

whether in A levels in the United Kingdom or undergraduate GPA (grade point average) in Canada, is a concern (the average GPA at McMaster last year was 3.74/4) the “fix” is straightforward, through the development of some standardised cognitive tests like the MCAT in the United States.

But I do not think that we are doing an acceptable job on the “non-cognitive” side, and I do not think it is simply an issue of training and standardisation of interviews. Measures like the personal interview are not nearly as defensible as the authors claim.² One interview, like one patient case, is a seriously restricted sample, an insight that led directly to new approaches like the multiple mini-interview.³ Some believe that personality measures are a viable alternative to interviews, but in my view the evidence of reliability and validity to date is pretty inconclusive.⁴

So where do we go from here? It seems to me that some diversity of selection is expected and desirable because of the different educational cultures in different schools. I cannot see any compelling reason

to insist on further uniformity of selection. After all, the standard assessment of student outcomes will ensure that the products are similar enough. We must do a better job of assessing the non-cognitive domain. I have no illusions that a better admissions process will identify all the potential “bad apples,” as some reformers hope. But we can all agree that both cognition and compassion matter and both should be assessed equally and well.

Competing interests: None declared.

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Predicting the “strugglers”: case-control study of students at Nottingham University Medical School

Janet Yates, David James

Abstract

Objective To identify potential predictors of undergraduate students who struggle during their medical training.

Design Case-control study. Cases were students who had experienced academic or personal difficulties that affected their progression on the course (“strugglers”). Controls were selected at random from the corresponding year cohorts, using a ratio of four controls for each struggler.

Setting University of Nottingham Medical School.

Participants Students who entered the course over five consecutive years.

Main outcome measures Likelihood ratios for independent risk factors for struggling on the course

Results 10-15% of each year’s student intake were identified as strugglers. Significant independent predictors of students being in this category were negative comments in the academic reference (likelihood ratio 2.25, 95% confidence intervals 1.44 to 3.50), lower mean examination grade at A level (2.19, 1.37 to 3.51), and the late offer of a place (1.98, 1.19 to 3.30). Male sex was a less significant risk factor (1.70, 1.09 to 2.65) as was a lower grade at GCSE science (2.13, 1.12 to 4.05). In UK students whose ethnicity was known, not being white was a significant predictor of struggling (2.77, 1.52 to 5.05) but the presence of negative comments was not. Age at entry to the course and the possession of a previous degree were not predictive.

Conclusions Our results support retention of existing selection practices relating to academic achievement and critical review of students’ references. We plan to undertake further investigation of the reasons why some students, including males, those with late offers and those from ethnic minority backgrounds, may do less well on the Nottingham course.

Introduction

Selecting the “right” students is a challenge for medical schools and the subject of much debate.¹⁻³ Most medical schools no longer select solely on the basis of high academic qualifications but include varied non-academic criteria. The aim is to identify personal qualities in potential students that will allow them to cope with the rigours of the medical course and to become globally competent as practising doctors.⁴ At Nottingham, there is regular review and development of the admissions process, which currently comprises four stages: review of academic ability, scoring of a validated questionnaire that focuses on personal attributes and attitudes, review of the statements on the application form from UCAS (the Universities and Colleges Admissions Service), and a semistructured interview by two trained interviewers.

Medical Education Unit, Faculty of Medicine and Health Sciences, University of Nottingham, Queen’s Medical Centre, Nottingham NG7 2UH

Janet Yates
research fellow

David James
director of medical education

Correspondence to:
D James
David.James@nottingham.ac.uk

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A subanalysis of strugglers is on bmj.com.



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It is not surprising that some students have doubts about their chosen career or have difficulties coping with the course. Yet to date, most studies of student performance have focused on positive predictors of successful students.¹ While important, such studies do not provide information about factors that predict impaired performance or students who may struggle both academically and personally. Indeed factors that predict success may be qualitatively different from those that predict problems. Identifying these would not only fill a gap in the current literature but also inform selection and support processes.

We conducted a case-control study of “struggling” students over successive cohorts of medical student entrants at Nottingham to determine whether any preadmission factors, academic or non-academic, predicted an increased risk of problems on the course.

Methods

Identification of strugglers and controls

We studied five consecutive year groups of medical students who should have completed the whole course at the time of data collection. To preserve confidentiality we have not specified the dates. We identified struggling students in one of four ways: students who attended the academic progress committee (APC), which meets several times each year and interviews students experiencing major academic difficulties and agrees various strategies of support; students who had their course terminated, usually for academic reasons; students who left the course voluntarily, whether for personal or academic reasons; and students whose course was suspended temporarily, for personal or academic reasons. These categories were not necessarily mutually exclusive—for example, a student who attended the academic progress committee might subsequently leave the course.

For each struggler, we identified four control students from the same year group cohort, but who did not fulfil the above criteria, by a computer generated

randomisation programme that used each student’s unique course identification code.

Data collection

For all students (strugglers and controls) we extracted data manually from two sources: the UCAS forms submitted by the students at the time of selection and the students’ progress records once they were on the medical course. We supplemented these data by additional information provided directly by UCAS (see bmj.com). GCSE (general certificate of secondary education) and A level passes were scored to create mean examination grades (MEGs). GCSEs were scored at A*=6, A=5 etc, an average of 5 being our screening threshold; A levels were scored at A=10, B=8 etc, an average of 9.33 equating to AAB. “Negative comments” were remarks made in the academic references on the UCAS form and generally referred to possibly adverse aspects of personality or behaviour. They were extracted verbatim and then summarised as a yes/no variable; we also conducted a validation exercise of this assessment (available from the authors on request).

Statistical analysis

We used SPSS v11 for data analysis. Our primary outcome variable was being a struggler. For univariate analysis we compared dichotomous variables with χ^2 tests and continuous variables by Mann-Whitney tests. For multivariate analysis we tested for independent predictors by binary logistic regression, using the backwards logistic regression option and including significant univariate factors in the modelling. We included year of entry to the course as a categorical variable to adjust for change over time.

Results

General

Overall, 123 students from the five cohorts were identified as strugglers and there were 492 controls. Fifty three strugglers were initially identified as APC attendees, nine as course terminations, 30 as voluntary

Table 1 Univariate (χ^2) analyses of discontinuous non-academic and academic variables. Figures are numbers (percentages) of students

Pre-admission factor	Strugglers (n=123)	Controls (n=492)	χ^2	Odds ratio (95% CI)	P value
Non-academic					
Male	61 (49.6)	168 (34.2)	10.05	1.90 (1.27 to 2.83)	0.002
From overseas	22 (17.9)	64 (13.0)	1.95	1.46 (0.86 to 2.48)	0.163
No gap year taken	97 (78.9)	410 (83.3)	1.36	0.75 (0.46 to 1.22)	0.244
Mature (age ≥ 21)	13 (10.6)	40 (8.1)	0.74	1.34 (0.70 to 2.58)	0.389
Negative comments by referee	56 (45.5)	130 (26.4)	17.03	2.33 (1.55 to 3.50)	<0.001
Disability declared	1 (0.8)	10 (2.0)	0.83	0.40 (0.05 to 3.12)	0.361
Offer made after 31 March	35 (28.5)	72 (14.6)	13.08	2.32 (1.46 to 3.69)	<0.001
Non-white ethnicity* (UK students only, n=492)	25 (27.5)	47 (11.7)	14.73	2.85 (1.64 to 4.95)	<0.001
Academic					
Lower MEG at GCSE (<5, n=584†)	51 (44.7)	138 (29.4)	9.91	1.95 (1.28 to 2.96)	0.002
Lower MEG at GCSE science (<5, n=583†)	21 (18.4)	35 (7.5)	12.68	2.80 (1.56 to 5.03)	<0.001
Lower MEG at A level (<9.33, n=588†)	46 (39.7)	100 (21.2)	17.02	2.45 (1.59 to 3.77)	<0.001
No A grade for biology A-level (n=472†)	33 (34.4)	53 (14.1)	21.11	3.19 (1.91 to 5.33)	<0.001
No A grade for chemistry A level (n=563†)	37 (32.7)	123 (27.3)	1.30	1.29 (0.83 to 2.02)	0.254
No previous degree (n=595†)	109 (92.4)	445 (93.3)	0.12	0.87 (0.40 to 1.88)	0.724

MEG = mean examination grade.

*Self defined ethnicity obtained from UCAS forms.

†Data not recorded for all students.

Table 2 Univariate (Mann-Whitney U) analyses of continuous non-academic and academic variables

Factors	Strugglers	Controls	Z score	P value
Age at course entry:				
No of students	123	492		
Mean	19.12	18.83		
Median (IQR)	18 (18-19)	18 (18-19)	-3.098	0.002
Townsend score* (n=474†):				
No of students	91	383		
Mean	-2.01	-2.41		
Median (IQR)	-2.86 (-4.03-0.89)	-2.99 (-4.14-1.12)	-0.948	0.343
Total tariff score (n=567†):				
No of students	113	454		
Mean	395	414		
Median (IQR)	360 (340-450)	400 (340-480)	-2.256	0.024
UCAS points (n=595†):				
No of students	118	477		
Mean	26	28		
Median (IQR)	28 (26-30)	30 (28-30)	-3.679	<0.001

IQR=interquartile range.

*Nationally, 1991 Townsend scores range from -7.55 (least deprived) to 11.8 (most deprived).

†Data not recorded for all students.

withdrawal, and 31 as course suspensions. The strugglers represented 12.8% of the full five year intake (961 students).

Extent of strugglers' problems

The strugglers experienced considerable academic problems. Seventy of the 123 (57%) failed three or more preclinical exams and only 92 (75%) had graduated as BMedSci (bachelor of medical science) at the end of the third year; of the 31 remaining, 21 left the course voluntarily, eight had their course terminated, and two were still on the preclinical course. At a date when all students should have completed their training, a further 12 had left during the clinical course, eight were still on the clinical course, and only 72 (59%) of the original group of strugglers had graduated BMBS (bachelor of medicine and bachelor of surgery).

In addition, 56 of the 123 (46%) had disruptive personal or medical problems noted in their undergraduate records, including a high incidence of depressive illness (strugglers 29/123 (24%) *v* controls 6/492 (1%); χ^2 91.6, $P < 0.001$).

Preadmission factors associated with strugglers (univariate analyses).

Tables 1 and 2 summarise these results. The non-academic factors that were significantly more common in the strugglers were the presence of negative comments in the head teacher's reference, the late offer of a place, male sex, and slightly older age. Non-white ethnicity was significant in UK students. There was no significant difference between UK strugglers and controls in social deprivation (Townsend score⁵).

The significant academic associations with the strugglers were lower mean examination grade at GCSE, lower mean examination grade at A level, and not achieving a grade A at A level biology. Such students were also more likely to have significantly lower UCAS points and total tariff scores.

Preadmission factors significantly and independently predicting strugglers (multivariate analysis)

We entered preadmission factors that had shown significant univariate associations with struggler status (above) into a binary logistic regression. Table 4 on [bmj.com](#) shows the data for all students excluding ethnicity as an explanatory variable because it was not known for overseas students, and data for UK students including ethnicity as that was recorded for most of these.

A lower mean examination grade at A level and the late offer of a place were highly significant predictors in all students (likelihood ratio 2.19, 95% confidence interval 1.37 to 3.51, and 1.98, 1.19 to 3.30, respectively) and in UK students alone (2.36, 1.40 to 3.99, and 2.25, 1.27 to 3.99). Negative comments were strongly predictive in the whole group (2.25, 1.44 to 3.50) but not in UK students alone. Men and those with lower GCSE science scores were more likely to struggle in the entire group (1.70, 1.09 to 2.65, and 2.13, 1.12 to 4.05) but again not in UK students alone. Non-white ethnicity was a highly significant predictor in UK students (2.77, 1.52 to 5.05).

Discussion

Our study shows that students with lower A level grades had the greatest risk of experiencing problems during medical training in the five consecutive cohorts studied. The late offer of a place was also associated with risk and men were slightly more at risk than women. When we excluded ethnicity as a pre-admission variable, negative comments were strongly predictive, but in UK students non-white ethnicity was a significant risk factor.

Strengths and limitations

We collected a wide range of robust quantitative data, with a 1:4 case:control ratio and random selection of controls to avoid matching on discriminatory factors. In comparing strugglers with controls we chose to analyse our strugglers as a single group because there was no definitive way to split them up. Their problems comprised academic, personal, medical, or social components in varying degrees. Hence, we could define a struggler only as a student who failed to make satisfactory progress and was identified in any one of the categories listed. We accept that there may be subtle associations between the categories and the predictors that we were unable to identify, but a subgroup analysis of those strugglers who attended the academic progress committee and those whose course was terminated showed that the same range of factors emerged as predictors of struggling (see [bmj.com](#) for results).

The inclusion of "negative comments" as a defining variable can be criticised on the grounds of subjectivity, especially as there was a wide range of comments and the researcher (JY) was not blind to control/struggler status. Additional studies using more formal statement analysis techniques, which we have used in previous research, are under way.⁶

Comparison with other studies

Our work confirms that risk factors for failure—lower school examination grades, non-white ethnicity, and being male—were as expected. We are not aware of any other studies that have examined "negative comments"

What is already known on this topic

Male students and those with lower A level grades and of non-white ethnicity may perform less well on the undergraduate medical course

What this study adds

Late acceptance on to the course and the presence of "negative comments" in the academic reference are additional risk factors at Nottingham medical school

in the academic reference. Powis et al found that interviewers' negative remarks had weak predictive value for course withdrawal,⁷ and Papadakis et al suggested some correlation between negative statements regarding unprofessional undergraduate behaviour and later disciplinary action in graduates.⁸ In view of our results, statement review remains an integral part of our admissions process.

Similarly, we are not aware that others have examined the timing of course offers in relation to undergraduate progress.

Future policy and research

Many medical schools in the United Kingdom are exploring more varied admissions policies, perhaps incorporating elements of the successful Australian policies of lower examination grades accompanied by psychometric testing.³ Their outcome evaluations, especially in relation to non-traditional students, may be important in guiding future policy across the UK.^{2,9} Our data suggest that the current four stage approach to student selection is sound, but we now have concerns that the introduction by UCAS of open references will reduce the opportunities for head teachers to draw attention to personal qualities or difficulties that might make it difficult for a student to succeed in medicine. A structured reference might be more helpful.

Pastoral support at Nottingham includes informal meetings with personal tutors and more intensive formal mechanisms, yet some students still hide, or deny, their difficulties until they reach a crisis point. In the course of this research we noticed a high incidence of depressive illnesses in strugglers, which is of particular concern. We intend to review our strugglers and our pastoral practices more closely to see what further support could be offered, perhaps as targeted interventions to those at greatest risk. Research elsewhere has identified personal, social, cultural, and financial pressures that may particularly affect students from non-mainstream backgrounds and that may need to be addressed explicitly and proactively.^{10,11} Failure in clinical examinations may have a sex related or cultural basis because the current emphasis on patient centred, empathetic care may be more natural for women than for men¹² and may present a considerable difficulty for students from more paternalistic cultures.¹³ Language barriers may be important because fluency in standard English may not be adequate for medical and colloquial needs.¹⁴

We plan further investigations into the nature of negative comments and the characteristics and difficulties of those who do less well on the course.

The 1991 Townsend deprivation scores were accessed via the Census Data Service at http://census.ac.uk/cdu/Datasets/1991_Census_datasets/. We are grateful to Chris Rix of UCAS for providing approval and data for Nottingham applicants specifically for this study and to Carol Coupland for statistical advice. We thank David Powis and Eamonn Ferguson for reviewing an early draft of this paper and for providing valuable suggestions and advice, Caroline Mulvaney for performing statement validation, and members of the interviewing pool who responded to our questionnaire on negative comments.

Contributors: DJ conceived the study and is guarantor. JY collected and analysed the data. Both authors contributed to interpretation and wrote the paper.

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Corrections and clarifications

Factors influencing death at home in terminally ill patients with cancer: systematic review

In this article by Barbara Gomes and Irene J Higginson the linked website in reference 64 (Macmillan Cancer Relief) was correct for the Gold Standards Framework (GSF) when the paper was written (*BMJ* 2006;332:515-21, 4 Mar). Macmillan Cancer Relief, however, ceased functioning as a support for the GSF Programme in 2004. The programme is now supported by the NHS End of Life Care Programme, and the correct web address is www.goldstandardsframework.nhs.uk.

Reproductive outcome after chromosome analysis in couples with two or more miscarriages: case-control study

In this research paper by Maureen T M Fransen and colleagues (*BMJ* 2006;332:759-62, 1 Apr) we wrongly described the study as a case-control study when it should have been an index-control study. The error, which happened during editing, occurred in the title and the abstract.