Title: Do differentials in access to advice and support at UK schools on preparation for the UK Clinical Aptitude Test disadvantage some candidate groups?

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ABSTRACT

Background

The United Kingdom Clinical Aptitude Test (UKCAT) is part of the selection process of the majority of UK medical and dental schools. However, a survey of applicants to a single UK medical school indicated that differentials in access to advice and support on test preparation may disadvantage some candidate groups. To assess the generalizability of this finding and extend understanding, a survey of the 2012 UKCAT candidate cohort was conducted.

Methods

An on-line survey of candidates who sat the 2012 UKCAT asked questions on; sources of advice and support about the test, opinions about the quality and utility of advice and support received, the amount of time spent in preparation, and opinions on the association between preparation and test performance.

Results

The focus of this paper is on direct school leaver applicants at UK schools and colleges. Thus, survey respondents aged 19 years and over, and those who reported University or Other as the last educational institution attended were excluded, resulting in an analytical sample of 4268 respondents and a response rate of 25%. The level of support and advice received at school or college, categorised as a Support Index, was positively associated with test performance. Those with a maximum Support Index were predicted to score 82 points greater than those with a minimum index ($p<.001$). However, 49% rated the advice they received on test preparation as less than satisfactory or poor and were more likely to do so if in non-selective school education. Categories of the amount of time spent on preparation

for the test correlated with test performance and 76% agreed that preparation enabled them to score more highly.

Conclusions

Whilst the UKCAT preparation effect observed is small, differences in preparation support received by candidates is significant and likely to be mirrored in other aspects of their University applications. Addressing equitable access to suitable information and preparatory resources is key to ensuring admission tests and, more generally, admissions processes successfully widen access.

Background

The United Kingdom Clinical Aptitude Test (UKCAT) was designed to complement and improve upon existing selection tools to enable universities to make more informed choices from amongst the many highly qualified applicants to over-subscribed places on UK medical and dental undergraduate programmes.[1] The UKCAT examines innate skills by assessment of cognitive ability in four domains: Verbal Reasoning (VR), Quantitative Reasoning (QR), Abstract Reasoning (AR) and Decision Analysis (DA). Thereby assessing cognitive ability independent of academic knowledge in order to broaden the criteria for selection beyond academic attainment.[2] A central objective of the test is to widen participation by improving the fairness and objectivity of selection, especially since the calibre and resources of their schools have been shown to affect the candidate's academic attainment.[3,4] How test scores are used in admissions is determined locally by each medical and dental school and used alongside more traditional methods of selection to select candidates for interview or to make offers. [5]

Studies of the UKCAT to date have mainly focussed on its predictive validity [6-9] and its ability to widen access.[4] Although the extent to which differences in access to advice and support influence performance in the UKCAT is unknown, a survey of applicants to a single UK medical school indicated that differentials in access to advice and support may disadvantage some candidates groups.[10]

This study sought to answer the research question whether differentials in support and advice impact upon UKCAT total score and thereby the process of medical school selection. This intention is in line with the recommendations of the Standards for Educational and Psychological Testing of equitable treatment of all examinees in terms of access to practise materials [11] and those of the UK medical profession that, admission systems to Higher Education should minimise barriers 'arising from the … varying resources and support available to applicants.[12]

Methods

The questionnaire

The mode of delivery was a confidential self-completed on-line questionnaire (see Appendix A). Development of the questionnaire was informed by previous UKCAT candidate surveys. [10,13] To ameliorate the impact of response bias, we avoided ambiguous terms and used simple language. [14] The questionnaire was pre-tested on a small number of first year medical students to ensure that respondents would understand the questions and the terms used.

Sample and study protocol

All candidates who sat the UKCAT in June to October 2012 (25,431) were sent an email in November 2012 inviting them to participate in the survey. In the initial contact email candidates were informed that this was an independent and anonymous survey being conducted by Plymouth University Schools of Medicine and Dentistry, University of Dundee College of Medicine, Dentistry and Nursing, and University of Dundee Health Informatics Centre. Moreover, that their participation would be much valued as the results of the study would be used to advise the UKCAT Consortium on how to improve current advice on preparation for the test. They were assured that research and analysis would only take place on fully anonymised data in compliance with the data protection requirements outlined in the UKCAT Data Privacy Statement. The following link to the statement was embedded in the email (available at http://www.ukcat.ac.uk/registration/candidate/candidate-data/). They were informed that their UKCAT test results, registration information and Universities and Colleges Admission Service (UCAS) application data, all fully anonymised, would be matched to their questionnaire response by the Health

Informatics Centre, using a unique identifying number, before being released for analysis. Candidates were further reassured that participation was entirely voluntary and would not influence their application to study medicine or dentistry in any way. Importantly, they were informed they could withdraw consent at any time and or, obtain the results of the study upon request. Furthermore, it was stated that the return of the completed questionnaire would give informed consent to participate and affirm their understanding of the purpose of the study, how confidentially and anonymity was guaranteed, how the results would be used, and that they were clear that consent could be withdrawn at any time. A single non-response follow-up email was sent two weeks later and after another two weeks the survey was closed.

Data sources

UKCAT scores and a range of background measures on all who sat the 2012 UKCAT, which included information provided by the UCAS and candidate registration information collected by UKCAT on gender, age, ethnicity, and National Statistics Socio-economic Classification.[15]

Statistical Analyses

All analyses were carried out using the software Stata12 (Stata Corp. Statistical Software Release 12.0, College Station, TX, USA). Descriptive and inferential statistical techniques, including chi-squared test of homogeneity, independent two samples t-test, binary and ordinal logistic regression, analysis of variance (ANOVA) and Ordinary Least Squares univariate and multivariate linear regression. List-wise deletion was used, meaning that only cases with non-missing values on all the independent variables in the models were included. Table 1 summarizes the variables used in the analyses.

Section 1 of the results reports the response rate, a power analysis, chi-squared tests of homogeneity to assess the representativeness of the sample in terms of gender, ethnicity and socio-economic class, and an independent two samples t-test of sample and non-respondent mean UKCAT total score.

Section 2 contrasts the frequencies of responses to survey items on advice and support received at school/college and, using binary logistic regression, the relative odds of a respondent reporting positively to these items given type of school

attended. The odds of positively rating the advice on preparation for the UKCAT provided was contrasted by type of school attended and the association between final UKCAT score achieved and rating examined. The results of an ANOVA which examined group differences in mean total UKCAT score given score on a Support Index, adjusted by type of school attended and gender is presented.

Section 3 of the results reports the types of preparation resources respondents used, how they rated their helpfulness, how many hours they had spent in preparation for the UKCAT and their level of agreement with statements about the association between preparation and test performance.

Section 4 reports the results of a multivariate linear regression of the outcome total UKCAT score. The model only includes predictors for which the null-hypothesis of no difference in mean total UKCAT scores between groups was rejected at $p<.05$ using, where appropriate, an independent two samples t-test or, ANOVA (see first column Table 1) . Finally, this section reports on differentials in the likelihood of quartile total UKCAT score, given candidate typologies based on predictors included in an ordinal regression model.

Ethical approval

Ethical approval for this study was granted by the Peninsula College of Medicine and Dentistry Research Ethics Committee on 4 October 2012.

Results

Response rate and representativeness

The overall response rate was 25%, with 4268 of the 16921 candidates aged less than 19 years who sat the 2012 UKCAT completing the on-line questionnaire.

A series of sample size power analyses were conducted, (power 0.9, alpha level .05) based on previous research in which a regression model with 6 categorical predictors (predictors also included in this survey) explained 14% of the variance in the dependent variable, total UKCAT score. [10] Omitting one categorical predictor at a time from the full model the analyses yielded sample sizes ranging from 172 to 896. Thus we concluded that the respondent sample size, 4268, was adequately powered to detect the differences of interest to this study. [16]

The type of educational institution attended by non-respondents was unknown and thus it was only possible to assess the representativeness of the respondent sample by comparison with the gender, ethnicity and socio-economic class of those aged less than 19 years in the non-respondent population (column 3, Table 2). Chi-squared tests of homogeneity indicated that the sample was somewhat unrepresentative of non-respondents aged less than 19 years in the population which sat the UKCAT 2012 (Gender (Pearson chi2(1) = 62.9484 p<.05, Cohen's d=0.25), socio-economic class (Pearson chi2(4) = 11.8533 p<.05, Cohen's d=0.11), and ethnic group (Pearson chi2(5) = 104.1981 p<.05, Cohen's d=0.36)).

Additionally, there was a statistically significant difference in mean total UKCAT score between the sample (n = 4268, mean = 2634, SD = 252) and non-respondents (n= 12653, mean = 2516, SD = 264) (t (16919) = 25.47, p < .001, Cohen's d=0.45). [16]

Advice and support

When asked the best description of the last educational institution attended, 846/4268 (20%) reported a Comprehensive school, 929/4268 (22%) a State Grammar school, 984/4268 (23%) an Independent/Private school, 1509/4268 (35%) a Sixth Form College or Further Education College (SFC/FEC).

A third of respondents, 1398/4268 (33%), first found out about the UKCAT from a tutor or career advisor at the school or college they attended. The majority, 67% first found out about the test from sources outside the educational institution they attended such as university websites, medical school prospectuses, family or friends, and other unspecified sources. At all types of schools and colleges respondents were more likely to have found out about the UKCAT from sources other than a tutor or career advisor (Figure 1).

Compared to a Comprehensive school, the odds of a having first heard about the UKCAT from a tutor or career advisor at a State Grammar school, a SFC/FEC and an Independent/Private school were respectively 1.7, 1.6 and 2.6 times greater (model 1, Table 3). When contrasted by Selective versus Non-Selective school (see Table 1 for definitions), Non-Selective school respondents were 60% less likely (odds ratio = 0.40) to have first heard about UKCAT via their school or college than Selective school respondents (model 1, Table 3). Compared to a Comprehensive

school, the odds of being advised to prepare for the UKCAT (model 2, Table 3), the odds of being directed to the UKCAT website (model 3, Table 3), and the odds of being advised about the content of the test (model 4, Table 3), were lesser than those at a State Grammar school, Independent/Private school, SFC/FEC and lesser in Non-Selective than Selective schools. Indeed, just 1404/4268 (33%) of respondents reported that the school or college they attended directed them to the UKCAT website and 946/4268 (22%) that their school or college had advised them about the content of the test.

Almost half of respondents, 1447/2931 (49%), rated the advice on preparation for the UKCAT from their school or college as less than satisfactory or poor. However, Grammar, Independent/ Private and SFC/FEC respondents were respectively 1.4, 2.8 and 1.6 times more likely than Comprehensive school to rate the advice satisfactory, good or very good (model 5, Table 3). The odds of a respondent who attended a Non-Selective school (odds ratio = 0.68) having rated the advice they had received at school or college as satisfactory/good/very good were 32% lower than those of a respondent who attended a Selective school (model 5,Table 3).

The association between respondents' evaluation of the adequacy of the advice on preparation for the UKCAT and respondent total UKCAT score was examined using a binary logistic regression model. The probability of a respondent reporting that the advice on preparation for the UKCAT was satisfactory, good or, very good, versus less than satisfactory or poor increased as total UKCAT score increased. Indeed, the predicted probabilities of reporting positively increased steadily from .32 at a total UKCAT score of 1500 to .65 at a total UKCAT score of 3500 (model 6, Table 3).

We found Support Index to have a statistically significant main effect on mean total UKCAT score ($F=19.78, p<.001$) even when adjusted by type of school attended and gender (Table 4). Moreover, comparison of the adjusted means indicated that as Support Index increased, mean total UKCAT score increased. Compared to those with a Support Index of 0 those who scored 1 were predicted on average 22 points higher in total UKCAT (2628.77 minus 2606.83 = 21.94, Table 4) 61 points with a Support Index of 2, and 80 points higher with a Support Index of 3. Given the inclusion in the ANOVA model of two known predictors of UKCAT performance and the statistically significant main effect of Support Index, the results gave indirect

support to our research proposal that differentials in access to advice and support on test preparation may disadvantage some candidate groups.

Preparing for the UKCAT

Respondents used a range of resources in their preparation for the UKCAT and were asked to rate how helpful they were in preparation for the test. Almost all respondents, 3813/4268 (89%), reported having used preparation books relevant to the UKCAT, and of these 3146/3813 (83%) rated their use as very helpful or helpful in preparation for the test. The UKCAT free online practice tests were used by 4116/4268 (96%) of respondents of whom 3427/4116 (83%) rated their use as very helpful or helpful in preparation for the test. Indeed, 3643/4116 (89%) strongly agreed or agreed that it increased their familiarity with the types of questions asked and ability to manage the test and 3184/4116 (77%) that it increased their ability to manage the timing of the test.

A fifth of respondents, 839/4268 (20%), attended a fee-paying preparation course and 627/839 (75%) rated the experience as very helpful or helpful. One in five respondents 945/4268 (22%) attended a school or college provided UKCAT preparation course and 236/945 (25%) rated having done so as very helpful or helpful. Attendance at MedLink or equivalent was reported by 1099/4268 (26%), of whom 365/1099 (33%) rated attendance as very helpful or helpful in preparation for the test.

When asked approximately how many hours they had spent in preparation for the UKCAT, 784/4268 (18%) reported 0-10 hours, 1212/4268 (28%) 11-20 hours, 1182/4268 (28%) 21-30 hours and 1063/4268 (25%) more than 30 hours. 27/4268 (1%) of respondents reported that they had not prepared for the test.

In response to the statement ‘Preparation enabled me to score more highly in the test’, 3241/4268 (76%) of respondents strongly agreed or agreed. Respondents were asked how strongly they agree or disagree that ‘It helps to review your maths skills in preparation for the Quantitative Reasoning section of the test’. The majority of respondents, 3169/4268 (74%), strongly agreed or, agreed with the statement.

Multivariate regression: Predictors of performance in the UKCAT

Given missing values on socio-economic class and ethnicity (Table 2), their inclusion as predictors in the following linear regression model reduced the sample size to 3174/16921 (19%) of candidates less than 19 years old who sat the UKCAT 2012. The overall model was significant and approximately 20% of the variance in total UKCAT score was accounted for by the variables in the regression model (Table 5). The coefficient (third column Table 5) for each respective predictor is the difference in the mean outcome score compared to a reference group, controlling for all other independent variables in the model. A negative coefficient indicates a lesser mean and a positive coefficient a greater mean compared to the reference group. The effect size of independent predictors was calculated in relation to the standard deviation of the respective reference group (last column Table 5).

Adjusting for all other predictors in the model, compared to the baseline of a Support Index of zero, a Support Index of 2 and a Support Index of 3 were associated with higher mean scores, 48 and 82 respectively, for total UKCAT score (all $p<.001$) (Table 5, Figure 2).

Compared to the baseline of prepared for 0-10 hours, preparation times of 11-20 hours, 21-30 hours and 30+ hours, were associated with higher mean scores, 35, 38 and 56 respectively, for total UKCAT (all $p<.001$). Not having prepared for the test was associated with a lower total UKCAT mean score of -116 compared to the baseline category of 0-10 hours ($p < .05$).

Respondents who had not studied mathematics beyond GCSE level scored on average 110 points lesser than those who had continued to study mathematics beyond GCSE level ($p < .001$).

In respect of the resources respondents used in preparation for the UKCAT the use of books specific to the UKCAT was predictive of performance and associated with a higher mean total UKCAT score of 38 points ($p<.05$). Use of the UKCAT provided online practice tests was associated with a higher mean score of 67 points ($p < .01$). However, attendance at a fee-paying preparation course, attendance at MedLink or similar, and use of other unspecified resources, were not predictive of total UKCAT score (Table 5). Somewhat anomalously, attendance at a school preparation course was negatively associated with performance in the test, with those who reported

doing so predicted to score on average 85 points lesser than those whose school did not provide a UKCAT preparation course (p<.001).

Female respondents were predicted to score on average 56 points lesser than their male counterparts (p < .001). Compared to the baseline category of NS-SEC 1, socio-economic classes 3, 4 and 5 were associated with lower mean total scores, 71, 118 and 79 respectively, for total UKCAT(all p < .001). In comparison with the baseline category NS-SEC 1, respondents in NS-SEC 5 were predicted to perform better than those in NS-SEC 4. Interestingly, the percentage of white working class respondents in NS-SEC 4 was twice that of NS-SEC 5, 42% and 20% respectively.

In terms of ethnic group, compared to the baseline category of white respondents, Asian and Black respondents were associated with lower mean total scores of 95 and 228 respectively (p < .001).

There were significant differences in mean total UKCAT score depending on the type of educational institution a respondent attended. Compared to the baseline category of Comprehensive school, Grammar (p<0.01), and Independent/Private (p < .001), were associated with higher mean scores, 37 and 64, respectively, and SFC/FEC predicted to score on average 38 points lesser (p < .001).

However when the binary indicator Selective versus Non-Selective school replaced school type, Non-Selective school respondents were predicted to score 71 points lesser than Selective school respondents (p<0.001).

Although the effect of increasing levels of Support Index was positive, the interaction between school type and Support Index was not statistically significant. We found no two-way or three-way interactions between Support Index, socio-economic class and school type.

In the main the effect size of the independent predictors in the linear regression model was small (i.e. Cohen's d < 0.20) (last column Table 5). [16] Although the contribution of each carried a relatively low predictive weight, we hypothesised that collectively they would have a cumulative effect on the likelihood of a lower or higher total UKCAT score. Furthermore, that the likelihood of a top quartile score for respondents with the same profile on the indicators, would be greater for those who scored 3 on the Support Index than those who scored zero. To test this we modelled the outcome quartile total UKCAT score (1=bottom quartile through 4 = top quartile UKCAT score), with Support Index, gender, BME (Black Minority Ethnicity=1, White

= 0) and Selective versus Non-Selective school as predictors, using ordinal logistic regression. We were able to conclude that Support Index, gender, BME and Selective schooling each had a statistically significant effect on the likelihood of quartile total UKCAT score achieved (X^2 = 310.05, df=4,p<.01). Moreover, a Likelihood Ratio test comparing the log likelihood of the full model to that of a restricted model excluding Support Index revealed the independent effect of Support Index on quartile total UKCAT score to be significant (LRX^2 = 25.19, df= 1, p<.01). The differentials in the likelihood of being in the top quartile of total UKCAT score, given candidate typologies based on the predictors included in the model, illustrated their combined predictive weight and the impact of Support Index (Table 6). For instance, the predicted probability (scale range 0 -1) of a top quartile UKCAT score for a white, male, Selective school respondent with a Support Index of 3 was 0.69, some 11% greater than a respondent with the same profile and a Support Index of zero (predicted probability = 0.58). The predicted probability of a top quartile UKCAT score for a white, male, Non-Selective school respondent with a Support Index of 3 was 0.55, some 11% greater than a respondent with the same profile and a Support Index of zero (predicted probability = 0.44). A differential in the predicted probability of a top quartile score between those with a maximum score and those with the minimum score on Support Index was also evident when respondents with the same profiles on ethnicity, gender and selective school type were contrasted (Table 6). Moreover, gender, ethnicity, Selective/Non-Selective school and Support Index appear to have a strong combined effect on the likelihood of achieving a top quartile UKCAT score. The predicted probability of a top quartile score of .69 for a white, male, Selective school respondent with a Support Index of 3, contrasts starkly with the predicted probability of .18 for an ethnic minority, female, Non-Selective school respondent with a Support Index of zero (Table 6).

Discussion

Irrespective of the type of school or college attended the findings of this study indicate that a significant proportion of schools and colleges do not appear to provide sufficiently high quality support and advice about the UKCAT. This finding is consistent with other studies that schools and colleges are not well informed about the UKCAT. [10,18] This study indicates that the level of support and advice

received, as measured by a Support Index, may be predictive of candidates' overall performance in the UKCAT. Those who were advised to prepare for the test, were directed to the UKCAT website and advised about the content of the UKCAT at the school or college they attended, outperformed others with some evidence of a dose response effect. It was unsurprising that the interaction between school type and Support Index was statistically non-significant given the wide variation in levels of support within different types of school. This finding concurs with that of the British Medical Association that a 'lack of guidance in applying to medicine is not . . . a problem found exclusively among lower socio-economic groups'.[12] Nevertheless, this study has indicated that Non-Selective school respondents are less likely to receive support and advice. We contend that the positive impact the UKCAT Consortium's initiatives and innovations in supporting candidates may have on widening access to medicine and dentistry is being eroded by a lack of support and advice in many UK schools and colleges. Furthermore it is reasonable to speculate that the differentials in support for UKCAT observed in these candidates is likely mirrored in candidate support more broadly, particularly in applying to high demand programmes.

The vast majority of respondents reported that they had prepared for the UKCAT and this study has shown the amount of time spent in preparation for the test was a statistically significant independent predictor of test performance. This is consistent with other research that preparation improves scores on aptitude tests. [19] UKCAT's online preparation advice has been updated to reflect this.[20] It is reassuring that this study found attendance at preparation courses (many of which are costly and therefore not equitably accessed) was not predictive of performance and supporting UKCAT's advise to candidates to be sceptical about commercially available preparation resources.[20] Moreover, a finding in agreement with that of Griffin et al in respect of the Undergraduate Medical and Health Admissions Test used in Australia, that fee-paying preparation courses were largely ineffective.[21] We are unable to explain the seeming anomalous finding that attendance at a school provided UKCAT preparation course was negatively associated with overall performance. It is a finding worthy of further scrutiny.

In addition to age and gender, the findings of this study indicate subgroup variation in UKCAT performance in respect of ethnicity, socio-economic status and school type. These findings concur with other studies.[2,9,10,22] The unique contribution of this study is the additional evidence that differentials in the availability of advice and support on the UKCAT at schools and colleges may at least partly explain the underperformance of certain candidate groups.

The increasing complexity of the application process in Higher Education in the UK 'demands high levels of understanding' by staff in schools and colleges who advise and support applicants through the application process'.[23-24] The importance of this has recently been acknowledged by the UK Medical Schools Council but resolving it will be a great challenge.[25] Comparable research is merited on other selection tests for medical school admissions.

We acknowledge that individually most of the statistically significant independent predictors identified by this study had a small effect size statistic. Furthermore the Standard Error of Measurement for the total scale score in 2012 was 96 points.[26] It is reassuring that the preparation and support effects fall well within this figure and suggest that there is no significant practice effect on overall test performance. However, as indicated by the ordinal regression modelling, we contend that the cumulative effect on performance in the UKCAT, given candidate typologies defined by these predictors meaningfully advantages some candidate groups over others. Thus, despite the evidence that use of the UKCAT can assist in widening access, [4] the impact of differential access to information and preparation in UK schools and colleges may run against this stated objective.

Limitations

The representativeness of a survey refers to how well the sample drawn compares with the population of interest, and this has implications for the reliability and validity of survey findings.[27] We recognise that the use of a non-probability sampling plan (self-selected sample) prevented evaluation of the reliability of the resulting estimates and the limitation this imposes on how much confidence can be placed in the interpretation of this survey's findings. A method of addressing concern about representativeness is to weight the study sample elements (such as, gender socioeconomic class, age, ethnicity etc.) to reflect the population parameters. We did

not do this because methods of weighting are imperfect and, given the diversity of elements in the population of UKCAT candidates, and missing values (e.g. ethnicity and socioeconomic class), weighting was not considered to be a plausible option. The response rate to this survey was low and respondents were aware of their UKCAT score so this survey is vulnerable to selection as well as other biases inherent in surveys. We acknowledge that respondents' evaluation of the quality of advice and support they received at the school or college attended was highly likely to have been influenced by knowledge of their final result. Conversely, to have conducted the survey before the candidates knew their results would also have introduced a confounding factor of respondent perception and a potential for bias. We also acknowledge that the analysis did not include an independent measure of candidate cognitive ability, such as A-level grades, which has been shown to correlate with UKCAT performance and may have correlated with the propensity to seek out additional information on how to prepare for the test. Whilst acknowledging the biases present in this dataset the large sample size and consequent statistical power enabled detection of small effect sizes and subgroup analyses. The UKCAT is but one test of many, and these findings relate exclusively to the UK context, so it is impossible to know how transferrable they may be to other countries or tests.

Conclusion

Whilst the UKCAT preparation effect observed is small, the differences in preparation support received by candidates are significant and likely to be mirrored in other aspects of their University applications. Addressing equitable access to suitable information and preparatory resources is key to ensuring admission tests and, more generally, admissions processes successfully widen access.

Tables

Table 1: A description of the variables used in the analyses and, for variables included in the multivariate linear regression model, a measure of association with total UKCAT score.

Variable	Description
Support Index One-way ANOVA ($F(3,4264) = 22.54$, $p<0.001$).	Categorical nominal variable coded; 0, 1, 2, 3. Respondents scored 1 if they reported that their school or college had given them advice on preparation for the UKCAT (Survey Question 3), 1 if their school or college had directed them to the UKCAT website (Survey Question 4), 1 if their school or college had advised them about the content of the test (Survey Question 5), and 0 otherwise. Respondents' scores ranged from a minimum of 0 to a maximum of 3 and the internal consistency of responses to these three survey questions was acceptable (scale reliability coefficient, alpha = 0.7).
First heard about the UKCAT	First heard about the UKCAT from a tutor or career advisor at the school/college attended (Survey Question 1) coded; 1 = yes, 0 = no.
Advised to prepare	Advised to prepare for the UKCAT by a tutor or career advisor at the school/college attended (Survey Question 2) coded; 1 = yes, 0 = no.
Rated advice given at school/college	5 point Likert-type item with the response options; very good, good, satisfactory, less than satisfactory, poor (Survey Question 3) coded; 1 = satisfactory/good/ very good, 0 = less than satisfactory/ poor.
Directed to UKCAT website	School/college directed respondent to the UKCAT website (Survey Question 4) coded; 1 = yes, 0 = no.
Advised about test content	School/college advised respondent about the content of the UKCAT (Survey Question 5) coded; 1 = yes, 0 = no.
Preparation Time One-way ANOVA ($F(4,4263) = 24.95$, $p<0.001$).	Categorical nominal variable (Survey Question 10) coded; 0 = did not prepare, 1 = 0-10 hours, 2 = 11-20 hours, 3 = 21-30 hours, 4 = 30+ hours).
Resources used in preparation Books($t(4266) = -7.83$, $p < .001$) UKCAT online practice tests ($t(4266) = -4.96$, $p < .001$) MedLink ($t(4266) = -3.36$, $p < .001$) Fee-paying preparation course ($t(4266) = -2.97$, $p < .001$) School provided preparation course ($t(4266) =$	(a) Used books relevant to the UKCAT, (b) Used UKCAT online practice tests, (c) Attended MedLink or equivalent, (d) Attended a fee-paying preparation course, (e) Attended a school provided preparation course, (f) Used other unspecified resources, (Survey Question 11) all coded; 1 = yes, 0 = no.

4.58, p < .001) Other (t (4266) = 3.34, p < .001)	
Studied maths beyond GCSE level (t (4266) = -9.71, p < .001)	(Survey Question 19) coded; 1 = yes, 0 = no.
Rated helpfulness of resources used in preparation	Likert-type items with the response options; very helpful, helpful, OK, not helpful, not helpful at all, did not use (Survey Question 11 a-f) coded; 1 = very helpful, helpful, OK, and 0 = not helpful, not helpful at all.
Opinion about preparation effect	Strength of agreement with the statement 'Preparation enabled me to score more highly in the test', a 5 point Likert-type item with the response options; strongly agree, agree, neither agree/disagree, disagree, strongly disagree (Survey Question 13.1) coded; 1 = strongly agree/agree, 0 = neither agree/disagree, disagree, strongly disagree.
Opinion about maths preparation	Strength of agreement with the statement, a 5 point Likert-type item 'It helps to review your maths skills in preparation for the Quantitative Reasoning section of the test' with the response options; strongly agree, agree, neither agree/disagree, disagree, strongly disagree (Survey Question 13.1) coded; 1 = strongly agree/agree, 0 = neither agree/disagree, disagree, strongly disagree.
School type One-way ANOVA (F(3,4264) = 45.95, p<0.001).	Categorical nominal variable (Survey Question 18) coded; 1 = Comprehensive, 2= State Grammar, 3 = Independent/Private, 4 = Sixth Form College/ Further Education College). Schools were classified as Selective = State Grammar and Independent/Private schools and Non-Selective = Comprehensive and Sixth Form College/ Further Education College. This dichotomisation of school type was informed by previous UKCAT research which has shown that state grammar (selected for admission on academic ability) and Independent/Private school students perform much better in the UKCAT than their counterparts from non-selective schools.[2, 4, 10]
Gender (t (4266) = -7.68, p < .001)	Coded; 1 = male, 0 = female.
Socio-economic class, NS-SEC One-way ANOVA (F(4,3929) = 23.17, p<0.001).	Categorical variable coded; 1 = Higher managerial, administrative and professional occupations, 2 = Intermediate occupations, 3 = Small employers and own account workers, 4 = Lower supervisory and technical occupations, 5 = Semi-routine and routine occupations.
Ethnicity One-way ANOVA (F(5,3416) = 62.26, p<0.001).	Categorical variable coded; 1 = white, 2 = Asian, 3 = Black, 4 = Mixed ethnicity, 5 = Chinese, 6 = Other ethnicity. Ethnicity also recoded as Black Minority Ethnic (BME) with 1 = BME comprised Asian, Black, Mixed Ethnicity, Chinese and Other, 0= white.

Table 2: Analytical sample of respondents aged less than 19 years of age, non-respondents aged less than 19 years of age, all survey respondents, all survey non-respondents and the population who sat the 2012 UKCAT contrasted by gender, age, ethnicity and socio-economic classification.

		Sample aged<19yrs (n=4268)		Non-respondent Age<19yrs (n=12653)		All respondents (n=6217)		All Non-respondents (n=19214)		All candidates (N=25431)	
		%	n	%	n	%	n	%	n	%	n
Gender	Male	39.39	1681	53.49	5885	40.02	2488	46.08	8853	44.59	11341
	Female	60.61	2587	46.51	6768	59.95	3727	53.91	10358	55.39	14085
	missing	-	-	-	-	0.03	2	0.02	3	0.02	5
	Total	100.0	4268	100.0	12653	100.00	6217	100.00	19214	100.00	25431
Age	<19yrs	100.0	4268	100.0	12653	74.67	4642	65.85	12653	68.01	17295
	>=19yrs	-	-	-	-	25.17	1565	33.90	6514	31.77	8079
	missing	-	-	-	-	0.16	10	0.24	47	0.22	57
	Total	100.0	4268	100.0	12653	100.00	6217	100.00	19214	100.00	25431
Ethnicity	White	50.30	2147	42.99	5440	49.27	3063	42.35	8138	44.04	11201
	Asian	8.28	1940	25.10	3176	17.76	1104	24.32	4672	22.71	5776
	Black	4.12	176	4.62	585	4.28	266	5.51	1059	5.21	1325
	Mixed	2.62	112	2.62	331	2.49	155	2.48	476	2.48	631
	Chinese	2.51	107	1.38	174	2.07	129	1.35	259	1.53	388
	Other	1.22	52	1.3	165	1.32	82	1.59	305	1.52	387
	missing	19.82	846	21.99	2782	22.81	141	22.41	4305	22.50	5723
	Total	100.0	4268	100.0	12653	100.0	6217	100.00	19214	100.00	25431
NS-SEC Class*	1	77.62	3313	76.63	9696	74.71	4645	71.85	13805	72.55	18450
	2	4.73	202	3.71	469	4.70	292	3.87	743	4.07	1035
	3	5.53	236	6.32	800	5.60	348	6.68	1284	6.42	1632
	4	1.69	72	1.56	198	2.16	134	1.95	375	2.00	509
	5	2.60	111	2.64	334	2.91	181	2.84	545	2.85	726
	missing	7.83	334	9.14	1156	9.92	617	12.81	2462	12.11	3079
	Total	100.0	4268	100.0	12653	100.0	621	100.0	19214	100.0	25431

***(NS-SEC Class 1 = Higher managerial, administrative and professional occupations, 2 = Intermediate occupations, 3 = Small employers and own account workers, 4 = Lower supervisory and technical occupations, 5 = Semi-routine and routine occupations.**

Table 3: Results of binary logistic regression models 1, 2, 3, 4 and 5 with school type as predictor and <u>Comprehensive school as the baseline category</u>, and model 6 with total UKCAT score as a predictor (*p<0.05, **p<=0.01, ***p<0.001).

Binary dependent variable	Predictor	Odds Ratio	Std. Error	Z	95% Confidence Interval	
(1) First heard about UKCAT from tutor/career advisor (Yes versus No)	Grammar (State)	1.68***	.18	4.87	1.36	2.07
	Independent /Private	2.62***	.27	9.36	2.14	3.21
	SFC/FEC	1.63***	.16	5.01	1.34	1.96
	Non-Selective school	0.66***	.04	-6.18	0.58	0.76
(2) Advised to prepare for the UKCAT by a tutor/career advisor (Yes versus No)	Grammar (State)	1.22*	.11	2.13	1.01	1.47
	Independent /Private	1.80***	.17	6.38	1.51	2.17
	SFC/FEC	1.14	.09	1.57		
	Non-Selective school	0.74***	.05	-4.37	0.64	0.85
(3) School/college directed respondent to the UKCAT website (Yes versus No)	Grammar (State)	1.66***	.17	4.75	1.34	2.05
	Independent /Private	2.63***	.27	9.31	2.15	3.13
	SFC/FEC	1.48***	.14	4.00	1.22	1.80
	Non-Selective school	0.61***	.04	-7.36	0.54	0.70
(4) School/college advised respondent about the content of the UKCAT (Yes versus No)	Grammar (State)	1.83***	.24	4.46	1.40	2.39
	Independent /Private	4.08***	.51	11.08	3.18	5.23
	SFC/FEC	2.14***	.26	6.14	1.68	2.74
	Non-Selective school	0.59***	.04	-7.00	0.51	0.68
(5) Rated advice given at school/college as satisfactory/good/ very good versus less than satisfactory/ poor	Grammar (State)	1.38**	.16	2.78	1.10	1.74
	Independent /Private	2.76***	.32	8.75	2.17	3.46
	SFC/FEC	1.58***	.17	4.31	1.28	1.94
	Non-Selective school	0.68***	.05	-5.13	0.59	0.78
(6) Rated advice given at school/college as satisfactory/ good/ very good versus poor/less than satisfactory versus	Total UKCAT score	1.00 ***	.0001	-4.57	1.00	1.00
Predicted margins of probability of rating advice given at school or college as less than satisfactory or poor given total UKCAT score.		Margin	Std.Err.	Z	95% Confidence Interval	
	1500	.32	.03	8.39	.24	.39
	2000	.40	.02	16.07	.35	.45
	2500	.48	.01	44.90	.46	.50
	3000	.57	.02	35.66	.54	.60
	3500	.65	.03	21.35	.59	.71

Table 4: Results of ANOVA with total UKCAT score as dependent variable and the categorical variables Support Index, type of school attended and gender as predictors, n=4268.

Source	Partial SS	df	MS	F	Prob>F
Model	15726757.2	7	2246679.6	37.49	p<.001
Support Index	3317024.61	3	1105674.87	18.45	p<.001
School	8114184.48	3	2704728.16	45.13	p<.001
Gender	3632043.51	1	3632043.51	60.61	p<.001
Residual	255297400	4260	59928.9672		
Total	271024158	4267	63516.3247		

Predictive margins of mean total UKCAT score n=4268						
Support Index	Mean	Std.Err.	t	P>t	95% C I	
0	2606.83	5.94	438.41	p<.001	2595.17	2618.49
1	2628.77	7.18	365.70	p<.001	2614.68	2642.87
2	2667.70	8.78	303.74	p<.001	2650.48	2684.92
3	2686.31	10.54	254.80	p<.001	2665.64	2706.98

Table 5: Independent predictors of the outcome performance on total UKCAT score (n=3174). *Effect size quantifies the difference between two groups, (for example, an effect size of 0.40 means that compared to the average score of those in the baseline category, the average score of the comparator group differs by 0.40 standard deviations).

Outcome = Total UKCAT score	Baseline category	Coef#	Std. Error	t	95% Confidence Interval		*Effect Size
Support Index=1	Support Index = 0	0.5	9.6	0.1	-13.8	24.0	
Support Index=2		**47.73*** **	10.9	4.4	26.3	69.2	0.1
Support Index=3		**81.85*** **	13.1	6.3	56.3	107.5	0.3
Prepared 11-20 hours	Preparation time = 0 to 10 hours	**35.2*** **	12.2	2.9	11.0	59.0	0.1
Prepared 21-30 hours		**38.4*** **	12.6	3.1	13.8	63.1	0.1
Prepared 30+ hours		**55.6*** **	13.2	4.2	29.7	81.5	0.2
Did not prepare		**-161.4***	64.8	-2.5	-282.1	-34.4	0.2
Did not study maths	Studied maths	**-110.8*** **	11.4	-9.7	-133.1	-88.5	0.4
Books	Did not use books	**38.3***	15.5	2.5	7.7	68.3	0.2
UKCAT online tests	Did not use online tests	**66.5** **	22.4	2.9	22.6	110.3	0.2
MedLink	Did not attend	29.3	8.8	3.3	11.9	46.6	
Fee paying course	Did not attend	19.7	10.1	1.9	-0.1	39.5	
School prep course	Did not attend	**-85.3*** **	9.9	-8.3	-104.8	-65.7	0.2
Other resource	Did not use	0.8	9.4	0.1	-18.3	14.5	
Female	Male	**-55.9*** **	7.9	-7.1	-71.4	-40.4	0.2
NS-SEC 2	NS-SEC1	-25.9	16.4	-1.57	-58.1	6.4	
NS-SEC 3		**-70.8*** **	16.9	-4.2	-103.9	-37.8	0.2
NS-SEC 4		**-118.5*** **	27.5	-4.3	-172.4	-64.6	0.5

NS-SEC 5		**--78.6*** **	22.7	--3.5	-123.1	-34.1	0.4
Asian	White	**-95.3*** **	9.8	-9.6	-114.7	-75.9	0.4
Black		**-228.3*** **	18.5	-12.3	-264.5	-192.1	0.8
Mixed Race		40.7	22.3	1.83	-2.9	84.4	
Chinese		4.3	22.8	0.19	-40.4	49.0	
Other ethnicity		-38.7	31.4	-1.2	-100.3	22.8	
Grammar (State)	Comprehensive	**36.7** **	11.4	3.21	14.3	59.2	0.3
Independent/Private		**63.8*** **	12.6	5.1	39.1	88.4	0.3
SFC/FEC		**-37.7*** **	10.5	-3.6	-58.3	117.2	0.3
Constant		**2597.3*** **	28.1	92.5	2542.2	2652.4	
F(27, 3146) = 29.17, Prob > F = 0.0000, R-squared = 0.20							
***P<0.05, **P<=0.01, ***P<0.001**							

Notes: #The coefficient is the difference in the mean total UKCAT score compared to the baseline reference group (column 2)

Table 6: Predicted probability of bottom or top quartile UKCAT score given ethnicity, gender, Selective versus Non-Selective school and Support Index.

Model fit: n= 3422, LR chi2(4) = 325.5, Prob > chi2= 0.0000				Predicted probability and 95% Confidence Interval	
Typology				Bottom quartile UKCAT score	Top quartile UKCAT score
Gender	Ethnic group	School	Support Index		
Male	**White**	**Selective**	**0**	**0.04 (0.03 – 0.05)**	**0.58 (0.55 -0.63)**
Female	White	Selective	0	0.07 (0.06 – 0.08)	0.48 (0.45 – 0.52)
Male	**White**	**Selective**	**3**	**0.02 (0.01 – 0.03)**	**0.69 (0.66 – 0.73)**
Female	White	Selective	3	0.04 (0.03 – 0.05)	0.59 (0.56 – 0.64)
Male	BME	Selective	0	0.09 (0.07 – 0.11)	0.37 (0.34 – 0.42)
Female	BME	Selective	0	0.15 (0.12 – 0.17)	0.28 (0.25 – 0.32)
Male	BME	Selective	3	0.07 (0.05 – 0.08)	0.49 (0.45 - 0.54)
Female	BME	Selective	3	0.10 (0.08 – 0.11)	0.39 (0.35 – 0.43)
Male	**White**	**Non-selective**	**0**	**0.08 (0.07 - 0.09)**	**0.44 (0.40 – 0.47)**
Female	White	Non-selective	0	0.12 (0.10 – 0.13)	0.33 (0.31 – 0.36)
Male	**White**	**Non-selective**	**3**	**0.05 (0.04 – 0.06)**	**0.55 (0.51 – 0.59)**
Female	White	Non-selective	3	0.08 (0.06 – 0.09)	0.44 (0.40 – 0.49)
Male	BME	Non-selective	0	0.17 (0.14 – 0.19)	0.25 (0.22 – 0.28)
Female	**BME**	**Non-selective**	**0**	**0.24 (0.21 – 0.27)**	**0.18 (0.16 – 0.19)**
Male	BME	Non-selective	3	0.11 (0.09 – 0.14)	0.34 (0.30 – 0.39)
Female	BME	Non-selective	3	0.17 (0.14 – 0.19)	0.26 (0.22 -0.29)

Figures

Figure 1: The percentage of respondents who reported that they first found out about the UK Clinical Aptitude Test from a school/college tutor or career advisor contrasted by type of educational institution attended (SFC = Sixth Form College, FEC = Further Education College).

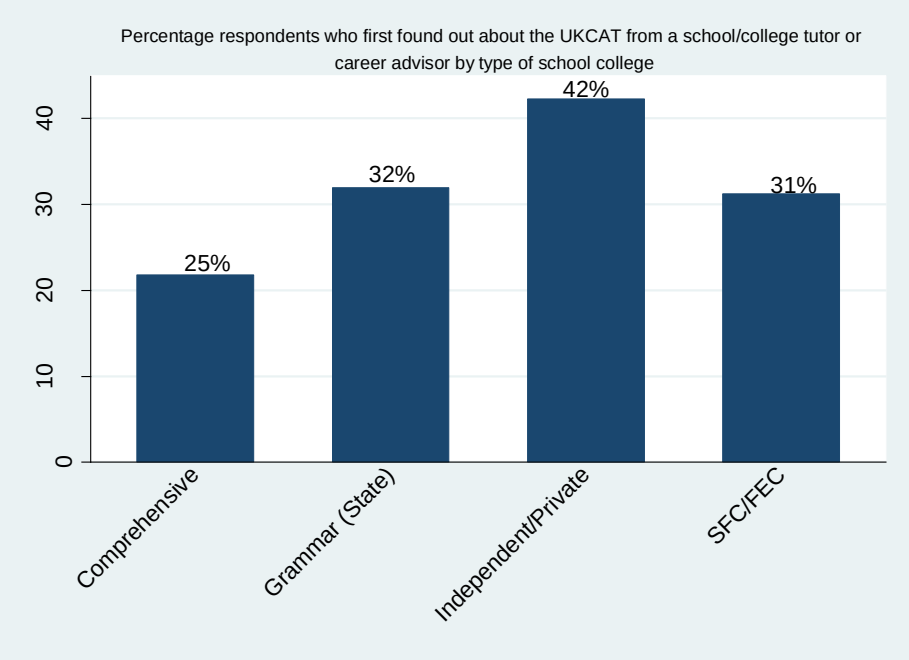
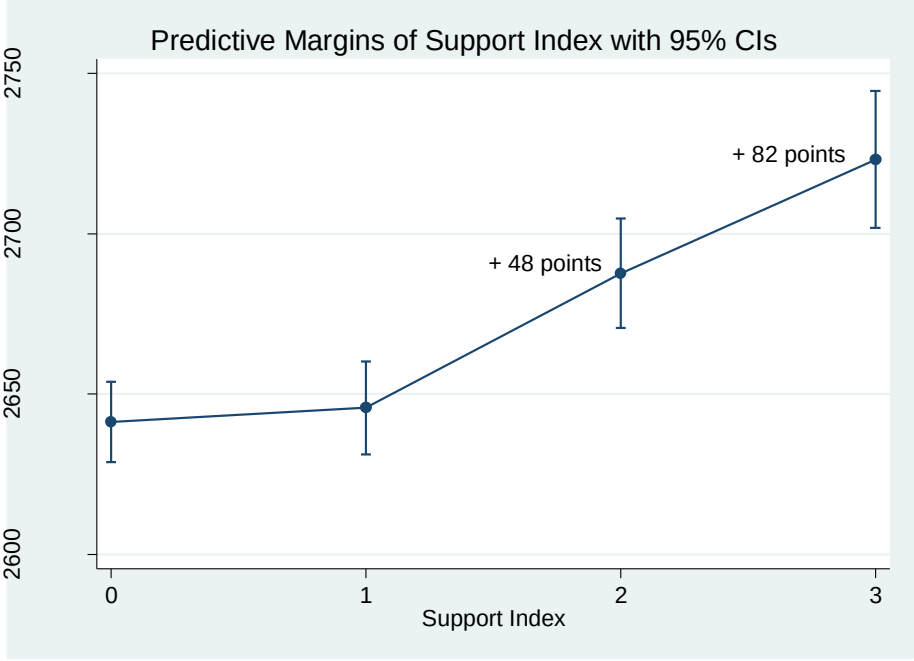


Figure 2: Predicted margins of Support Index in respect of mean total UKCAT adjusted by indicators included in the regression model outlined in Table 5 (n=3174).



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