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Unpacking the Dark Variance of Differential Attainment in Exams for Overseas Graduates

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Preview

Unpacking the Dark Variance of Differential Attainment in Exams for Overseas Graduates

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Authorship & Contributorship

All authors have made a substantial contribution to the design, the intellectual content, the data interpretation and analysis, and writing of the paper. FP and PAT conceived of the overall study and analysis strategies, and led the interpretation of results. PAT also contributed to the statistical analyses. SL assisted in data collection, analysis, interpretation of results and in drafting the paper. All authors helped draft several versions of the paper and provided comments. All authors commented on the final version of the paper.

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Ethical Approval

The analysis was performed on de-identified, routinely arising data. Thus an external ethical review and opinion was not required. This was confirmed in writing by the Chair of the Research Ethics committee for the University of York, Department of Health Sciences.

Competing Interests

FP, SL and LZ provide advice to and receive funding from Health Education England in designing the GP selection methodology (including the clinical knowledge test and situational judgement test) through the Work Psychology Group. PAT has previously received research funding from the Economic and Social Research Council (ESRC), the Engineering and Physical Sciences Council (EPSRC), the Department of Health for England, the UKCAT Board, and the General Medical Council (GMC). In addition, PAT has previously performed consultancy work on behalf of his employing University for the UKCAT Board and Work Psychology Group and has received travel and subsistence expenses for attendance at the UKCAT Research Group.

Guarantor

FP is guarantor for the paper.

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For Review

Unpacking the Dark Variance of Differential Attainment in Exams for Overseas Graduates

Abstract

Context

Differential performance at postgraduate exams between home medical graduates and those who qualified outside their country of practise is well recognised. This difference is especially marked in the practical component of the UK Membership of the Royal College of General Practitioners (MRCGP) exam. The potential causes of such disparities are not well understood.

Methods

Data were available for 1874 international medical graduates who applied for UK GP speciality training 2008-2012. The primary outcome was performance at the Clinical Skills Assessment (CSA) OSCE component of the MRCGP. The main predictors were performance on the Situational Judgment Test (SJT) and the Clinical Problem Solving Test (CPST- a test of applied clinical knowledge), used in the selection for GP training. Data relating to the demographic characteristics and English language fluency were also available. To understand better the relationship between the predictors, the selection measures, and the outcome, a series of univariable and multivariable models were developed and tested, concluding with a structural equation model to explore causality.

Results

The CSA rating was more strongly predicted by SJT scores (standardised beta 0.26) than by performance on the CPST (standardised beta 0.17). There was a relationship between English language fluency and CSA score that was mainly mediated via SJT performance.

Conclusions

These findings demonstrate that performance on an SJT predicts performance at a high fidelity clinical simulation (the CSA) in international medical graduates. Whilst the constructs tested by SJTs are debated, and are likely to vary across settings, culturally appropriate knowledge of interpersonal competence is likely to be evaluated. Improving the confidence of doctors in this area through targeted educational interventions, rather than focussing on increased clinical knowledge, is likely to be more effective at reducing disparities observed in postgraduate exam performance. Thus there are important implications for the design of speciality selection and licensing assessments globally.

INTRODUCTION

Doctors wishing to practise as general practitioners (family physicians) in the UK are required to pass the Membership of the Royal College of General Practitioners (MRCGP) licensing examination.(1) Most trainees pass this exam at first attempt with a minority of postgraduate trainees struggling to meet the criteria for independent practice.(2) However, international medical graduates (i.e. those who obtained their primary medical qualification from outside the European Economic Area) have a substantially lower pass rate compared to UK graduates.(3) Differential attainment is particularly marked for the Clinical Skills Assessment (CSA) OSCE component of the MRCGP. The CSA involves the observation and rating of candidates interacting with clinical scenarios. Esmail and Roberts reported that Black and Minority Ethnic (BME) international medical graduates were 14.7 times more likely to fail the CSA at first attempt compared to white UK graduates, even after controlling for the potential influence of age, sex and performance in the written, knowledge-based component of the MRCGP- the Applied Knowledge Test (AKT).(4) These differential pass rates for the CSA were subsequently debated in the High Court when the British Association of Physicians of Indian Origin (BAPIO) took legal action (ultimately unsuccessfully) against the GMC and the Royal College of General Practitioners.(5)

These observations are not restricted to the specialty of general practice; meta-analytic studies consistently report differences in candidate performance relating to ethnicity across a variety of medical education settings internationally.(6,7) Whilst BME candidates, on average, tend to perform less well than comparable White candidates in medical educational academic assessments the effect is confounded by place of medical qualification.(2) It is also notable that the most marked differential outcomes between home and international medical graduates are for specialisms where patient-doctor communication was a key focus, such as general practice and psychiatry.(8)

Despite these consistent findings there is no firm causal explanation for the observed differences in attainment(9) which ultimately limits the scope for high quality educational interventions. Indeed, it has been highlighted that, generally, around a third of variation in medical academic performance is unexplained by prior educational attainment. An astrophysical analogy has been used for these poorly characterised, presumably non-academic attributes, that may explain the '*dark variance*' of medical selection.(10) English language fluency and clinical knowledge and skills are two factors that may influence the

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3 discrepancy between international medical graduates and UK graduates.(3,4,8) Specifically,
4 international medical graduates may struggle with the nuances of the English language and
5 cultural issues.(11,12)
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9 Previous research exploring differential performance has mainly focused on the final stage of
10 assessment of competence for GPs; that is, the MRCGP. In contrast we examine differential
11 attainment at the point of selecting doctors into GP training. Currently the cost of GP training
12 is estimated at £485,390 per trainee.(13) Thus, more effective staff selection will ultimately
13 lower the costs (both direct and indirect) when doctors fail to progress in training. Since 2009
14 there has been a decline in both training and practicing GPs.(14) Given these trends it is
15 important to maximise the number of trainees who qualify. If trainees who may struggle to
16 complete the programme are identified early, appropriately targeted support could promote a
17 higher qualification rate, reducing overall training costs. This was recently estimated as
18 £64,395 for every 6 month period of extension. This includes costs for the extension,
19 remediation, administration and loss of healthcare service which the trainee would have
20 provided.(15)
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28 The current GP selection process is a three stage, competency-based selection process
29 (see Figure 1) based on a job analysis (16,17) which predicts in-training
30 performance.(18,19). Applicants are scored against attributes considered important in
31 relation to GP training (e.g. *empathy, communication, clinical expertise*). An aggregated
32 individual summary score is produced. In Stage 1 applicants are long-listed based on
33 eligibility criteria. International medical graduates, from Countries where English is not widely
34 spoken as a first national language, must also achieve minimum scores on the International
35 English Language Testing System (IELTS) test and the Professional and Linguistic
36 Assessments Board (PLAB) (if they are not from the European Economic Area).(20)
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43 ***INSERT FIGURE 1 AROUND HERE***
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46 In Stage 2 candidates complete both a computer-based Clinical Problem Solving Test
47 (CPST) and a Situational Judgement Test (SJT). The CPST is a test of clinical knowledge
48 and measures the ability to apply this when making clinical decisions. The SJT presents, in
49 written format, a series of scenarios. Candidates are asked to rank a list of possible
50 behavioural responses to the scenarios according to their perceived effectiveness or
51 appropriateness.(21). The SJT content is designed around a number of domains (*empathy,*
52 *professional integrity* and *coping with pressure*) identified as critical to competent
53 performance in the role.(18,22) Thus, the SJT could be considered as providing a metric of a
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3 person's knowledge of interpersonal competence (23) within a primary care health service
4 context.
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8 Finally, in Stage 3, successful candidates take part in a selection centre based on a multi-
9 trait, multi-method assessment approach. The selection centre tests aptitude for training in
10 GP, following which allocation to local education and training boards (LETB) takes place
11 based on trainees' preferences and their aggregated score across the three stages. Once
12 candidates are accepted onto GP specialty training their progress performance is measured
13 through an integrated MRCGP assessment system (see Figure 1), involving the AKT and
14 CSA exams as well as Workplace Based Assessments (WPBAs).
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20 It could be argued that clinical knowledge (as measured by the CPST or AKT) is relatively
21 comparable across languages because the content is objective. Conversely, the practical
22 exams, such as the CSA, may require a degree of interpersonal and cultural
23 competence.(4,21) Likewise, performing well on the SJT is likely to require an ability to
24 recognise both professionally and culturally appropriate (and inappropriate) behaviours and
25 make judgments about them. In this study, in the absence of data related to patient
26 outcomes or experience, we used the CSA as a 'high-fidelity simulation' proxy of clinical
27 behaviour in practice. We hypothesised that, in a group of international medical graduates,
28 language performance on the SJT would have a relatively larger influence on performance at
29 the CSA compared to tests of clinical knowledge. In turn, we anticipated that English
30 Language fluency, as evaluated by the IELTS, would act as something of a filter, having an
31 impact on both the predictors and outcome of interest, in line with knowledge acquisition
32 models (24). Thus, we proposed a model that hypothesised a relationship between language
33 fluency (an eligibility criteria), the two stage 2 selection measures (CPST and SJT) and the
34 CSA rating (Figure 2).
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47 Thus, the aim of this retrospective observational cohort study was to understand the
48 determinants of (simulated) clinical performance in candidates applying for GP training in the
49 UK, in relation to the selection measures. Our findings would have implications for how to
50 effectively support practitioners working outside of their country of qualification, as well as to
51 regulatory policy. As Western countries, such as the UK, will continue to rely on international
52 graduates to deliver health services tackling such disparities is important to the wellbeing of
53 overseas doctors as well as patient care.(25)
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METHOD

Data

Data were provided by the General Medical Council (GMC), the UK medical regulator, supplied in a de-identified form to the research team. (26) Demographic data (place of medical qualification, sex, ethnicity and age) were available. Selection data for medical trainees who applied to GP specialty training between 2008 and 2012 were provided to the GMC by the GP National Recruitment Office in the form of standardised CPST and SJT scores. In the analyses, the scores from the successful (last) attempt at CPST and SJT resulting in a training place offer were used since this is what selectors base their decision on. Moreover, in order to evaluate how the achieved level of applied knowledge and performance on the SJT influenced CSA rating it was considered that the most recent scores would reflect this level of attainment. Overall and component IELTS band scores (*listening, speaking, writing and reading*) were provided by the GMC and matched for trainees who had applied for GP training. The IELTS overall scores are derived by averaging the subtest bands and rounding up to the nearest half integer.(27)

MRCGP performance data for the years 2008 to midway through 2013 were provided by the Royal College of GPs (RCGP). The CSA scores were also available for only a proportion of the candidates, as some may have failed the GP selection process, declined an offer, received a placement or either left/paused training or were still due to sit the examination. This study used scores from the first CSA attempt, expressed as relative to the pass mark for that particular sitting as the primary outcome. Trainees are allowed up to a maximum of four sittings of the CSA, so the first attempt may not be a true reflection of typical performance. However, other approaches (e.g. an average of examination performance) are equally problematic since subsequent scores are often higher and those who failed would have more than one score. Therefore, in this instance we considered it is more meaningful to use first attempt data.(22) We also had access to the AKT results for GP training scheme applicants. However, these scores were only included in the univariable not the multivariable models. This was because AKT was not used as primary selection measure for entry to GP training, as it is taken subsequently. Moreover, both the CPST and AKT evaluate applied clinical knowledge, albeit calibrated to different stages of training. This was evidenced by the relatively high correlation between the two scores at first attempt ($r=0.61$). Note that this correlation was slightly higher than that observed in the scores at pass (subsequently used) as the latter were left (lower) censored at the pass mark. In this study, only candidates who

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3 had IELTS scores were included (predominantly international medical graduates, with a
4 small number from the European Economic Area).
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7 **Data analysis**

8 Scores for the CPST, SJT, and CSA were normally distributed. The IELTS scores were
9 positively skewed and so Spearman's rho was employed as a non-parametric index of
10 correlation. The conceptual model (Figure 2) was tested with a Structural Equation Modelling
11 (SEM) framework. Within the SEM English fluency was modelled as a latent variable with the
12 four IELTS subset bands serving as ordinal indicators. The SJT, CPST and CSA scores
13 were defined as endogenous (dependent) observed (manifest) variables. The SEM was
14 estimated using robust weighted least squares estimation (i.e. WLSMV), as a robust
15 estimator which does not assume normally distributed data and also accommodates the
16 ordinal nature of the IELTS band scores.(28) Model fit was evaluated using the Comparative
17 Fit Index (CFI) (29), the Tucker-Lewis Index (TLI)(30) and the root mean square error of
18 approximation (RMSEA)(31,32). For the SEM standard errors and confidence intervals were
19 derived via a bootstrapping process, with a 1000 replications and correction for bias. (33)
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28 STATA 14.2 MP(34) was used to conduct the correlation, univariable and multivariable
29 regression analyses. MPlus v8 was used for the path analyses.(35)
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32 **RESULTS**

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3 For doctors with data on selection measures scores available, in terms of ethnicity, 2149
4 (57.3%) classified themselves as 'Asian', 385 (10.3%) as 'Black', 178 (4.7%) as 'White', 198
5 (5.3%) as 'Mixed & Other', while reported ethnicity was missing in 840 (22.4%) cases. The
6 average age for the sample was 34 years old (SD = 4.60 years). In the sample 1,889
7 (50.4%) were male. Table 1 displays the descriptive statistics for the sample who had at
8 least some data on IELTS or selection scores (n=3750). Table 1 also shows the degree of
9 correlation between the background, predictor and outcome variables. As can be seen, there
10 were at least moderate correlations observed between IELTS reading band, AKT, CPST and
11 SJT scores (r ranging from 0.18 (CPST) to 0.29 (AKT)). It should be noted that, for
12 consistency, the correlations were performed on the most recent (pass) sittings of the CPST,
13 SJT and AKT and the first attempt at CSA. Although this would have led to attenuation in the
14 observed correlations (due to lower (left) censorship at the pass marks for the predictors)
15 these were the scores used in the later univariable and multivariable models. Likewise the
16 limited range and categories for the IELTS bands would be expected to result in relatively
17 low observed correlations between the subtest scores.
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29 The results from univariable regression analyses, predicting CSA scores from the
30 background, demographic and selection measures are presented in Table 2. As can be
31 seen, being female and younger were all significantly associated with higher CSA scores.
32 Likewise, better performance at IELTS (especially *reading* and *listening*), AKT, the SJT and
33 CPST was also associated with, on average, higher scores at CSA. The effect of gender on
34 the selection measures was also evaluated. In the study sample there was no sex difference
35 observed for the SJT compared to males (p=0.7). There was a slight, non-statistically
36 significant trend for women to score more highly on the CPST (mean score 238.26 vs
37 236.48, p=0.1). Males also reported, on average significantly lower IELTS overall scores
38 (mean score 7.38 vs 7.47, p<0.001).
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49 In order to assess the independent effects of the predictor variables they were entered into a
50 multivariable linear regression model. (36). Note that the IELTS overall score was included
51 but that the subtest scores were not entered individually as it would not be possible to
52 meaningfully interpret each subtest band independent of the other three. However, the
53 relative strength of the univariable relationships between the IELTS subtest scores and the
54 CSA ratings can be viewed in Tables 1 and 2. As can be seen in Table 3, all three
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3 coefficients for the selection variables were statistically significant at the $p < 0.001$ level,
4 together accounting for 14% of the variance in the CSA scores (as indicated by both the
5 adjusted and unadjusted R^2 values). As the standardised coefficients in Table 3 imply, all
6 three selection measures make roughly equal independent contributions to the prediction of
7 CSA score.
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11 ***INSERT TABLE 3 AROUND HERE***
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14 Finally, the path model presented in Figure 1 was estimated. Initially a unidimensional
15 confirmatory factor analytic (CFA) model was tested, with English language fluency as a
16 latent variable with the four IELTS subtest scores as ordinal indicators. The model showed
17 acceptable to good fit according to the CFI value of 0.93, although the TLI was somewhat
18 lower at 0.81 and the RMSEA 0.11 slightly higher than conventional guidelines for goodness
19 of model fits. (31,37) However, previous methodological research suggests where a latent
20 variable model has categorical indicators CFI may serve as a more accurate estimate of fit
21 than TLI or RMSEA. (38) Once a model for English fluency was developed the remaining
22 SEM was built and tested. The estimated coefficients can be seen in Figure 3 and also Table
23 4. The model showed a generally acceptable fit to the data with a CFI of 0.93, a slightly
24 lower TLI of 0.88 and a RMSEA of 0.11. As can be seen from Figure 3 SJT scores were
25 more strongly related, in this sample of doctors, to CSA than CPST performance. However,
26 both CPST and SJT scores appeared fairly strongly related to language fluency. Therefore
27 the specific indirect effects were also estimated in order to explore in more detail the putative
28 mediating pathways between language fluency and CSA performance. The relevant
29 coefficients for the indirect pathways are also shown in Table 4. As can be seen in Table 4,
30 the indirect relationship between language fluency and CSA score appears to be mainly
31 mediated by performance on the SJT.
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46 DISCUSSION

47 *Key findings and comparison with previous studies*

48 In this study we were able to demonstrate a relationship between the two main selection
49 measures (SJT and CPST scores) and the outcome (CSA performance). In this sample of
50 international medical graduates we observed a relatively stronger relationship between the
51 SJT scores and CSA performance than between CPST and the outcome. Moreover, we
52 were able to provide a detailed analysis of how the relationship between language fluency
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3 and CSA rating is mediated by the two differing selection measures, with SJT performance
4 appearing to be the main conduit.
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7 To our knowledge this is the first study to explore how performance at an applied knowledge
8 test and SJT are related to performance at a high fidelity clinical simulation in international
9 medical graduates. However, our findings are broadly in keeping with those previously
10 reported in the literature on medical postgraduate differential attainment. For example, the
11 prior report that high discrepancies in pass rates for the CSA persisted despite controlling
12 for the effects of performance on the AKT suggest that other factors, beyond clinical
13 knowledge, lay behind these.(4) The detailed linguistic study of candidates taking the CSA
14 also highlighted subtle cultural and communication factors as potentially explaining much of
15 the differential pass rate between home and international graduates.(12) Likewise the
16 importance of language fluency in postgraduate medical educational performance has
17 previously been highlighted in relation differential attainment.(3,5,12) Performance at IELTS
18 was also reported to be a predictor of Fitness to Practice (FtP) events in international
19 medical graduates registered to practice in the UK, though the relationship was more
20 complex than simply better subtest scores reducing the risks. (39) It was also interesting to
21 note that, although females tend to outperform males on SJTs(40), in this sample of
22 overseas doctors we did not observe this sex difference. This may have been because the
23 advantage of being female was not apparent where there were also linguistic and cultural
24 challenges to candidates sitting the SJT.
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34 35 ***Strengths and limitations of the study*** 36

37 This was a large and relatively complete dataset on a cohort of international medical
38 graduates applying for a national GP training scheme. By linking data from a variety of
39 sources we were able to explore the relationship between a number of important constructs.
40 Our use of SEM also allowed us to delineate the relationship between language fluency, the
41 two selection measures and the outcome of interest in more detail than a conventional
42 multivariable linear regression. Nevertheless there are several limitations of this study that
43 should be noted. Firstly, CSA performance could not be observed in those who were not
44 selected into GP training, or who had not yet taken the exam. This has led to some
45 degree of attenuation in the degree of correlation observed between the predictors and the
46 outcome of interest. (41) However, it is reasonable to assume that the restriction of range
47 would have applied to both the main predictors of interest (SJT and CPST scores) and
48 therefore their relative contributions of each to CSA performance are likely to be realistic.
49 There were also challenges in deciding how the CSA result was to be defined. Since
50 trainees are allowed a maximum of four sittings of the CSA the first attempt may not be a
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3 true reflection of typical performance, which we used in this study. However, other
4 approaches such as using the average of examination grade are equally, if not more,
5 problematic. Subsequent scores are usually higher, yet it has been shown that, with
6 increasing postgraduate medical exam attempts, chance plays a greater role.(42) These
7 points suggest it is more meaningful to use first attempt data, as other researchers have
8 done previously.(22) Future research could explore other potential predictors, such as
9 number of attempts required to pass: the number of attempts at the PLAB exam has been
10 previously reported to predict the risk of later malpractice in international medical
11 graduates.(39)

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17 A separate potential limitation relates to the measures themselves. Between 2008 and 2012
18 there have been changes to the GP selection process, as well as with CSA assessments.
19 The weighting of the CPST and SJT in the final selection score has increased since 2008.
20 Moreover, IELTS requirements changed over the period from a requirement of a minimum
21 score of 7.0 overall to a minimum score of 7.0 on all components. Subsequently this value
22 has been raised again to a minimum overall score of 7.5 (or equivalent) for international
23 medical graduates to be eligible to take the PLAB exam.(43) Thus, these current findings
24 may not fully generalize to subsequent cohorts. Finally, at the time of the study we did not
25 have access to information about the training interventions and programs on which GP
26 trainees were placed. For example, we could not ascertain whether borderline candidates
27 systematically received poorer quality training than their counterparts, which theoretically
28 could account for some effects reported here. For example, weaker trainees could have
29 been assigned to less desirable training posts where learning potential was restricted. Thus,
30 the present dataset did not allow an analysis of the impact of training interventions or
31 differences in training programs, which could also influence outcomes. Further analysis of
32 training interventions in each program would help to understand the 'value-added' of various
33 education and training interventions.

34 35 36 37 38 39 40 41 42 43 44 ***Interpretation of findings***

45 It is relatively clear that the IELTS evaluates language (though other aspects of cognitive
46 ability are no doubt tested, given the academic nature and purpose of the test) and the
47 CPST assesses applied clinical knowledge. In this case it was the IELTS *reading* and
48 *listening* subtest scores that appeared most closely associated with subsequent CSA
49 performance, suggesting that language comprehension is a key ability in relation to actual
50 clinical performance. In contrast to the IELTS and CPST, the constructs evaluated by SJTs
51 are less clear and will vary across contexts. One way of conceptualising the type of SJT
52 used in GP selection is to consider it a special case of a knowledge test. That is, the SJT is

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3 measuring the ability to identify and rate professional behaviours within a specific cultural
4 context (i.e. that of a UK health service). It may also be that SJTs can, to some extent in
5 certain contexts, measure '*implicit trait policies*' (ITPs). These can be conceptualised as the
6 beliefs that an individual holds about the attitudes and behaviours they consider important to
7 effective workplace practice. For example, it has previously been reported that individuals who
8 have high level of 'agreeableness' as a trait often consider this to be an important
9 characteristic to exhibit in the workplace. Such ITPs are influenced by work and general
10 personal experience.(44,45) In this way, SJTs can be hypothesised to be measuring the
11 knowledge of interpersonal competence and an understanding of what are effective
12 workplace behaviours. Given that the CSA is designed to measure domains such as data
13 gathering, clinical management and interpersonal skills, it is reasonable to assume that there
14 should be overlap in terms of the constructs measured by the SJT and CSA. Such
15 knowledge of interpersonal competence could be thus considered a necessary, but not
16 sufficient, condition for subsequent effective performance in the simulated patient-doctor
17 interactions rated in the CSA. According to our results, such knowledge of interpersonal
18 competency appears somewhat distinct from the medical knowledge captured by the CPST.
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28 Our findings also suggest that the relationship between language fluency and other types of
29 knowledge, in this context, is relatively complex. The results highlight how an otherwise
30 competent doctor (who has a good understanding of clinical issues) may have issues with
31 "translating" this semantic medical knowledge into practice. High demands are placed on
32 medical physicians practicing in their own language, and those practising in a second
33 language have the added burden of understanding, especially colloquialisms. (46) It is also
34 difficult to disentangle language from culture. Thus both language fluency and interpersonal
35 competence are needed to make effective behavioural responses when engaging in
36 culturally-laden social interactions. It is these constructs which are likely to account for at
37 least a substantial portion of the 'dark variance' of differential attainment not explained by
38 academic performance. (10) We propose that these findings are not unique to the UK,
39 whereby international medical graduates applying for licensure in other countries are likely to
40 face the same challenges.
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49 In terms of policy and practice our findings imply that if deficits relating to interpersonal
50 competence are identified during selection they are likely to persist, manifesting as poorer
51 performance in the CSA component of the MRCGP exam. Therefore, the selection methods
52 could be useful tools for identifying trainees at risk of poor subsequent performance so that
53 remediation can be offered. Our results also imply that support for international medical
54 graduates should focus on building cultural and interpersonal competence and confidence.
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3 An increased focus on evaluating such abilities should also be placed on the tests required
4 of doctors who wish to register to practice in a particular country. Indeed, in the UK the
5 addition of an SJT evaluating knowledge of professionalism within a UK health service
6 context is being considered.(47) Interestingly, the lack of an observed sex difference in SJT
7 performance in the study sample suggests that there would probably be minimal impact on
8 the gender balance of selected international doctors were this approach introduced.
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13 **Conclusions**

14 Our findings build on the past research exploring issues relating to the issue of language in
15 the MRCGP assessments.(3,4) We go beyond previous work by providing a more fine-
16 grained analysis where we treat the CSA as a continuous outcome variable in a modelling
17 approach designed to tease out more subtle relationships between the putative predictors.
18 Consequently, we have added to the understanding of both the possible theoretical basis of
19 differential attainment and where the key causal issues may lie. Thus, we would recommend
20 that efforts directed at reducing these group differences should focus on 'socio-linguistic'
21 factors, rather than clinical knowledge.
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Table 1. Sample descriptive statistics and correlations between age, IELTS scores, Applied Knowledge Test (AKT), selection assessment scores (CPST- Clinical Problem Solving Test and SJT- Situational Judgment Test) and performance on the Clinical Skills Assessment (CSA). Note: all correlations are significant at the $p < 0.01$ level except where indicated by an asterisk (*).

	N	Mean	SD	1	2	3	4	5	6	7	8
IELTS reading	3750										
IELTS speaking	3750			0.24							
IELTS writing	3750			0.19	0.25						
IELTS listening	3748			0.40	0.23	0.17					
	2109	10.83	8.50	0.17	-	0.04	0.06				
AKT					0.01	*	*				
					*						
	3709	237.37	33.03	0.11	-	0.04	0.03	0.42			
CPST					0.04	*	*				
					*						
SJT	3709	233.98	27.25	0.29	0.13	0.15	0.18	0.18	0.23		
Age	3750	34.09	4.62	-	0.01	0.01	-	-	-	-	
				0.13	*	*	0.16	0.10	0.08	0.14	
CSA	1874	-4.82	10.53	0.12	0.11	0.06	0.09	0.19	0.13	0.10	-
						*					0.15

Predictor	Coefficient	Lower 95% confidence limit	Upper 95% confidence limit	p
Male sex	-5.96	-6.88	-5.03	<0.01
Age	-0.74	-0.84	-0.64	<0.01
SJT score at pass	0.11	0.09	0.13	<0.01
CPST score at pass	0.07	0.06	0.09	<0.01
IELTS reading	1.55	1.24	1.86	<0.01
IELTS speak	1.16	0.80	1.52	<0.01
IELTS writing	0.46	0.12	0.80	0.01
IELTS listening	1.66	1.35	1.98	<0.01
IELTS overall score	5.90	4.88	6.93	<0.01
AKT score at pass	0.36	0.30	0.41	<0.01

Table 2. Results from univariable regressions predicting Clinical Skills Assessment score (at first attempt) from the selection measures, Applied Knowledge Test performance, age and sex.

Predictor	Coefficient (standardised)	LL	UL	p
SJT score at pass	0.07 (0.18)	0.05	0.09	<0.001
CPST score at pass	0.05 (0.17)	0.04	0.07	<0.001
IELTS overall score	4.21 (0.18)	3.18	5.25	<0.001

Table 3. The results of a multivariable linear regression examining the prediction of the components of the IELTS and the two selection measures to independently predict subsequent performance (at first attempt) in the Clinical Skills Assessment (N=1874).

Path	Coefficient	SE	Standardised β
Direct effects			
English fluency \rightarrow CPST	24.67	1.37	0.44
English fluency \rightarrow SJT	29.287	1.40	0.63
CPST \rightarrow CSA	0.05	0.01	0.17
SJT \rightarrow CSA	0.10	0.01	0.26
Indirect specific effects			
English fluency \rightarrow CPST \rightarrow CSA	1.32	0.20	0.07
English fluency \rightarrow SJT \rightarrow CSA	2.96	0.30	0.17
Total overall indirect effects			
English fluency \rightarrow CSA	2.96	0.30	0.24

Table 4. Results from a path analysis evaluating the direct and indirect relationships between the variables in the structural equation model (see Figure 3). All paths were statistically significant at the $p < 0.001$ level. CPST = Clinical Problem Solving Test; SJT = Situational Judgement Test; CSA = Clinical Skills Assessment. 'English fluency' is conceptualised as a latent variable with the four IELTS subtest scores (reading, speaking, writing and listening) as indicators.

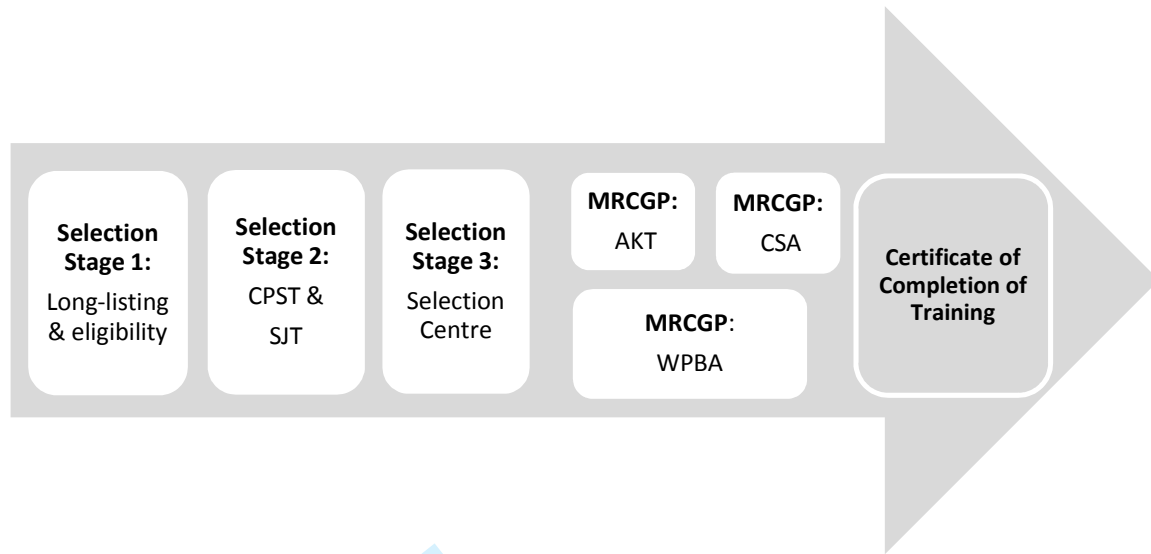


Figure 1. General Practice Selection and MRCGP Assessment Pathway. MRCGP = Membership of the Royal College of General Practitioners; CPST = Clinical Problem Solving Test; SJT = Situational Judgement Test; WPBA = Workplace Based Assessment; AKT = Applied Knowledge Test; CSA = Clinical Skills Assessment.

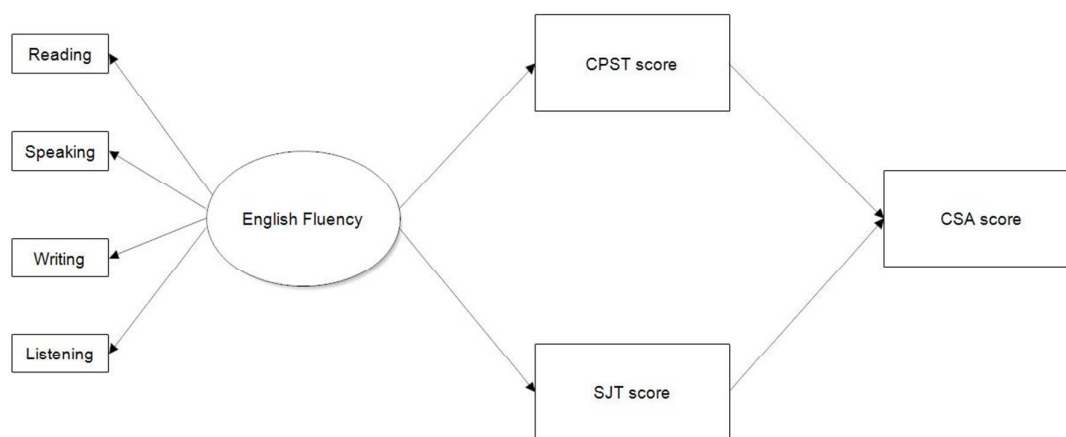


Figure 2. Proposed model examining the relation between language fluency, performance on the selection assessments and subsequent Clinical Skills Assessment (CSA) performance.

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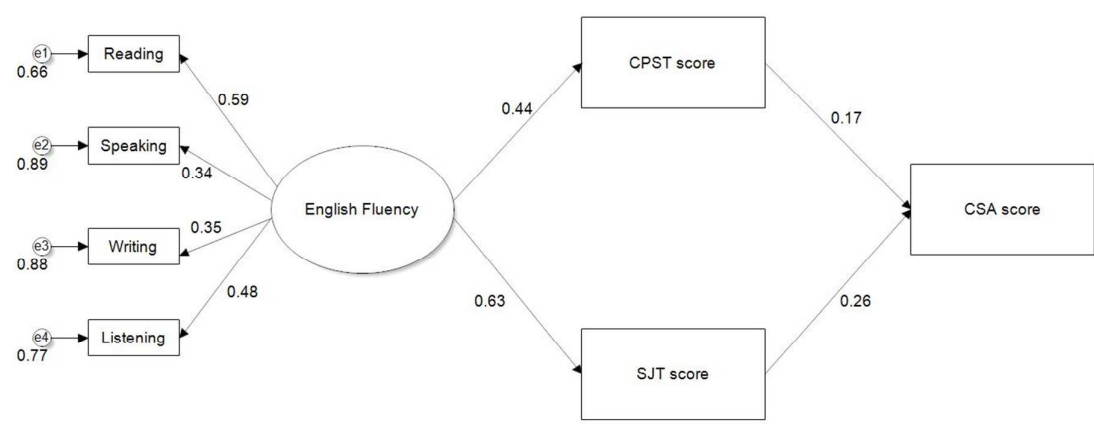


Figure 3. Final model examining effects of language ability and knowledge on CSA performance (N=1874). Note: ‘English fluency is conceptualised as a latent variable with the four IELTS subtest scores (reading, speaking, writing and listening) as indicators.

For Review