Trajectories of undergraduate medical students' performances and their relationship with learning approaches

FACULTÉ DE MÉDECINE · UDREM · UNIVERSITÉ DE GENÈVE

Anne Baroffio, Giovanni Piumatti, Milena Abbiati, Margaret W. Gerbase

Background

Acting on factors impacting medical students' academic performances since early study years is crucial to support lower achieving students at risk of dropout. Evidence shows that prior academic performance predicts success in medical school. On the other hand, the way students approach their learning has a discrimination power on students' performance. In particular, deep learning approaches have been positively associated with higher academic performance in opposition to surface learning approaches. It remains nevertheless partially unexplored how academic performance longitudinally evolves during the medical training and whether the learning approaches used by students may act on this evolution.
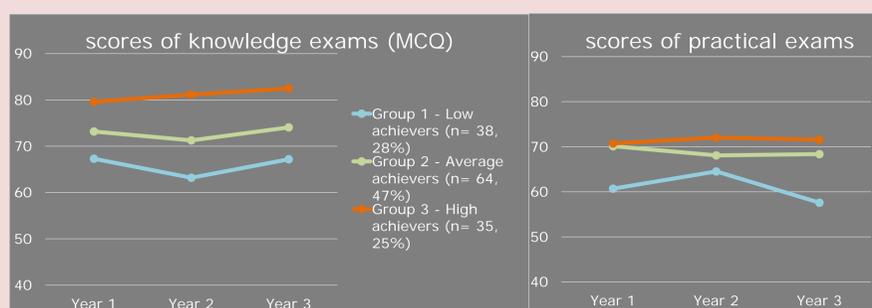
Research hypothesis

The learning approaches used by students during their first study year predict their trajectory of performance during the subsequent study years.

Summary of work

Population: 137 undergraduate medical students from the Geneva medical school (Mage=20.85 years, 53% females) recruited during their first pre-selection academic year (Year 1) who successfully passed to Years 2 and 3.
Measures: (1) scores of two types of assessments, a written knowledge-based multiple choice question test and an oral practical exam, recorded during three semesters throughout academic years 2 and 3; (2) deep and surface learning approaches used at Year 1 assessed by students' answer to the revised two-factor Study Process Questionnaire
Statistical analysis: Longitudinal group-based trajectory modelling, multinomial logistic regression

Aim of the study

1. Test whether medical students' academic performance evolves along different trajectories during pre-clinical years.
2. Investigate whether the learning approaches used by students at the onset of medical training predict their subsequent trajectory of academic performance
3. Examine whether repeating the first study year is a predictor of future performance

Summary of results

1. Evolution of students along three longitudinal trajectory groups of academic performance

scores of knowledge exams (MCQ) — scores of practical exams
Group 1 - Low achievers (n= 38, 28%)
Group 2 - Average achievers (n= 64, 47%)
Group 3 - High achievers (n= 35, 25%)

Descriptive statistics of both longitudinal trajectory groups
(Values are means (standard deviations) unless stated otherwise)

	Whole sample (N = 137)	Low achievers (n = 38)	Average achievers (n = 64)	High achievers (n = 35)	p*
Age	20.85 (2.41)	20.86 (1.29)	20.98 (2.90)	20.60 (2.39)	0.754
Females N (%)	72 (53%)	20 (28%)	35 (49%)	17 (24%)	0.844
Repeaters N (%)	50 (37%)	21 (41%)	21 (41%)	8 (16%)	0.008
Knowledge exams – Year 1	73.19 (6.24)	67.29[a] (4.60)	73.19[b] (3.95)	79.60[c] (4.60)	<0.001
Knowledge exams – Year 2	71.56 (8.25)	63.18[a] (5.04)	71.27[b] (5.32)	81.17[c] (4.05)	<0.001
Knowledge exams – Year 3	74.41 (7.28)	67.17[a] (5.27)	74.06[b] (4.61)	82.49[c] (4.00)	<0.001
Practical exams – Year 1	67.64 (9.12)	60.71[a] (10.19)	70.13[b] (7.25)	70.74[b] (6.74)	<0.001
Practical exams – Year 2	68.10 (8.70)	64.53[a] (9.30)	68.08[a,b] (8.56)	72.03[b] (6.51)	<0.001
Practical exams – Year 3	66.29 (11.02)	57.58[a] (10.54)	68.37[b] (10.22)	71.57[b] (7.28)	<0.001

Note. Group-means with different single letters in the same row are statistically different at p < 0.001 according to post-hoc Bonferroni corrections. * Statistical difference were tested according to Chi-square tests for categorical variables and univariate analyses of variance for continuous variables.

2. Prediction of trajectories according to repeater status and learning approaches used at year 1

Results of multinomial logistic regression analyses

	Average vs. Low				High vs. Low			
	RRR	SE	RRR 95% CI	p	RRR	SE	RRR 95% CI	p
Age	0.98	0.10	0.78, 1.19	0.817	1.01	0.12	0.79, 1.27	0.979
Gender (Ref. Males)	1.05	0.55	0.37, 2.96	0.922	0.89	0.52	0.29, 2.77	0.846
Repeater (Ref. Not repeater)	0.21	0.12	0.07, 0.63	0.005	0.12	0.08	0.03, 0.42	0.001
Deep approach – Year 1	1.12	0.57	1.01, 1.24	0.026	1.08	0.06	0.97, 1.21	0.157
Surface approach – Year 1	0.99	0.06	0.89, 1.11	0.894	1.04	0.07	0.92, 1.18	0.513

Note. RRR: relative risk ratios; SE: Standard Error; RRR 95% CI: relative risk ratios' 95% Confidence Intervals

Three longitudinally stable trajectory groups of academic performance were found: low (n=38, 28%), average (n=64, 47%) and high achievers (n=35, 25%).
Low achievers consistently obtained the lowest results on both types of assessments across semesters. Average achievers had worse performances than high achievers (who reported the best scores on all semesters) especially on the knowledge exams.
Multinomial logistic regression evidenced that (1) students who had been repeating Year 1 after failing, were more likely to belong to the low vs. average or high achievers groups ; and (2) students using deeper learning approaches at Year 1 were more likely to belong to the average vs. low achievers group.

Conclusion

Undergraduate students can follow different trajectories of performances during the pre-clinical years: "low, average and high achievers".
Using deep learning approaches during the first study year weakly predicts to belong to "average (vs low) achiever" trajectory.
Repeating the first study year predicts to belong to the "low achievers" trajectory. It thus has a negative but more important impact than the learning approaches used during the first study year.

Take-home message

The deep learning approaches used by students during their first study year are weak predictors of their trajectory of performance during the subsequent pre-clinical study years.

Students repeating their first academic year are particularly at risk of underperforming during the following undergraduate years.