Cumulative grade point average as a tangible predictor of academic achievement: A retrospective cross-sectional study

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Abstract: .
The study was conducted with an objective to determine the role of Cumulative Grade Point Average as an indicator of academic achievement of undergraduate medical students in Physiology. A retrospective cross-sectional study was conducted in Melaka Manipal Medical College (Manipal Campus) after obtaining approval from the institutional research committee. Eight batches of undergraduate medical students (n=1051) admitted from 2008 to 2012 were included in the study. CGPA and University Examination theory and practical marks in Physiology were collected from the college database. Pearson's correlation was done to find the strength of association between the CGPA and University marks. In first phase, variables like CGPA, learning approaches and block examination marks were used for performing a univariate analysis, with university examination performance as a dependent variable. Correlations that had a p-value <0.2 were considered significant. In second phase, the variable that was best correlating with students' performance in the University examination was subjected to multiple regression analysis. It was observed that, >98% of students who had CGPA greater than 3.5 were successful in the Physiology University examination A linear relation was observed between the CGPA and University marks in Physiology. The present study reemphasized that CGPA score is good predictor of student achievement.

Keywords: CGPA, Predictor, Academic achievement, Physiology, Medical students.   .

Introduction:

Prediction of academic achievement has always been a complex and challenging area of educational research. This is mainly because of several confounding factors that tend to influence student life and hence, student achievements. We have attempted to use the most commonly used variable, Cumulative Grade Point Average (CGPA) as a predictor of academic achievement in a medical school setting to explore how well it serves as an indicator.

In higher education, CGPA has often been reported as one of the major indicators of academic achievement (1). The measure of achievement in academics is usually measured using the letter grades that provide an overall CGPA. The GPA, when seen cumulatively, gives the complete pedagogic performance of a student in a specified College and within the study program. Along with considering CGPA as a very good measure of academic achievement, its significance is also emphasized in the prediction of persistence (2). It has also been promoted as an indicator of the extent to which the environment in the institution has been adapted by the students' themselves. The accuracy in prediction could become difficult with the increase in diversity of the student population and for some groups if the measures have minimal predictive abilities, this would add to the difficulty (3). However, in the present study, the diversity of student population was minimum with regard to their educational and cultural backgrounds. The traditional cognitive predictors have been able to predict around 25% of college achievement according to a report by Astin et al (4). The traditional cognitive measures

such as CGPA and standardized test scores have been occasionally reported to be unsuccessful in the prediction of certain non-cognitive abilities of students' (5). The cognitive measures were able to predict that both male and female students who were admitted showed higher levels of academic achievement. According to the report by Baron and Norman (6) CGPA was the best predictor in their proposed model involving GPA and standardized test scores and this result came up when the standardized test scores and CGPA were the only dominators as predictors.

Academic under-achievement of a student in a program would mean that the college has to relook into selection procedures while admitting students, and provide essential academic support for students during the course. The academic achievement of students reflects the quality of education imparted by an institution. It has been reported in literature that students who do not succeed in their first year of medical school have minimal chances of graduating as doctors (7). Prediction of students' academic achievement in college is rather difficult, as there are numerous cognitive and non-cognitive variables that play a role in determining student performance. CGPA could possibly provide administrators with a more precise indicator for selection as well as to predict students' academic achievement (8).The study was conducted to identify to what extent the CGPA could serve as a possible indictor of academic achievement.

The undergraduate medical program at Melaka Manipal Medical College (MMMC), where this study was conducted, runs the Bachelor of Medicine and Bachelor of Surgery (MBBS) program which is of five years duration. The students spend the first two and a half years in Manipal campus, India and the remaining two and a half years in Melaka campus, Malaysia. The first year subjects include Anatomy, Physiology and Biochemistry. The first year curriculum is divided into four blocks as follows: Block 1: Basic concepts, blood and nerve-muscle Physiology, Block 2: Cardiovascular, respiratory, and gastrointestinal Physiology, Block 3: Endocrine, reproductive, and renal Physiology and Block 4:

Central nervous system and special senses. There are two admissions per year; one in March and another in September. The assessments include several formative and five summative examinations. Of the summative examinations, they have four major block examinations and final university examinations. These examinations have both theory and practical components which are assessed in block and university examinations. In these examinations, the student is said to have successfully completed the course if he/she has scored 50% and above.

Objective:

To determine the role of Cumulative Grade Point Average (CGPA) as an indicator of academic achievement of undergraduate medical students in Physiology.

Materials and Method:

The study was conducted at the Melaka Manipal Medical College, Manipal University, India. The study design was retrospective and cross sectional. Eight batches of undergraduate medical students (n=1051) were included in the study. The college admits students twice a year and the student population included in the study were taken from eight batches admitted from 2008 to 2012. The study was approved by the Institutional Research Committee. These students study Physiology for a duration of one year, in the first year of the MBBS course.

The data regarding the CGPA and University Examination theory marks in Physiology were collected from the college database which maintains a record of student scores from the time of admission until they graduate. The Pearson's correlation was done to find the strength of association between the CGPA and University exam theory marks. In the first phase, variables such as, CGPA, learning approaches and block examination marks were used for performing a univariate analysis, with university examination performance as a dependent variable. Correlations that had a p-value <0.2 were considered significant. In the second phase, the variable that was best correlating with performance of students in the University examination was subjected to

multiple regression analysis. The multivariate regression analysis was carried out to determine the best independent predictor of student performance in the University examination.

Results:

The entry-level grade point average of students admitted to the program at Melaka Manipal Medical College ranged between 2.75 to 4 as recorded in the database. The batch wise distribution of CGPA is compiled in Table 1. 86% (904) of the students had CGPA above 3. The student population that had a CGPA in the range of 2.75-3.00, was 13.99 % and 9.71 % of the study population had CGPA in the range of 3.01 -3.25. A major proportion i.e. 34.35% of the study population had CGPA in the range of 3.26-3.50, whereas 21.98% of the study population had a CGPA ranging from 3.51-3.75. The highest CGPA ranging from 3.76-4.00 was achieved by 19.98% of the study population (Fig. 1).

Figure 1: The cumulative grade point average of the students in the study population at various cut-off levels
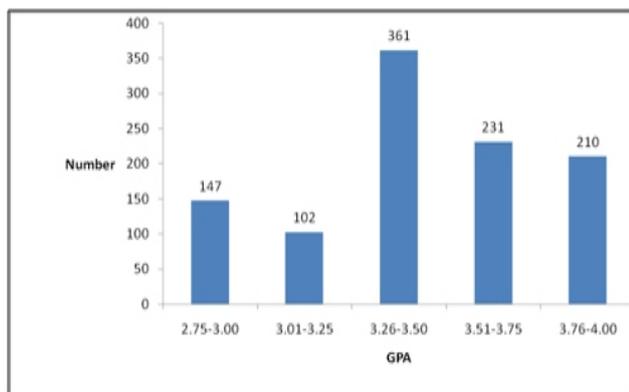

Table 1: The cumulative grade point average of the students in the study population across batches at various cut off levels.

CGPA	Batch 21 n (%)	Batch 22 n (%)	Batch 23 n (%)	Batch 24 n (%)	Batch 25 n (%)	Batch 26 n (%)	Batch 27 n (%)	Batch 28 n (%)	Total n (%)
2.75-3.00	8 (6.4)	16 (12.90)	24 (19.05)	25 (22.73)	7 (4.93)	22 (16.79)	22 (13.75)	23 (17.29)	147 (13.99)
3.01-3.25	2 (1.6)	6 (4.84)	34 (26.98)	22 (20.00)	10 (7.05)	10 (7.63)	12 (7.50)	6 (4.52)	102 (9.71)
3.26-3.50	38 (30.4)	52 (41.94)	28 (22.22)	28 (25.46)	72 (50.70)	35 (26.72)	71 (44.38)	37 (27.82)	361 (34.35)
3.51-3.75	32 (25.6)	19 (15.32)	34 (26.98)	23 (20.91)	34 (23.94)	32 (24.43)	28 (17.50)	29 (21.80)	231 (21.98)
3.76-4.00	45 (36.0)	31 (25.0)	6 (4.77)	12 (10.9)	19 (13.38)	32 (24.43)	27 (16.87)	38 (28.57)	210 (19.98)
Total	125	124	126	110	142	131	160	133	1051

A linear relation was observed to be existing between the CGPA scores and University marks in Physiology in this study. It was observed that, >98% of students who had CGPA greater than 3.5 were successful in the Physiology University examination; Table 2 showing student distribution based on CGPA and Physiology theory marks, Table 3, based on CGPA and practical marks and Table 4 showing entry level CGPA and success rate.

Table 2: Distribution of study population based on CGPA at various cut-off levels, and their mean scores in the university Physiology theory examinations

Group	CGPA	Frequency n (%)	University Theory Marks (out of 100) Mean ± SD	p-value
I	2.75 – 3.00	147 (13.99)	54.1 ± 11.5	
II	3.01 – 3.25	102 (9.71)	56.5 ± 8.6	
III	3.26 – 3.50	361 (34.35)	62.3 ± 9.9	< 0.001
IV	3.51 – 3.75	231 (21.98)	68.8 ± 8.1	
V	3.76 – 4.00	210 (19.98)	74.9 ± 9.8	

It was also found that CGPA has strong correlation with University theory marks (r= 0.591) and University practical marks (r=0.484) in Physiology across all batches of students. The details of student scores in University examinations, both theory and practical components have been presented in tables 2 and 3 respectively.

Table 3: Distribution of study population based on CGPA at various cut-off levels, and their mean scores in the university Physiology practical examinations

Group	CGPA	Frequency n (%)	University Practical Marks (out of 50) Mean ± SD	p-value
I	2.75 – 3.00	147 (13.99)	35.1 ± 5.1	
II	3.01 – 3.25	102 (9.71)	36.4 ± 4.4	
III	3.26 – 3.50	361 (34.35)	38.0 ± 4.6	< 0.001
IV	3.51 – 3.75	231 (21.98)	40.2 ± 3.6	
V	3.76 – 4.00	210 (19.98)	42.4 ± 3.8	

at various cut-off levels was significant at p-value less than 0.001. All the students included in the study were found to have a CGPA score between 2.75 - 4.00. Among them majority (86%) were having a CGPA of more than 3.00. It was also found that CGPA has strong correlation (r= 0.591 with University theory marks) with academic performance in Physiology. In our study we observed that, the academic achievement of students with more than 3.5 CGPA was 98% 100% in all the batches of the study population. It also highlights and reminds us that if the students with CGPA ≥3.5 are only selected to our medical school, then the overall success rate could be improved further and the failure rate can be minimized to a great extent. In our study, CGPA accounted for 26.9% of variance in the overall academic achievement in the University theory examination. This makes it an important factor in understanding the academic ability of the student to perform satisfactorily in Physiology. Similarly, reports by Ferguson et al and Wilkinson et al have found similar results (1,10). In these studies, the authors were able to predict the achievement in undergraduate level of curriculum and the importance of GPA was also applicable for the variance in the retention probability[13] and cumulative college GPAs (6). The study also highlights that students being admitted to a medical school, have a great social responsibility once they graduate, and draws attention to the fact that selections to such courses should be streamlined and a CGPA ≥3.5 as an entry level cut-off for selections of students to a medical school would have a greater impact on the overall success rate of such students.

Conclusion:

In summary, it was seen that, we were able to predict student academic achievement in Physiology using CGPA scores. The present study reemphasized the fact that CGPA scores could predict students' academic achievement and the same prediction feature of CGPA could be extended for predicting the chances of students graduating as doctors. In order to enhance the efficiency of delivery of Physiology curriculum and to enhance the academic achievement of

A detection of academic difficulties encountered by the students are essential. This in turn improves student satisfaction and competency in attaining the demands of the curriculum. This also improves satisfaction of other stake-holders by reducing the failure and attrition rate.

References:

1. Ferguson, Eamonn, David James, Laura Madeley. Factors associated with success in medical school: Systematic review of the literature. BMJ 2002; 324.7343 (2002): 952 957.
2. Tinto, Vincent. "Classrooms as communities: Exploring the educational character of student persistence." Journal of higher education (1997): 599-623.
3. Jones RF, Thomae-Forgues M. Validity of the MCAT in predicting performance in the first two years of medical school. Academic Medicine. 1984; 59(6):455-64.
4. Astin, Alexander W. What matters in college?: Four critical years revisited. San Francisco: Jossey-Bass, 1993.
5. Sansgiry SS, Bhosle M, Sail K. Factors that affect academic performance among pharmacy students. American journal of pharmaceutical education. 2006;70(5):104.
6. Baron, Jonathan, and M. Frank Norman. "SATs Achievement Tests, and High-School Class Rank as Predictors of College Performance." Educational and Psychological Measurement 52 (1992): 1047-1047.
7. Wilkinson, Tim J., and Christopher M. Frampton. "Comprehensive undergraduate medical assessments improve prediction of clinical performance." Medical education 38.10 (2004): 1111-1116.
8. Cohn, Elchanan, et al. "Determinants of undergraduate GPAs: SAT scores, high-school GPA and high-school rank."

Economics of Education Review 23.6 (2004): 577-586.

9. Jones RF, Thomae-Forgues M. Validity of the MCAT in predicting performance in the first two years of medical school. Academic Medicine. 1984; 59(6):455-64.

10. Wilkinson, David, et al. "Medical school selection criteria and the prediction of academic performance." Medical Journal of Australia 189.4 (2008): 235.

11. Naretto, Josephine A. "Adult Student Retention: The Influence of Internal and External Communities." NASPA journal 32.2 (1995): 90-97

12. Kahn, Jeffrey H., and Margaret M. Nauta. "Social-cognitive predictors of first-year college persistence: The importance of proximal assessment." Research in higher education 42.6 (2001): 633-652.

13. Mitchell, David F., Bert A. Goldman, and Moreland Smith. "Change factors affecting College matriculation: A re-analysis." Journal Of The First-Year Experience & Students in Transition 11.2 (1999): 75-91.

14. Tinto, Vincent. "Classrooms as communities: Exploring the educational character of student persistence." Journal of higher education (1997): 599-623.

15. Murtaugh, Paul A., Leslie D. Burns, and Jill Schuster. "Predicting the retention of university students." Research in higher education 40.3 (1999): 355-371.

16. McCleary, Vikki L., Gayle Aasen, and Henry B. Slotnick. "Predictors of success in undergraduate human Physiology." Natural science 1.3.8 (1999): 2-9.

17. Tan, Christine M., and K. Thanaraj. "Influence of context and preferred learning environments: Approaches to studying Physiology." Medical education 27.2 (1993): 143-159.