1	3.11		3.28		2.76		2.74		2.76		2.72	
	group 2	3.30	3.89***	3.57	3.54***	3.15	4.15***	3.16	4.23***	3.19	3.91***	3.08	3.55**
1992	group 1	3.15		3.05		2.65		2.59					
	group 2	3.33	1.80*	3.38	2.91**	3.07	3.51**	3.05	3.66***				

*p < .05 **p < .01 ***p < .001

There was no significant difference in the clinical year period, except that the students in group 1 who enrolled in 1987 had a higher GPA

mean than the students in group 2, as shown in table 7.

Table 7. Means and Statistics in the comparison of student GPA in the clinical period.

Students cohort	semester 7		semester 8		semester 9		semester 10		semester 11		semester 12	
	Mean	t	Mean	t	Mean	t	Mean	t	Mean	t	Mean	t
1987	group 1	2.96		3.06		2.88		2.86		3.40		3.47
	group 2	3.13	1.71	3.37	4.22***	3.16	4.10***	3.11	3.33**	3.48	1.21	3.59
1988	group 1	2.93		2.90		3.03		3.07		3.52		3.50
	group 2	3.00	0.79	3.16	2.86**	3.18	1.99	3.19	1.76	3.62	1.80	3.58
1989	group 1	3.00		3.22		2.99		3.12				
	group 2	3.17	1.70	3.23	0.17	3.08	1.32	3.10	-0.31			
1990	group 1	2.99		2.99								
	group 2	3.10	1.01	3.13	1.53							
1991	group 1											
	group 2											
1992	group 1											
	group 2											

*p < .05 **p < .01 ***p < .001

3. A coefficient of correlation considered what variables or combination of variables could most effectively predict the students success. The relationship between the obtained data was analyzed and the findings were:

3.1 The correlation was between the total scores of the entrance examination and each sub-test score of the six subjects which was a requirement for admission. Those were

mathematics, chemistry, physics, biology, English and general knowledge which was examined by use of the Pearson's product moment coefficient. The obtained correlation coefficient is shown in Table 8 and was statistically significant at 0.001 point. It showed that the students in group 2, whose score was high in physics, also got high scores in chemistry and mathematics.

Table 8. Matrix of correlation coefficients between the entrance scores and sub-test scores of the informal secondary education students.

Coefficient of Correlation	Mathematics	Chemistry	Physics	Biology	English	General knowledge	Total score
Mathematics	1.00						
Chemistry	0.13*	1.00					
Physics	0.34***	0.40***	1.00				
Biology	0.10*	0.14*	0.09	1.00			
English	0.13*	0.01	0.12*	0.13*	1.00		
General knowledge	0.09*	0.01	-0.08	0.10*	0.17**	1.00	
Total score	0.56***	0.50***	0.54***	0.38***	0.27***	0.25***	1.00

*p < .05 **p < .01 ***p < .001

In Table 9, the coefficient correlation of the general knowledge scores of the students in group 1 was positively significant with the scores in English and biology. Conversely, the correlation of the scores in the subject of English was negative with the scores in chemistry and physics.

Table 9. Matrix of correlation coefficients between the entrance scores and sub-test scores of formal secondary education students.

Coefficient of Correlation	Mathematics	Chemistry	Physics	Biology	English	General knowledge	Total score
Mathematics	1.00						
Chemistry	0.06	1.00					
Physics	0.35***	0.26***	1.00				
Biology	0.11*	0.02	0.24***	1.00			
English	-0.11	-0.13*	-0.12*	0.12*	1.00		
General knowledge	0.08	0.08	0.03	0.22***	0.23***	1.00	
Total score	0.62***	0.44***	0.60***	0.51***	0.30***	0.46***	1.00

*p < .05 **p < .01 ***p < .001

3.2 Stepwise multiple regressions were performed using the predictor variables that included the six subject scores and those acquired in the entrance examination. The GPA and GPAX of the students were the independent determiners of success in academic achievement. The results indicated that:

3.2.1 The use of entrance scores in predicting the overall academic achievement of the six year medical program from the beginning to the end of the program was statistically significant at 0.05 point. Four of the six independent variables showed the significant variation in prediction. English scores were the most effective predictor of GPAX in every academic year, and the next variable were biology scores which were used to predict the students GPAX during the first year to the fourth year of study. Mathematics scores were better predictors of GPAX in the first and second year, and chemistry was the subject that respectively correlated with GPAX in the fifth year grade. The determination of correlation coefficients between these variables to the GPAX in academic years 1-5 was 11.17, 7.07, 7.12, 8.03 and 5.71 respectively and in percentage.

3.2.2 When directly comparing the GPAX of students in group 1 and group 2 during the medical program, the analysis showed a significant difference between the predictor at 0.05 point. The multiple correlation of entrance scores in English and biology was significant with the GPAX of the students in group 1 during academic years 1 and 2, while the scores in English also correlated with the GPAX during academic years 3 and 4. The percentage of the determination correlation coefficients in academic

years 1 and 2 was 11.38 and 8.26. There were two more predictors of academic achievement in students group 2. The mathematics scores consistently correlated with the English and biology scores in prediction of GPAX during academic year 1 and 2, and followed by the total entrance scores as the last predictor in academic years 3 and 4. The coefficient of multiple determination in the academic success of students in group 2 in the years 1-4 was 14.82, 10.20, 10.37 and 9.62, respectively.

3.2.3 Analysis of the students grade point average (GPA) in each class by stepwise multiple regression considered that each of the independent variables, which included the entrance scores of biology, chemistry, English, general knowledge, mathematics and total scores, were statistically significant at 0.05 point, but there was some difference in the number of predictors in determining the semester average grade.

For the students who enrolled in 1987, the chemistry scores were the most significant variable that correlated between the GPA obtained in every semester from the first year to the fourth year. The multiple correlation coefficients was 24.96 in percentage of the variance for the first semester of the freshmen grade. The scores in English from the first semester to the end of fourth year was the only predictor of the students average grade who enrolled in 1988. Another best predictor of the students who enrolled in 1989 and 1990 were the total entrance scores. They correlated to the GPA in each semester for three years of pre-clinical period, and also associated with the scores in English

so that the coefficients of multiple determination in percentage were 22.03 and 15.60 to the first semester GPA, respectively. It was obvious that the scores in general knowledge had been related to the third year GPA of the students who enrolled in 1991, while the scores in biology were the predictor of GPA in every semester of the first and second year. And the general knowledge scores of the students in the last class was the best predictor of GPA while the next best predictor was the mathematic scores, as 20.64 was described for the percentage of determination coefficients.

Discussion

The trends of the CU medical students showed the rapidly increasing number of students in group 2, and the average age of admission was one year younger than in students group 1. The pre-admission average entrance scores in each class was more than 60%. When the academic success during the medical program was longitudinally analyzed, the findings revealed that the most significant predictor was the English entrance scores. Next in importance were the biology scores, the mathematics scores and the chemistry scores, respectively. The results of the Ministry of University Affairs study⁽¹⁾ indicated that the English scores and the general knowledge scores of the entrance examination were significant predictors of the medical students both in the theory and the pre-clinical courses. And the predictors of the CU medical students would be five subject scores obtained from the general knowledge test, the English test, the mathematics test, the biology and the physics

test. The other finding of a comparison of the students achievement between the two groups showed that the higher level achievement among the students in group 2 both in the grade point average and cumulative grade point average. It appeared from multiple regression analysis that both of the sample groups entrance scores in the English and biology subjects correlated with the GPAX of undergraduate study in the Faculty of Medicine. The other two predictors, mathematics scores and total entrance scores, were associated with the next best correlations for predicting the achievement grade average during the pre-clinical study period. Furthermore, in an analysis of entrance scores since 1991 it appeared that the general knowledge scores was an independent variable that effected the coefficient of determination in predicting the semester grade point average associated with the other independent variables. These results were in broad agreement with Pongtip,⁽²⁾ who revealed that the predictive validity of the entrance examinations for the CU medical students was .25-.38 by correlation coefficient. It also indicated that the general knowledge scores were a moderately effective predictor of grade point average in semesters 1-3. Marojohan's⁽³⁾ findings agreed with other studies about prediction of academic performance is that the most significant variable was the basic knowledge of the higher education entrance examination scores. Next in importance was general knowledge, but the secondary school national examination scores and the secondary school grades were not significant predictors. This was a challenge for further study about other variables in the aspects of selection that

influence medical education success. For example, whether it concerns access to appropriate standardized tests or participative processes restricted to considering best solutions. Sukchai⁽⁴⁾ suggested that the work of the Institution for the Promotion of Teaching Sciences and Technology (IPST) and the Ministry of University Affairs should be coordinated and set the entire secondary school curriculum as well as develop the process of scientific thinking so that alternative testing methods for special recruitment would be in considered, and which is relevant to the educational goals of the IPST. The educational results of the CU Faculty of Medicine is described by the number of students graduated from each class. This has been more than 95%.⁽⁵⁾ Many argue that maturity may be the critical problem among medical students now. In our study it was shown that there was no difference in performance during the clinical study between the two sample groups by comparison of average grade point. Those results confirmed the previous study of Jensen⁽⁶⁾ about the relationship of pre-admission variables to criterion variables which showed that natural science ACT scores were included in the greatest number of regression formulas; but age, prior college experiences and gender were not as indicative of success. Another study, by Hojat⁽⁷⁾ compared psychosocial characteristics with basic sciences examination grades, clinical examination grades, and clinical competency ratings, and the results indicated that noncognitive psychosocial measures were significant and unique predictors of medical school performance. But anyway, the suggestion of various literature concerned about the alternative

of independent variables that influence the educational success. And the information from the study conveyed some useful aspects of selection; if possible, any other aspects should be selected for further study. Such as the secondary education system itself may be involved the students' capability background. The overall findings our study indicated some interesting information that may be useful when examining the current debates and future directions surrounding the issue of entrance requirements, with particular attention to select the more important academic criteria both in general admission criteria and special criteria. The effort of conducting a battery of individual tests, including aptitude, interest and personal measures may also be of use.

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