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ORIGINAL ARTICLE

Candidates registered for reasonable adjustments underperform compared to other candidates in the national undergraduate Prescribing Safety Assessment: Retrospective cohort analysis (2014–2018)

Kate Hutchinson[1] | William M. Ricketts[1,2] | Simon Maxwell[3,4] | Fu Liang Ng[1,5]

[1]St Bartholomew's and the Royal London Hospitals, Barts Health NHS Trust, UK

[2]Institute of Health Sciences Education, Queen Mary, University of London, UK

[3]British Pharmacological Society, London, UK

[4]Clinical Pharmacology Unit, Edinburgh Medical School, University of Edinburgh, UK

[5]Department of Clinical Pharmacology, William Harvey Research Institute, Queen Mary, University of London, UK

Correspondence
Dr Fu Liang Ng, Department of Clinical Pharmacology, John Vane Science Centre, William Harvey Research Institute, Queen Mary, University of London, Charterhouse Square, EC1M 6BQ, UK.
Email: f.ng@qmul.ac.uk

Aims: Candidates with disabilities are eligible for reasonable adjustments (RA) while undertaking the national Prescribing Safety Assessment (PSA). The PSA is a novel open-book, time-constrained, multiformat assessment that may pose challenges to candidates with dyslexia and other disabilities.

Methods: Retrospective cohort analysis of 36 140 UK candidates undertaking first-sitting of the PSA (2014–2018).

Results: Of the 36 140 candidates, 9.1% (3284) were registered for RA. The RA group had lower pass rates (absolute difference 1.94%, 95% confidence interval 1.01–2.87%; $P < .001$) and assessment scores (1.16 percentage marks, 95% confidence interval 0.83–1.48; $P < .001$) compared with the non-RA group. This absolute difference is small relative to overall variability. This difference persists after adjusting for confounding factors (medical school and paper), and was present for all 8 different question types. The attainment gap within each medical school is negatively correlated with the school's overall performance, both in terms of pass rate ($P < .001$) and scores ($P = .01$). The RA group were also less likely to perceive the PSA as an appropriate test, having easy to follow layout/presentation or clear/unambiguous questions, even after adjusting for candidate performance.

Conclusion: This analysis identifies slight differences in academic performance of candidates requiring RA in a national undergraduate assessment. The study is limited by the unavailability of data on ethnicity, sex, age, diagnosis and time of diagnosis. While further research is required to determine the cause of the attainment gap, this study emphasises the need to maintain a careful review on the fairness and validity of all aspects of the assessment.

KEYWORDS

medical education, medication safety, prescribing

The authors confirm that the Principal Investigator for this paper is Fu Liang Ng. There was no direct clinical contact for this study.

1 | INTRODUCTION

Disabilities, including specific learning difficulties such as dyslexia, are protected characteristics under UK equality legislation.[1] With this, examination bodies are required to provide equality of opportunity. There are various steps taken for undergraduate and postgraduate assessments. For written assessments, this may typically be an allocation of 25% extra time. Each medical school is required to consider requests for reasonable adjustments (RA) in line with equality legislation.[2] This would typically be based on a referral to the school's disability support team, although there currently is no national guidance on best practice in deciding RA. The Prescribing Safety Assessment (PSA) currently accepts applications from medical schools for extra time up to 25% and requests above this duration are considered on a case-by-case basis by an advisor or panel.[3]

Perhaps the most common diagnosis accounting for applications for RA is that of dyslexia. Dyslexia is a common condition characterised by difficulties with fluent word recognition and ability to decode print, with subsequent negative impact on reading fluency and spelling.[4] Individuals with dyslexia can be affected differently but tend to have difficulties with reading, writing, spelling, sequencing, rapid naming, word retrieval or recognition. During adult years, dyslexia may manifest as difficulties with unfamiliar words, slower reading relative to the level of education, and being potentially penalised in multiple-choice tests.[5,6]

While estimates vary, the prevalence of dyslexia is thought to be around 6–10% of the global population.[4,5,7] The number of medical students registering as dyslexic has also been increasing,[8] and also increases from admission to graduation.[9,10] Medical students with dyslexia who did not have concessions in place tended to have a poorer performance in written and practical examinations,[11] and therefore are offered RA such as 25% extra time in examinations or using an e-reader. In studies of undergraduate medical school examinations, the difference in performance of dyslexic students *vs* other students tends to disappear towards the final years of the course, so long as dyslexic students apply for and receive RA.[8,10–12] These studies are however usually limited to single medical schools with limited sample sizes. A study of 14 801 candidates undertaking the postgraduate general practitioner licensing examination highlighted that candidates disclosing dyslexia and were eligible for RA performed to a similar levels to their counterparts after adjusting for covariates.[9]

The PSA is a national summative examination sat by all medical students prior to commencing their careers as doctors in the UK. It was designed by the British Pharmacological Society in partnership with the Medical Schools Council to assess competencies outlined by the General Medical Council, including writing new and reviewing existing prescriptions, calculating drug doses, identifying/avoiding drug errors and adverse reactions, and prescribing to suit patient circumstances. This assessment combines multiple question formats including blank-space prescribing, one/some-from-many, best-of-five and blank-space calculations delivered online, over 120 minutes, and with *open-book* access to the online British National Formulary (BNF).[13]

What is already known about this subject

- Medical students with disabilities or temporary or flare-up of long-term health conditions are eligible for reasonable adjustments during assessments.
- Estimated prevalence of dyslexia is 6–10% in the general population.
- In previous studies, the difference in performance of dyslexic students tends to disappear after applying reasonable adjustments.

What this study adds

- Despite providing reasonable adjustments (typically 25% additional time) for this online, multiformat, open-book, time-pressured prescribing assessment, candidates registered for reasonable adjustments underperform compared to the rest of the candidates. The underlying cause for this attainment gap cannot be determined by this study.

Results of the assessment are pass–fail, with the pass mark being decided by a modified Angoff process.[14] By the end of their first postgraduate year (FY1), candidates must have passed the PSA in order to progress to their second postgraduate year (FY2),[15] and several undergraduate courses include the PSA as part of their summative assessment prior to graduation. Any possibility of students and doctors with dyslexia being disadvantaged in either undergraduate or postgraduate examinations is a concern that requires further assessment. The impact of the PSA on students with disabilities have not previously been assessed.

The aim of this study is to establish whether there is a difference in performance of candidates who request RA compared to all other candidates in the PSA. In addition, we also aimed to determine whether candidates registered for RA perceived the assessment differently to the rest of the cohort, particularly regarding timing and layout.

2 | METHODS

2.1 | Study population

Anonymised data from 36 140 individual examination sittings of the PSA between 2014 and 2018 were obtained. This included all first-sit candidates from UK universities during the first 5-year period of the assessment, not including its pilot phase. This does not include candidates undertaking re-sits (n = 1269) or based in non-UK universities (n = 248), as they were excluded from the analysis to limit

potential confounding factors.[9] These data encompassed 33 UK medical schools. When considering differences between candidates registered for reasonable adjustments (RA group) and the other candidates (non-RA group), only the data from 31 UK medical schools were used, as 2 medical schools (n = 150 candidates from these 2 schools combined) participated in the PSA only in 2018 in the analysed timeframe. There were 21 separate exam papers during this period (5 papers for 2014, 4 papers each for 2015–2018). Approval for use of data was obtained through the PSA Executive Committee. No additional ethical approval was required due to the nature of retrospective anonymous research on undergraduate medicine assessment performance. All data were anonymous.

For each examination sitting, the following anonymous information was available for each candidate: year of exam, exam paper, medical school (anonymised), overall score, scores for each of the 8 question types, Angoff pass mark and pass-fail status. Data were prospectively collected by the Medical Schools Council Assessment/PSA team, and provided to the authors on application. Data for ethnicity, age and sex were not available. Although the assessment consists of questions, which total 200 marks, the following analysis has been normalised to 100 marks for ease of representation in percentages. The *statistical borderline group* is defined by the PSA as the subgroup of candidates with a score that is within 1 standard deviation either side of the Angoff pass mark. We adjusted for pass mark to avoid confounding due to different pass marks being set each year by the Angoff method (pass mark range 58.5–73.5%, median 63.5%, interquartile range 62–65.5%). For this study, we use the term *score above pass mark*.

We represented exam difficulty as a separate covariate by the mean score above pass mark of candidates taking that paper, or the overall pass rate for each exam. To account for the differences in exposure and importance placed on prescribing education/assessment in the varying medical schools, we also used covariates representing overall school performance by the mean score above pass mark of candidates within the medical school, or the overall pass rate for each medical school. We also considered the prevalence of candidates with RA within a medical school (as a % of total candidates) as an additional covariate.

Candidates who provide expert evidence that they require RA are usually provided 25% extra time. A small proportion (0.5%, 18/3284) of candidates were allocated more extra time following an additional application with extenuating circumstances, but due to the small sample size it is not possible to assess them as a subgroup. It should be recognised that there may be candidates with undiagnosed dyslexia or other disabilities who undertook the assessment in the non-RA group.

2.2 | Factors impacting on individual candidates' exam performance

We compared the exam performance of candidates in the RA group against those in the non-RA group using a 2-sample t-test. We utilised multiple linear regression to assess the impact of RA status on exam performance, with continuous variables of school performance and exam paper difficulty as covariates. Year of exam and number of candidates with RA within a medical school did not reach statistical significance as covariates to enter the multiple linear regression.

We utilised multinomial logistic regression to estimate the odds ratio for failure at the first-sitting of the PSA based on RA status, with covariates of overall exam paper pass rate (by quintiles), overall medical school pass rate (by quintiles), percentage of candidate population within the medical school requiring RA (by quintiles) and year of exam.

2.3 | Factors impacting on attainment gap between RA and non-RA candidates

Potential factors impacting on the attainment gap between RA and non-RA candidates were also assessed by linear regression. Independent variables assessed were overall exam paper pass rate, overall medical school pass rate, percentage of candidate population within the medical school requiring RA and year of exam. When analysing the attainment gap, we also analysed 121 exam events where there were at least 10 candidates in both the RA and non-RA groups sitting the same exam from the same medical school. There were 197 other exam events that did not fit these criteria (n = 121 insufficient in RA group, n = 74 insufficient in non-RA group, n = 2 insufficient in both groups).

2.4 | Attainment gap between RA and non-RA candidates in relation to question types

The attainment gap between the groups was also assessed for each of the 8 question types. To account for the potential differences across exam papers, the candidates' question-specific scores were expressed relative to the mean overall score for that question type in each paper. In recognising the different weighting of the various question types, the attainment gap was also represented on a normalised (to 100 marks) scale.

2.5 | Analysis of Likert scale anonymous candidate feedback

Candidates also provided anonymous feedback in a window of time after completing the assessment and before accessing their results. We utilised multiple linear regression to assess potential factors for candidates agreeing with the feedback statement as reflected by a Likert score of 4 or 5 on a 5-point Likert scale. Independent variables assessed were candidate's exam score above pass mark, RA status, overall medical school performance (school mean score above pass mark) and paper difficulty (paper mean score above pass mark).

2.6 | Statistical analysis

Statistical analyses were conducted using SPSS version 25 (IBM Corp). An α level of $P < .05$ was defined as statistically significant. Where appropriate, data are expressed as mean (95% confidence interval).

3 | RESULTS

3.1 | Exam candidate characteristics

The RA group comprised of 3284 candidates (9.1% of the overall cohort). The distribution within medical schools regarding the proportion of candidates in the RA group is positively skewed (range 3.3–23.3%, median 7.6%, interquartile range 5.2–12.1%). The proportion of candidates in the RA group has increased over the 5 years (7.7–10.5%).

3.2 | Impact of RA group and other factors on individual candidate's examination performance

Candidates in the RA group had lower mean scores, a lower pass rate and were more likely to be in the statistical borderline group as compared to those in the non-RA group (Table 1). Individual candidate performances were correlated with both the overall school performance and the difficulty of the examination paper. Taking these variables into a multiple linear regression model, the RA group remains a predictor of lower mean score (Table 2). Those in the RA group continue to have higher odds of failing the exam even after accounting for school performance, paper difficulty, percentage of candidates within a school with RA and the examination cohort year in a multinomial logistic regression model (Table 3). The attainment gap is, however, small compared to the variability in performance between schools and between papers (Table 4).

3.3 | Factors impacting on attainment gap between RA and non-RA candidates

Candidates in the RA group obtained lower scores than those in the non-RA group in 24/31 medical schools and for 20/21 exam papers. This attainment gap is smaller in higher performing schools (Figure 1A,B), but not correlated with the difficulty of the exam paper or the proportion of the medical school's candidates registered for RA (Figure 1C–F). There is no statistically significant relationship between the attainment gap (Figure 1E,F) and the cohort year (Figure 1G,H), although there are fewer data points.

We attempted to remove confounding factors by assessing only the exam events that comprised at least 10 candidates from each of the RA and non-RA groups. One exam event was defined as 1 sitting from the same medical school with the same exam paper at the same time. With these 121 exam events, the negative correlation between attainment gap and the medical school's performance persisted (Figure 2).

TABLE 2 Multiple linear regression identifying variables associated with individual candidate's examination score

	Linear regression	Multiple linear regression
School performance (school mean score above pass mark)	β = 1.000 (95%CI 0.967–1.032) R^2 = 0.091, $P < .001$	β = 0.854 (0.821–0.886) $P < .001$
Paper difficulty (paper mean score above pass mark)	β = 1.007 (0.971–1.042) R^2 = 0.079, $P < .001$	β = 0.839 (0.804–0.873) $P < .001$
School % with RA	N.S.	Not in model
RA group	Not applicable	β = −0.014 (−0.017 to −0.011) i.e. 1.4 (1.1–1.7) marks less in RA group $P < .001$

CI, confidence interval; RA, reasonable adjustments.

3.4 | Attainment gap between RA and non-RA candidates in relation to question types

Candidates in the RA group scored lower than their non-RA counterparts in all 8 broad question types. Based on raw scores, the largest attainment gap was the blank-space prescribing questions. However, the exam is skewed in its weighting towards blank-space prescribing and prescription review questions. When this weighting is normalised, the gap is largest in the blank-space calculation questions (Figure 3).

TABLE 1 Differences between the 2 groups on examination scores, pass rates and being classified as statistical borderline group

	RA group (n = 3,284)	Non-RA group (n = 32,856)	Difference
Score above pass mark (marks/100)	13.29 (95%CI 12.97–13.60)	14.44 (14.35–14.53)	1.16 (0.82–1.48) $P < .001$
Pass rate	92.57% (91.67–93.47)	94.51% (94.26–94.75)	1.94% (1.01–2.87) $P < .001$
Statistical borderline group	12.18% (11.06–13.30)	9.52% (9.20–9.84)	2.66% (1.50–3.82) $P < .001$

CI, confidence interval; RA, reasonable adjustments.

TABLE 3 Multinomial logistic regression identifying variables associated with individual candidate's odds of failing the assessment

Coefficient		Exp β (95%CI) odds ratio for failing exam	*P*
Reasonable adjustment	Without	Reference	
	With	1.510 (1.306–1.745)	.001
Paper pass rate	1st (highest) quintile	Reference	
	2nd quintile	1.476 (1.223–1.780)	.001
	3rd quintile	2.113 (1.763–2.533)	.001
	4th quintile	2.469 (2.015–3.025)	.001
	5th (lowest) quintile	2.531 (2.029–3.156)	.001
School pass rate	1st (highest) quintile	Reference	
	2nd quintile	1.950 (1.558–2.440)	.001
	3rd quintile	2.783 (2.288–3.385)	.001
	4th quintile	2.988(2.461–3.629)	.001
	5th (lowest) quintile	5.969 (4.928–7.231)	.001
School % reasonable adjustment	1st (highest) quintile	Reference	
	2nd quintile	0.899 (0.726–1.115)	.333
	3rd quintile	0.931 (0.782–1.108)	.419
	4th quintile	0.888 (0.742–1.064)	.198
	5th (lowest) quintile	0.973 (0.786–1.204)	.973
Year	2014	Reference	
	2015	1.275 (1.107–1.469)	.001
	2016	0.907 (0.769–1.071)	.250
	2017	0.716 (0.675–0.987)	.036
	2018	0.734 (0.616–0.874)	.001

CI, confidence interval.

TABLE 4 Variations in examination scores and pass rate stratified by different factors

	Score above pass marks (out of 100)	Pass rate (%)
Difference between RA and non-RA groups	1.16	1.94% (absolute rate difference)
Between all students	Standard deviation 8.64	Not applicable
Between schools	School mean score range 8.81–20.02	School pass rate range 82.06–99.75%
	Median 14.09	Median 95.39%
	IQR: 12.83–16.13	IQR: 92.68–96.53%
Between papers[a]	Paper mean score range 8.72–18.07	Paper pass rate range 88.37–98.72%
	Median 14.39	Median 94.53%
	IQR: 12.41–15.68	IQR: 92.10–96.47%

[a]acknowledging the caveat that difference between papers is also confounded by schools sitting the paper and any cohort effect.
IQR, interquartile range.

3.5 | Analysis of Likert scale candidate feedback

There is a consistent correlation between candidate scores and self-reported agreement with positive statements regarding the assessment. After accounting for impact of exam performance, paper and medical school, the candidates in the RA groups were less likely to perceive the assessment as an appropriate test of prescribing skills, and an easy-to-follow layout/presentation/interface, the questions being clear/unambiguous. There were no residual differences between the groups in their preparedness and the timing allocated for the assessment. The groups also did not differ in the likelihood to have written >20 prescriptions in their training (Table 5).

4 | DISCUSSION

This is the single largest study to assess the impact of having a medical diagnosis that qualifies for RA on exam performance in a national undergraduate medical examination. This study has identified a slight attainment gap between candidates requiring RA compared to other candidates undertaking the PSA (Table 1). This differs from previous literature that suggests that performances in summative undergraduate examinations tended to equalise after the provision of RA.[8,10–12] The difference may be related to the sample size of this study being

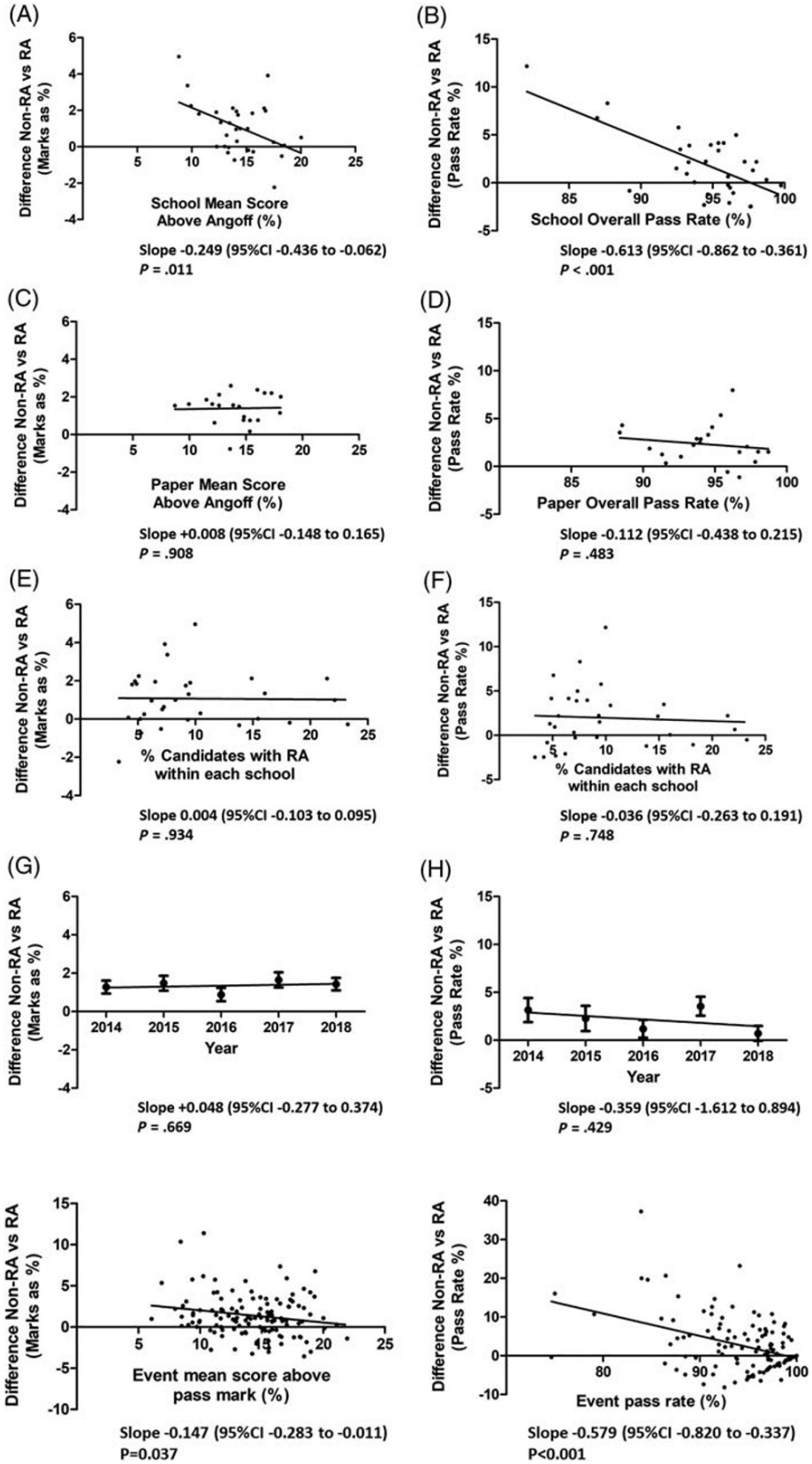

FIGURE 1 Factors impacting on attainment gap between reasonable adjustments (RA) and non-RA candidates. Positive values for the y-axis represents where the non-RA group has a higher exam score or pass mark as compared to the RA group. CI, confidence interval

FIGURE 2 Attainment gap between reasonable adjustments (RA) and non-RA candidates in 121 exam events that comprised of at least 10 candidates from both groups. CI, confidence interval

adequately powered to detect a smaller difference. Alternatively, the finding of the attainment gap may be linked to the novel nature of the online, open-book, multiformat and time-pressured PSA.

Overall, the poorer performance of candidates in the RA group is independent of medical school, exam paper and cohort year (Tables 2 and 3). Some potentially confounding factors such as re-sitting

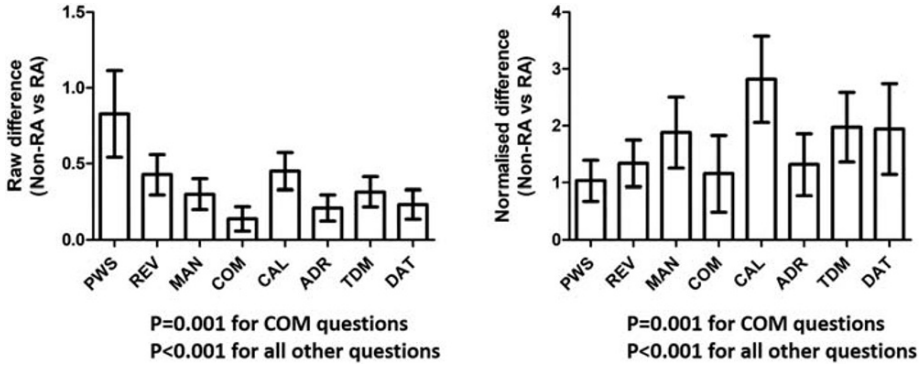

FIGURE 3 Attainment gap between reasonable adjustments (RA) and non-RA candidates across different question types. Abbreviation for question types (question format in parentheses): PWS, prescribing (blank-space); REV, prescription review (one/more-from-many); MAN, management (best-of-five); COM, communications (best-of-five); CAL, calculations (blank-space calculation); ADR; adverse drug reactions (best-of-five), TDM denotes drug monitoring (best-of-five); DAT, data interpretation (best-of-five). Questions listed in chronological order of the assessment. Positive values for the y-axis represens where the non-RA group has a higher score compared to the RA group. Error bars denote 95% confidence interval

TABLE 5 Multiple linear regression of Likert scale feedback from candidates presented in numerical order as seen by candidates

	Score (per mark)	RA group vs non-RA group[a]
Q1. This was an appropriate test of prescribing skills	β = 0.013 *P* < .001	β = −0.028 0.037
Q2. My course prepared me for the content	β = 0.011 *P* < .001	NS
Q3. The number of prescriptions that I have written (is >20)[b]	β = 0.007 *P* < .001	NS
Q4. The time provided for answering the questions was sufficient	β = 0.011 *P* < .001	NS
Q5. The layout and presentation of the questions was easy to follow	β = 0.007 *P* < .001	β = −0.059 *P* < .001
Q6. The online interface was easy to use	β = 0.006 *P* < .001	β = −0.031 0.002
Q7. The information about the PSA was helpful	β = 0.006 *P* < .001	β = −0.025 0.014
Q15. The questions in the assessment were clear and unambiguous	β = 0.007 *P* < .001	β = −0.060 *P* < .001

[a]Negative β indicates that the non-RA group were less likely to agree with the statement.
[b]Split into category of more than >20 prescriptions, reflecting Likert score of ≥4 out of 5.
P values corrected for multiple testing. Where *P* is nonsignificant (NS), variables are excluded from the model.
RA, reasonable adjustments.

candidates as well as candidates from non-UK universities were excluded, but data pertaining to other potential confounders such as ethnicity, sex and age[9] were not available. While candidates in the RA group do perform worse than their counterparts, this difference appears small relative to the variation between medical schools or assessment papers (Table 4). In addition, the attainment gap might also be viewed as a modest difference in comparison to the overall pass rates (Table 1).

This attainment gap is observed to be smaller in higher-performing medical schools (Figure 3), with several potential explanations. It may be related to factors specific to individual medical schools, such as entry admission criteria/bias, the relative quality of prescribing/pharmacology teaching and the different emphasis on the assessment in context of their overall undergraduate degree. Alternatively, this observation may be related to an intrinsic relationship between overall school performance and any attainment gaps. In other words, as any school performance approaches 100% pass rate, any potential attainment gap is intrinsically narrowed.

There is no effect of the overall *difficulty* of the assessment itself on the attainment gap. Thus far, there is also no observed cohort effect, but may not be revealed by the 5-year follow up. It is feasible that with increasing exposure and importance of the PSA, candidates may become increasingly familiar with the assessment and any potential novelty effect that may disproportionately impact on those in the RA group becomes attenuated.

With the multiformat nature of the assessment questions, it was interesting to note that there were attainment gaps across all question types (Figure 3). We considered several explanations for this finding. Firstly, this could be due to a bias present in all question types, such as the user interface and information layout, that is consistent across all question types. Secondly, a bias across multiple question types may also relate to the overall impact of the different diagnoses of candidates in the RA group on overall medical training and preparation of high-stakes assessments. The third explanation considered was that this may also relate to the open-book source (BNF) structured in such a way that is less conducive to efficient use for the RA group candidates. It is interesting to note that the blank-space calculation questions that do not require the use of the BNF show the largest

attainment gap relative to weighting of the assessment (Figure 3). There is a known relationship between dyslexia and dyscalculia,[16] and a small study has previously suggested that non-medical undergraduate students with dyslexia were at higher risk of mathematics anxiety.[17] Our fourth potential explanation was that RA group candidates may be adversely impacted by 1 or some question types, which in turn impacts on the overall time available for remaining questions in a time-constrained assessment.

The data shown in Table 5 appear to indicate that supplementation with additional 25% time is overall sufficient to equalise any perceived difficulties in completing the exam in time for the candidates in the RA group. However, the RA group candidates were more likely to disagree with positive statements on the layout and presentation of the questions, the ease of use of the online interface and whether the questions in the assessment were clear and unambiguous. This may suggest that the candidates in the RA group perceive that they are disadvantaged by the current format of the assessment, although it is important to recognise that the feedback questionnaire was not designed to test this specific hypothesis and is subject to observer bias, particularly with 1 blank-space question specifically prompting a response from the RA group. In addition, the survey is conducted immediately after a high-stakes exam, and must be completed before receiving their results. With this, there is a possibility that their initial perceptions may not always align with reality.

There are, however, limitations, as expected of a retrospective study. First, our findings may be assessment specific. The PSA is unique as an online, multiformat, open-book, time-pressured exam. The retrospective nature of this study does not allow differentiation as to whether any 1 or more of these factors contribute to the attainment gap. This study was also unable to obtain data on potential confounding factors such as ethnicity, sex and age. Another consideration is that while anecdotally the majority of applications for RA relates to a diagnosis of dyslexia or specific learning difficulties, the data for diagnoses, severity and timing of the underlying the application for RA are not available. Furthermore, there may potentially be students in the non-RA group with undiagnosed or undeclared diagnoses. A study has previously found that a large proportion of specific learning disability diagnoses are established during undergraduate studies.[10] The authors hypothesised that students with then-undiagnosed dyslexia would have had their learning strategies overwhelmed with the increased demands of medical study, leading them to seek a diagnosis.[10] With this, there is potential for selection bias between the groups where students in the RA group may have been partly self-selected for candidates who may have had difficulties in preceding years. Additionally, the candidates who have been allocated RA are a heterogeneous group, and while the large majority may be related to dyslexia and specific learning difficulties, it would be inappropriate to attribute the overall finding to these diagnoses alone.

This study has been unable to answer why the observed attainment gap is present, or whether it can be narrowed. In terms of the candidates with dyslexia and specific learning difficulties, it may be argued that the format of the exam between 2014–2018 had a layout that is not optimal for their word recognition. This includes long sentences/paragraphs, limited spacing, and with black text on a white background which is thought to contribute to visual stress. While the evidence is limited, a change to the layout may help all candidates, such as using pastel coloured background, using shorter sentences and paragraphs, bullet-lists and improved visual framework.[18] There is potential for further research to determine whether changes in layout may help narrow the attainment gap, but not in the process unintentionally biasing against other candidates.

The BNF is another key resource that is potentially difficult for candidates with dyslexia. This is often text-heavy with long paragraphs that compound the difficulties of an open-book time-pressured assessment. The BNF search tool, with a low tolerance for spelling errors may disproportionately impact on candidates with dyslexia.[19]

There was an incidental finding of the wide range between medical schools with regards to the proportion of candidates registered for RA. It is unclear whether this observed range relates to potential admission selection bias, limited awareness of relevant diagnoses or an environment that either encourages or discourages assessment for diagnosis and subsequent RA. In addition, there is no current standardised manner to manage requests for RA across medical schools. This variation between medical schools potentially merits further exploration. A recent small qualitative study of medical students with dyslexia revealed some reluctance or delay in disclosing their disability due to a range of issues, including concerns of confidentiality, while other students were more proactive in disclosure as this could facilitate early access to RA and support services.[20]

Having identified an attainment gap, it is important to consider whether all possible steps have been taken to eliminate potential biases and provide equality of opportunity to all candidates. Adopting best practice for dyslexic readers has the potential advantage of making documents easier on the eye all candidates, potentially narrowing but not completely resolving the attainment gap in this time pressured exam. We believe that this study serves as a reminder of the need to eliminate potential biases in high-stakes summative assessments and will prompt further research into the impact of layouts and online interfaces on candidate examination performances.

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AUTHOR CONTRIBUTION

FLN and WMR initiated the collaborative project. FLN wrote the statistical analysis plan, analysed the data, and is the guarantor for this study. FLN, KH, WMR and SM provided interpretation, contextualization, wrote and revised the paper.

COMPETING INTERESTS

F.L.N. has no conflict of interest to declare in relation to this work. He is an Assessment Board member of the PSA. S.M. has no conflict of interest to declare in relation to this work. He has provided consultancy services to the BPS on behalf of the University of Edinburgh for

other educational projects. He is also an Executive Committee member for the PSA. K.H. and W.M.R. have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the PSA Executive Committee. Restrictions apply to the availability of these data, which were used under license for this study.

ORCID

Simon Maxwell https://orcid.org/0000-0002-3032-7237
Fu Liang Ng https://orcid.org/0000-0002-3647-2355

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