The relationship between UKCAT scores and Finals exam performance for widening access and traditional entry students

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Abstract

Background

The admissions process into medical school is an integral part of medical education, ideally it should reliably identify whether applicants have the qualities and capabilities to become a competent clinician. The UK Clinical Aptitude Test (UKCAT), introduced in 2006, is a cognitive skills test, which aims to provide UK medical schools with an objective measure to help screen large numbers of applicants with similar grades[1].

At the University of Southampton's Faculty of Medicine, the selection process varies between programmes. For the traditional entry programme (BM5) UKCAT scores are used to rank applicants with the highest scoring applicants being invited to selection days, whereas for the widening access programme (BM6), non-academic criteria are used to score applicants prior to invitation to selection days[2].

Research suggests that UKCAT scores are a better predictor of exam performance in later years of medical school compared to exam performance in earlier years[3] and significant correlations of total UKCAT scores and Verbal Reasoning Subtest scores with final year exam performance have been reported[4]. However, a comparison of the relationship between UKCAT scores and final examination performance for widening access and traditional entry students has not yet been reported[5].

The aim of this study is to investigate the relationship between UKCAT scores and finals examination performance and to determine any differences in the correlations between BM5 and BM6 students from the University of Southampton[6].

Methods

This retrospective, cohort study examined the correlation between the UKCAT scores and the total Finals examination performance measure (FPM) and its component examinations for BM5 and BM6 students who entered Year 1 in 2009. The raw scores were converted into z-scores, standardising the data[7]. Pearson's product moment correlation was applied once normal distribution was ascertained. Analysis was undertaken without the adjustment for socio-economic confounding factors.

Results

There was a significant correlation between the BM5 UKCAT total score and the multiple choice question paper (MCQ) component of the Finals examination ($r=0.254$ $P=0.01$) $n=183$. Of the UKCAT subtest scores, Verbal Reasoning correlated with the BM5 overall

FPM (r=0.226, P=0.01) n=183 and the MCQ component of Finals (r=0.236, P=0.01) n=156. There were no correlations between the UKCAT total or subtest scores with BM6 FPM or its component examinations[6].

Discussion

The significant correlation between the UKCAT score and the results of the MCQ component, and the Verbal Reasoning sub-test score with MCQ and FPM for the BM5 cohort supports the use of UKCAT in the admissions process. However, the results also suggest a re-evaluation of the use of UKCAT results, with potentially greater weighting for the verbal reasoning test. The absence of significant correlations seen for the BM6 cohort suggests it may not be appropriate to use UKCAT scores in the widening participation admissions process. However, these results should be interpreted with caution, as the BM6 cohort size was too small to draw firm conclusions from and only one year of data was analysed. Future studies with multiple cohorts would provide data that are more robust.

Introduction

Due to the highly competitive process of selection into medicine, the admission's procedures have moved from using purely subjective measures (such as references, personal statements and interviews) towards evidence-based methods of selection to increase reliability (such as aptitude tests, educational attainments and different types of interview). Although there is still ambiguity about what selection methods are actually selecting for, evidence-based methods are considered more robust than subjective measures[8]. In the past, selection for medicine was based purely on academic achievements, which remains to be at the core of the selection process. However, academic achievement can now be used in combination with references, personal statements and aptitude tests, such as the United Kingdom Clinical Aptitude Test (UKCAT) or Bio-Medical Admissions Test (BMAT), to further refine the number of applicants[9].

The UKCAT was introduced in 2006 to provide the medical schools with an objective measure of screening applicants that is quick and fair to use, reducing the administrative burden of admissions teams. The UKCAT is a cognitive skills test intended to help medical

schools differentiate and refine the number of applicants with highly competitive academic grades. Furthermore, it was anticipated the UKCAT would help overcome some of the criticisms of potential bias and low validity in the traditional admissions process[10]. The UKCAT board proposed that ranking applicants could help universities select potential students with very similar academic grades. It was also thought to have the potential to "improve fairness in the system" and "widen participation of non-traditional applicants from disadvantaged backgrounds"[11]. Due to the addition of UKCAT, universities are better able to assess applicants on their academic abilities, interpersonal skills and cognitive abilities[12].

The UKCAT consists of 4 sections or subtests: Verbal Reasoning (VR), Decision Analysis (DA), Quantitative Reasoning (QR) and Abstract Reasoning (AR) and has been structured in a specific way so that each subtest examines specific skills, which can be used in a doctor's or dentists' everyday life[12]. Each subtest is scaled 300-900; the scores of the individual subtests, the total score and the candidate's percentile ranking is provided to medical schools for use in their selection process[13].

Since its introduction, papers have been published on whether UKCAT can predict early year's exam results and clinical examination performance with conflicting results (lynch et al 2009. Sartania 2014 Yates and James 2010). However, a recent multi-centre study consisting of 12 medical schools, showed the UKCAT does correlate with Year 1 exam results, especially for mature students.[17]. This study considered socio-economic factors and had a large study number (thus increasing its validity), but did not include performance across later years of medical school.

Studies into the UKCAT's predictive ability of performance in the later years are also conflicting. James and Yates 2013 followed up their original study analysing the predictive

validity of the UKCAT with the first year of medical school by analysing the predictive validity of the UKCAT with the clinical years of the same cohort. The results of the study concluded UKCAT scores at admission did not independently predict subsequent performance on the course.[4] Whereas MacKenzie et al recently reported that UKCAT is a predictor of medical school outcome with the total score having small but significant predictive validity on educational performance measure (EPM) and situational judgement test (SJT) scores. (Mackenzie 2016).The data provide modest supportive evidence for the UKCAT's role in student selection but did not compare widening participation and traditional entry students.

Given the ambition to further widen participation in medicine programmes it is important to determine if relationships between UKCAT scores and performance differ between widening participation (WP) and traditional entry students. The Faculty of Medicine at the University of Southampton offers several different undergraduate programmes, two of which are the BM5 and BM6[14]. The BM5 programme is regarded as the traditional 5-year programme[15]. The BM6 is a 6-year undergraduate programme widening access to medical school for students from underrepresented socio-economic groups[16].

To ensure the most appropriate selection methods are used for the different programmes, relationships between the UKCAT total and subtest scores and finals exam performance need to be determined for both programmes

Aims

This study will correlate UKCAT scores of BM5 and BM6 students with performance in finals examinations. It will also investigate whether there is a difference in the relationship between UKCAT scores and examination performance of BM5 and BM6 students.

Methods

Data were collected for BM6 and BM5 students who undertook the UKCAT in 2007 and 2008 respectively and entered Year 1 in 2009. BM6 students entered medical school in 2008 and undertook an initial year 0 before entering year 1 in 2009. The abstract reasoning scores were not available for BM6 students who undertook the UKCAT in 2007. UKCAT tests were undertaken by both cohorts but the scores were not used as a part of the admissions process at the time of this study.

Z-scores for the UKCAT scores were derived using the formulae [$(x - \mu) / \sigma$], whereby (x) is the candidates' raw score, (μ) is the mean score of all the candidates whom took the UKCAT test. (μ) was attained from the UKCAT consortium[21]. (σ) is the standard deviation of all the candidates whom took the UKCAT test, which was also attained from published data by the UKCAT consortium. Z-scores allow reliable comparison across different years and data sets as it standardises the scores[22].

Z-scores for the total 'finals performance measure' (FPM) an aggregate score based upon the combination (with equal weight) of its component assessments; objective structured clinical examination (OSCE), assessment of clinical competence (ACC), multiple choice question (MCQ) and essay papers, were derived using the formulae [$(x - \mu) / \sigma$], whereby (x) is the candidates' raw score, (μ) is the mean score of all the candidates whom took the assessment. (μ) was attained from the Faculty assessment lead. (σ) is the standard deviation of all the candidates whom took the assessment and was similarly attained from the Faculty assessment lead.

The data were imported into SPSS and relationships between the variables were explored. The variables were UKCAT scores (including 4 subtest scores and the total score) and total finals performance measure (FPM) as well as its component assessments; objective structured clinical examination (OSCE), assessment of clinical competence (ACC), multiple choice question (MCQ) and essay.

To examine the relationship between these variables, the distribution of the data had to be determined by plotting the data into a graph. The graph, displayed an evenly distributed, symmetrical bell shaped curve with a relatively centred mean[23]. Given that the independent variables are evenly distributed and portray a bivariate normal distribution, a Pearson's product-moment Correlation coefficient can be utilised[24].

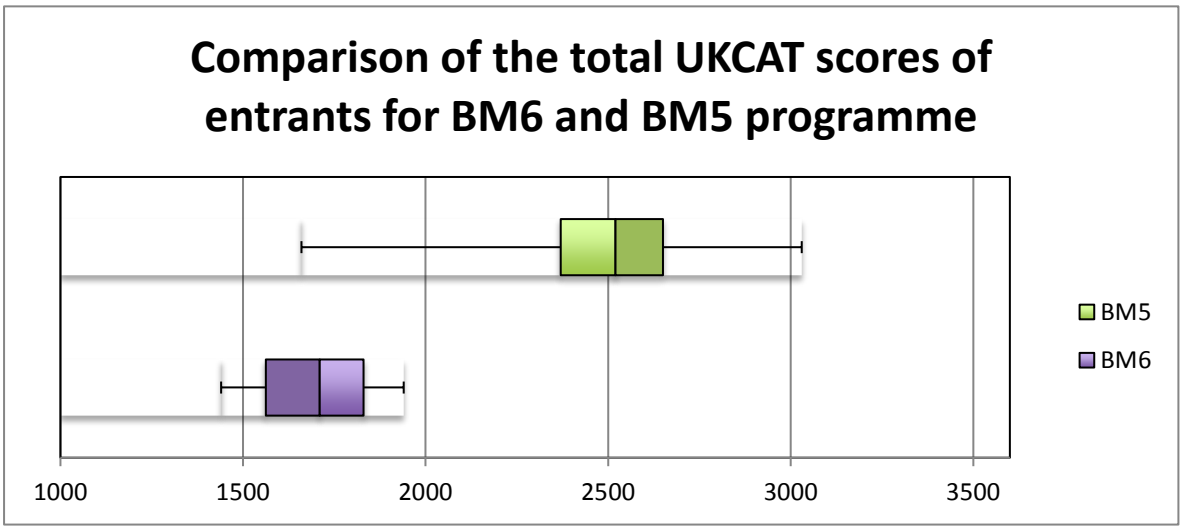
Missing Data

There were some missing applicant and UKCAT data. The missing data for the BM5 cohort in 2009 entry (n=55), and for the BM6 cohort in 2008 entry (n=5). Any student who had any missing data was not included in this study.

Results

An initial comparison of total UKCAT scores was undertaken to determine their distribution for BM6 and BM5 cohorts.

Figure 1 - distribution of the UKCAT scores between the two the BM5 and BM6 cohorts



The difference in the median between both cohorts is 810. The distribution of the total UKCAT scores for the BM5 programme is 2.74 times of the BM6 programme.

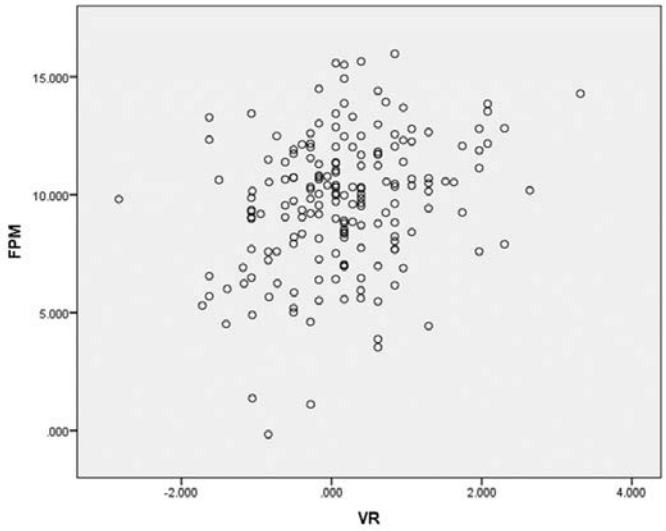
Table 1 - The combined and individual correlations between the total and subtest UKCAT scores and all the components of the FPM.

	Total UKCAT score	Subtest UKCAT score			
		Verbal reasoning	Quantitative reasoning	Abstract reasoning	Decision analysis
BM5 & BM6 combined					
FPM	0.329**	0.285**	0.195**	-0.023	0.155*
OSCE	0.241**	0.204**	0.134	-0.034	0.127
ACC	0.125	0.157*	0.007	-0.096	0.098
MCQ	0.337**	0.278**	0.260**	0.097	0.162*
ESSAY	0.250**	0.176*	0.146*	-0.048	0.071
BM5 ONLY					
FPM	0.084	0.226**	0.031	-0.027	0.053
OSCE	0.028	0.154	-0.003	-0.039	0.014
ACC	-0.053	0.145	-0.089	-0.104	0.001
MCQ	0.254**	0.236**	0.196*	0.106	0.132
ESSAY	-0.023	0.063	-0.03	-0.055	-0.007
BM6 ONLY					
FPM	0.21	0.081	0.099		0.213
OSCE	0.13	-0.158	0.14		0.241
ACC	0.166	-0.1	-0.085		0.352
MCQ	0.171	0.184	0.076		0.094
ESSAY	0.164	0.288	0.165		-0.029

** $p \leq 0.01$ * $p \leq 0.05$

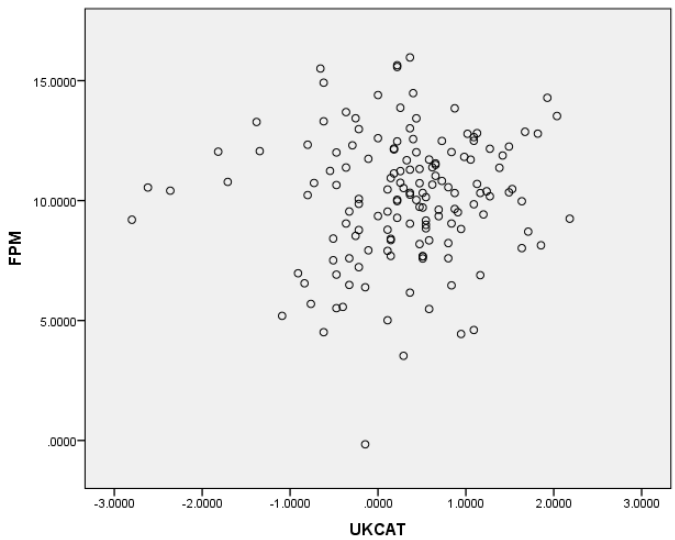
Table 1 shows a number of significant correlations between total UKCAT score and verbal reasoning with assessment performance when the BM5 and BM6 cohort are combined. However the number of significant correlations is greatly reduced when analysing the cohorts individually.

Figure 2. The relationship between the total UKCAT scores and FPM results for the BM5 and BM6 cohorts combined.



The relationship between the total UKCAT score and FPM (BM5 and BM6 combined) is moderately strong with a significant positive correlation (r=0.329 P=0.01) n=183,

Figure 3. The relationship between the total UKCAT scores and FPM results for the BM5 cohort only



The correlation between the total UKCAT score and FPM (BM5 only) is weak (r=0.084 P=0.306) n=1149.

Figure 4. The relationship between the total UKCAT scores and FPM results for the BM6 cohort only

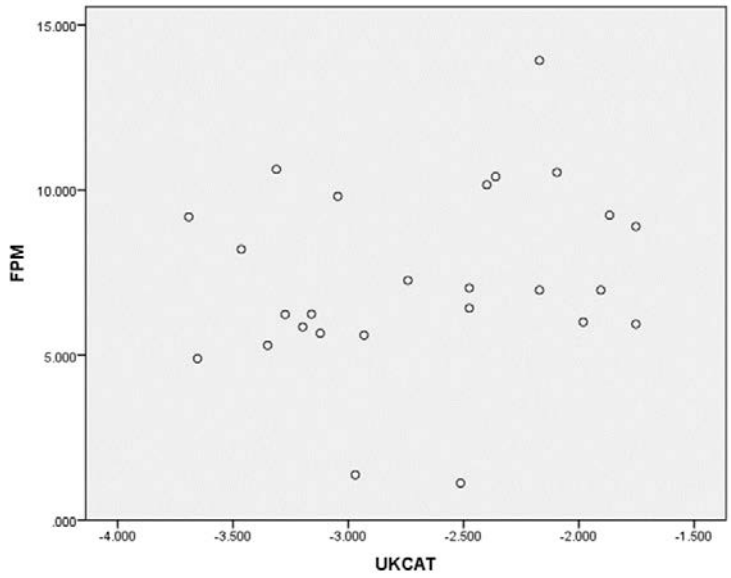


Figure 4 shows a weak correlation between the total UKCAT scores and FPM results for the BM6 cohort only, (r=0.210 P=0.303) n=26

Discussion

An initial analysis of the distribution of UKCAT scores for the BM5 and BM6 cohorts who entered Year 1 in 2009 was undertaken. The median UKCAT score for BM6 is lower than BM5 by 810, an explanation for this may be that students who apply for the BM6 cohort come from less affluent and underrepresented backgrounds and they may have less time or exposure to the UKCAT, which in turn may negatively impact on test preparation compared to those who apply for the BM5 programme.

As shown in Table 1, when both cohorts are combined and measured against the total UKCAT scores, there is a moderately strong correlation, with statistical significance for all assessments, except ACCs a clinical assessment similar to the Mini-CEX undertaken in the clinical setting. However, when the cohorts are analysed individually (as shown in Figures 3 and 4), there seems to be moderately weak correlation with no statistical significance. This is because the BM5 and BM6 cohorts are two distinct heterogeneous groups and when they are combined, it gives a false positive result.

When the BM6 cohort were analysed separately from the BM5 no significant correlations were found with this sample size between UKCAT total and subtest scores with assessment performance.

However, when BM5 were analysed separately there were significant correlations for the total UKCAT score with MCQ and also the VR subtest score with FPM and MCQ. VR is a subtest examining the applicant's ability to comprehend the information provided and deduce the correct conclusion. This is a key skill in medicine, not only in theory but also in a clinical scenario too. Thus, the VR score could be used as an initial screening, just like the University of Warwick as they have clearly identified VR scores to be "one of the predictors of success in certain examinations"[25].

Study Limitations

This study was undertaken with cohorts from one year. In order to increase the validity of this study, multiple cohort could have been used to assess the relationship between UKCAT scores and FPM. By using multiple cohorts, the n number will increase therefore decreasing the level of uncertainty and the margin of error. This would in turn provide the study with a

greater precision of results. Furthermore, when the sample size is bigger it would be more feasible to identify the outliers and provide an accurate picture of the students. Analyses were conducted without the adjustment for socio-economic confounding factors, which could have had an impact on the UKCAT scores and on FPM. This study was carried out at one university, if the study was to be carried out at multiple institutions it would have provided a wider and more robust picture of the relationship between UKCAT scores and assessment performance.

Future Research

As highlighted in the limitations, the study could be expanded in the future to multiple cohorts and institutions. Additionally, with the adjustment of socio-economic factors, it would provide a better understanding of the impact of student background in selection to medical school.

Conclusion

Initially there was evidence of strong correlations between UKCAT scores and final year assessment results when analysing the data as a combined cohort, but when the BM5 and BM6 cohorts were analysed separately no significant correlations were evident for the BM6 cohort. However, for the BM5 cohort correlations between VR and FPM and MCQ were seen as well as the total UKCAT score and MCQ.

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