Less-Than-Full-Time Training as a Predictor of Performance at the Fellowship of the Royal College of Radiologists (FRCR) Exams

Introduction:

In the UK, trainee doctors can apply to work less-than-full-time (LTFT); this refers to a working pattern where trainees work a reduced number of hours compared to their full-time (FT) counterparts.[1] Over the past decade, the proportion of LTFT trainees in the NHS has been steadily increasing among all specialties, including radiology; in 2015, 12% of all trainees and 13% of radiology trainees were LTFT, compared to 20% of all trainees and 19% of radiology trainees in 2023.[2] Historically, the option to train LTFT has been reserved for doctors who meet specific criteria, limited to those with compelling reasons such as care-giving responsibilities or unique personal development opportunities.[1] However, in recent years, there has been an increasing focus on improving the working lives of doctors and workforce retention through increasing flexibility in training, led on a national level by the General Medical Council (GMC) and Health Education England (HEE).[3-5] In 2022, following the completion of a successful pilot period, HEE expanded the criteria for LTFT training to include personal choice, thereby dramatically widening elibility.[1] As a result, the proportion of LTFT trainees is expected to increase further and more rapidly over the coming years, although access does remain subject to local service needs.[6]

With a growing proportion of LTFT trainees, it is of increasing importance to evaluate if the training needs of this group are met to facilitate their success at a comparable level to their FT counterparts. While LTFT training has been shown to have a positive impact on trainee

work-life balance and choosing to remain in training, it is not without drawbacks.[3] Several survey studies have shown that LTFT trainees face a multitude of additional barriers as a result of training LTFT.[3,7-10] These include reduced training opportunities, bullying, stigma, lack of senior support, and discrimination for job appointments.[6,7,9] However, to date, there has been a paucity of available data assessing whether these experiences translate into differential training outcomes. Understanding if there are any disparities in outcomes is essential to understand whether we are merely facilitating a diverse workforce, or an inclusive one in which these trainees can thrive. This study begins to fill this gap, with a focus on radiology trainees.

The Fellowship of the Royal College of Radiologists (FRCR) exams are a series of three assessments (Part 1, 2A and 2B) that are mandatory in UK radiology training.[11] Success at these exams serve as critical checkpoints for progression that a trainee must achieve; without a 'passing' result at the FRCR Part 1 and 2A exams, a trainee cannot progress to the third specialty training year ("ST3").[11] Without a pass at each of the exams a trainee cannot achieve Certification of Completion of Training.[11] Therefore, if differential outcomes exist for some groups of doctors and not others at these high-stake assessments, a significant and lasting impact on the lives, career progression, and retention of these trainees could result.

In this cohort study, we aimed to evaluate whether LTFT trainees show group-level differences in performance at postgraduate training examinations compared to their FT counterparts, with a focus on the FRCR examinations. The results will help inform whether there is a need for additional support aimed at LTFT trainees and, if so, can help guide the development of such initiatives.

Methods:

This was a retrospective longitudinal cohort study using data from the United Kingdom Medical Education Database (UKMED). UKMED is a national database managed by the GMC, which cross-links demographic and educational outcomes data for all trainees within the UK from a multitude of sources.[12] These include the Higher Education Statistics Agency (HESA), Postgraduate Deaneries, Local Education and Training Boards, and the GMC National Training Survey.[12] The variables extracted for the purposes of this study were linked to FRCR performance on an individual level by UKMED before access to the anonymised dataset was granted to the research team. The variables are detailed below.

In line with HESA standards, all counts presented have been rounded to the nearest 5 to ensure person-level anonymity.[13]

Study Population:

Data were extracted for all UK Radiology trainees who attempted the FRCR Part 1 and 2B exams between 2014 and 2021, and the 2A exam between 2018 and 2021. Prior to 2018, the FRCR 2A exam was made up of 6 separate exam modules taken by candidates at various intervals. As of 2018, the format changed to a single exam taken over two days.[14] Therefore, to reliably compare the performance of candidates in the current exam format, data for the FRCR Part 2A exam were extracted between 2018 and 2021 only.

Less-Than-Full-Time Training:

LTFT status was determined for each exam year based on trainee responses at the compulsory GMC National Trainee Survey (NTS) in the same year. Trainees who had explicitly indicated that they were or were not training LTFT were included. Trainees for whom no response to this question was available for a given year were not included for that year. Due to the COVID-19 pandemic, the usual NTS survey was paused in the year 2020 and therefore no LTFT information was available in the database (only a shortened survey focused on the impact of the pandemic was performed).[15]

Exam Data:

Results for first attempts at the FRCR examinations were extracted for evaluation, as first attempts have been shown to be most predictive of future success in postgraduate exams.[16,17]

The Part 1 exam is composed of two modules, Physics and Anatomy, and a 'pass' is required at each module to be eligible to proceed to the 2A exam. Therefore, for the purposes of this study, a 'fail' at either module was classified as an overall 'fail', and a pass at both modules at first attempt was required to classify as a 'pass'. Candidates were only included if they attempted the Physics and Anatomy module in the same year.

Demographic Data:

Demographic variables included were those previously shown to be associated with postgraduate exam performance in other specialties, if they also had large enough sample sizes among LTFT trainees for statistical power.[18] Specifically, the included demographic

factors were gender, age at time of exam, ethnicity, and whether they were an international or UK medical graduate (IMG versus UK-MG).

Statistical analysis:

All analyses were performed using STATA (Statacorp, TX, USA). Chi-square tests were used to assess for univariate associations between individual characteristics and FRCR success at each exam. All variables were then brought forward into a multivariate logistic regression model. Statistical significance was set at alpha level = 0.05. All analyses were performed on a complete case bases for reproducibility of results by others and in keeping with similar studies.[18-20] Effect sizes are given as odds ratio (OR) (95% confidence interval [CI]).

Ethical Approval:

UKMED have received ethics exemption from a University Ethics of Research Committee (institution anonymised on editorial request for peer review) on behalf of all UK medical schools for research projects that exclusively use UKMED data. As a research study that meets this criterion, no further ethics approval was required. **A Link detailing this exemption is included as a reference but hidden on editorial request for the purposes of maintaining anonymity of peer review**.

Results:

During the study period, 3.1% (55/1,770) of Part 1 candidates were LTFT, compared to 9.9% (75/740) of 2A candidates and 13.2% (190/1,435) of 2B candidates. The characteristics of these groups are shown in **Table 1.** Women represented a significantly larger proportions of

LTFT trainees compared to men ($p<0.05$), and this gender difference widened between each successive examination. Among Part 1 candidates, 6.1% (45/700) of female candidates were LTFT, compared to 1.0% (10/1,070) of male candidates. At the 2B exam, over one-in-four (27.2%, 145/540) female candidates were LTFT, compared to 4.7% (40/895) of male candidates. Similarly, a larger proportion of trainees over the age of 34 were LTFT at the Part 2B compared to the Part 1 examination; at 2B, 23.6% (85/360) trainees over 34 were LTFT, compared to 13.6% (20/155) at the Part 1 examination. For the Part 1 and 2B exams, a significantly higher percentage of IMGs were LTFT compared to UK-graduates. No significant association was seen between ethnicity and LTFT training.

Table 1. *Cohort characteristics of the study population by FRCR exam and LTFT status.*

Cohort Characteristics	**Part 1 n = 1,770**		**2A n = 740**		**2B n = 1,435**	
	% LTFT	**n**	**% LTFT**	**n**	**% LTFT**	**FT**
Gender						
Male	1.0%	10/1,070	5.3%	25/470	4.7%	40/895
Female	6.1%	45/700	17.7%	450/270	27.2%	145/540
p-value		***<.001***		***<.001***		**<.001**

Ethnicity						
White	3.5%	30/810	11.0%	35/335	13.4%	85/640
Asian or Asian British	2.5%	15/600	9.4%	25/245	14.2%	75/520
Black or Black British	1.3%	0/75	5.1%	0/40	0.0%	0/40
Other ethnic groups	2.7%	5/110	10.4%	5/50	14.8%	10/80
Mixed	4.5%	5/65	4.2%	0/25	10.9%	5/65
Missing		*n = 105*		*n = 50*		*n = 85*
p-value		*0.67*		*0.65*		0.12
Age at Exam						
<35	2.0%	35/1,615	7.4%	45/620	9.7%	105/1,075
≥35	13.6%	20/155	22.7%	25/120	23.6%	85/360
p-value		**<.001**		**<.001**		**<.001**
Primary Medical Degree						
UK-MG	2.6%	40/1,545	9.6%	60/650	11.9%	140/1,160
IMG	6.2%	15/225	12.0%	10/90	18.4%	50/280
p-value		**0.003**		*0.47*		**0.004**

Univariate associations between LTFT status and demographic factors with first attempt FRCR results are demonstrated in **Table 2**. Differences in FRCR pass rates were observed

between FT and LTFT cohorts in each of the Part 1, 2A and 2B examinations ($p < 0.05$ for all). Of LTFT trainees, 63.0% (35/55) passed Part 1 at first, compared to 77.8% (1,335/1,715) of FT trainees. Less than half of LTFT trainees (43.8%, 30/70) passed the 2A exam at first attempt, compared to nearly two-thirds of FT trainees (62.7%, 420/665). At the 2B exam, 61.4% of LTFT trainees passed at first attempt (115/190), compared to 71.4% of FT trainees (890/1,245). Differences in examination pass rates were also observed when comparing ethnicity, age at examination attempt, and primary medical degree, with ethnicity minority, older and IMG trainees demonstrating lower pass rates at each exam.

Table 2. *Univariate analyses assessing the association between FRCR results and LTFT status and demographic factors.*

Cohort Characteristics	**Part 1 n = 1,770**		**2A n = 740**		**2B n = 1,435**	
	Pass	**n**	**Pass**	**n**	**Pass**	**n**
LTFT						
LTFT	63.0%	35/55	43.8%	30/75	61.4%	115/190
FT	77.8%	1,335/1,715	62.7%	420/665	71.4%	890/1,245
p-value		**0.01**		**0.002**		**0.005**
Ethnicity						
White	82.8%	670/810	71.6%	240/335	78.4%	505/645
Asian or Asian British	73.3%	440/600	52.9%	130/245	63.4%	330/520

Black or Black British	54.7%	40/75	38.5%	15/40	64.3%	25/40
Other ethnic groups	72.1%	80/110	43.8%	20/50	65.4%	55/80
Mixed	79.1%	55/65	70.8%	15/25	68.8%	45/65
Missing		*n = 105*		*n = 50*		*n = 85*
p-value		**<.001**		**<.001**		**<.001**
Gender						
Male	80.3%	860/1,070	62.6%	295/470	67.5%	605/895
Female	72.8%	510/700	57.7%	155/270	74.3%	400/540
p-value		**<.001**		0.19		**0.006**
Age at Exam						
<35	78.6%	1,270/1,615	64.6%	400/620	75.2%	810/1,075
≥35	63.9%	100/155	41.2%	50/120	54.9%	200/360
p-value		**<.001**		**<.001**		**<.001**
Primary Medical Degree						
IMG	66.8%	150/225	51.1%	45/90	55.8%	155/280
UK-MG	78.9%	1,220/1,545	62.2%	405/650	73.5%	850/1,160
p-value		**<.001**		**0.04**		**<.001**

Multivariate logistic regression analyses predicting performance of LTFT trainees at the FRCR exams after adjusting for a number of demographic factors are demonstrated in **Table 3**. Less-than-full-time trainees were half as likely to pass the 2A (OR: 0.50, CI: 0.29-0.87) and

2B (OR: 0.55, CI: 0.38-0.80) exams, after adjusting for demographic factors. LTFT status was not a significant predictor of Part 1 performance. Although not predictors, it is noted that ethnic minority status and older age were also independently associated with lower likelihood of passing the FRCR exams after adjustment for all other factors in the model. Black or Black British candidates were less likely to pass Part 1 and 2A relative to candidates of White ethnicity. Similarly, Asian or Asian British candidates were less likely to pass each of the FRCR exams. Female candidates were less likely to pass Part 1 but were more likely to pass Part 2B. Being an IMG was not significantly associated with exam outcomes after adjusting for covariates.

Table 3. Multivariate logistic regression predicting success at the FRCR exams by LTFT status and demographic factors.

CI = 95% Confidence Interval.

Cohort Characteristics	**Part 1 n = 1,665**		**Part 2A n = 690**		**Part 2B n = 1,350**	
	Odds Ratio	**CI**	**Odds Ratio**	**CI**	**Odds Ratio**	**CI**
LTFT						
FT	Reference	-	Reference	-	Reference	-
LTFT	0.70	0.37-1.32	0.50	0.29 -0.87	0.55	0.38-0.80

Gender						
Male	Reference	-	Reference	-	Reference	-
Female	0.66	0.52-0.84	0.89	0.63-1.24	1.49	1.13-1.97
Ethnicity						
White	Reference	-	Reference	-	Reference	-
Asian or Asian British	0.56	0.43-0.72	0.38	0.27-0.55	0.53	0.40-0.69
Black or Black British	0.27	0.16-0.44	0.22	0.10-0.45	0.51	0.26-1.02
Other ethnic groups	0.56	0.35-0.89	0.29	0.15-0.55	0.59	0.35-0.99
Mixed	0.82	0.44-1.53	1.14	0.44-2.97	0.60	0.34-1.06
Age						
<35	Reference	-	Reference	-	Reference	-
≥ 35	0.55	0.37-0.81	0.34	0.21-0.53	0.46	0.35-0.62
Primary Medical Degree						
UK-MG	Reference	-	Reference	-	Reference	-
IMG	0.75	0.53-1.05	1.10	0.65-1.89	0.74	0.54-1.03

Discussion:

The proportion of LTFT trainee doctors in the UK has been steadily increasing over the past decade, and is likely to increase further with recent widening of eligibility criteria; now including personal choice.[3] However, despite their increase, current research has been limited to the subjective experiences of these trainees through survey work, with very little available data on the demographic distributions of these trainees and their training outcomes.[6,7,9] This study begins to fill this gap in the current literature, with a focus on radiology trainees.

Demographic characteristics and workforce patterns of LTFT Radiology trainees

LTFT trainees in Radiology were significantly more likely to be of female gender and over the age of 35 for each of the FRCR exams. IMGs also represented a larger proportion of LTFT trainees compared to UK-MGs, however the interpretations of this are limited by the very small numbers of trainees in this category. There were no significant variations by ethnicity. The data also highlight workforce patterns among these trainees. The proportion of LTFT trainees was three times higher among 2A candidates compared to Part 1 candidates, and four times higher among 2B candidates, indicating that more trainees change from FT to LTFT as they progress through their training careers. The underlying reasons for this are not known, but we speculate that with increasing age comes the increasing likelihood of commitments outside of work, such as caring for children or family members. Trainees may also have increased personal development opportunities as they begin subspecialty training (usually in the fourth and fifth specialty year).

Differential exam outcomes of LTFT versus FT trainees

Despite the aim of LTFT training to support trainees and improve their working lives, LTFT trainees currently show significantly lower pass rates at each of the FRCR exams compared to their FT counterparts. This difference is particularly marked at the 2A exam - only 43% of LTFT trainees passed the 2A exam at first attempt, compared to 63% of FT trainees. LTFT training remained a statistically significant predictor of lower pass rates at the 2A and 2B exams even after adjusting for other demographic factors (gender, age, ethnicity, and the region of their primary medical degree).

The causes of the observed differential outcomes for LTFT trainees are likely multifactorial, with signposts for potential underlying reasons seen in prior qualitative studies.[6-8] A 2022 survey by Cathcart et al found that one-third of LTFT trainees felt that there was a negative impact on their training from being LTFT.[6] More specifically, 23% of these trainees perceived stigma as a barrier and 40% experienced negative attitudes from seniors.[6] Trainees have been shown to consider relationships with senior doctors as essential to learning, and trainers need time with trainees to develop good relationships.[21] LTFT trainees are inherently less present in their department on a week-to-week basis, which may contribute to less productive trainer-trainee relationships. For example, LTFT trainees have reported issues with missing specific teaching days and procedure lists that coincide with fixed LTFT days.[6] These obstacles are further compounded by a perception among trainees of medicine as a profession that requires long hours of work and personal sacrifice, with experiencing difficulties considered a sign weakness.[21] Such perceptions can limit trainees from seeking extra support or additional courses due to fear of stigma.

Finally, the most common reason to date for pursuing LTFT training has been childcare, followed by healthcare reasons, and the demands of these circumstances are also likely to add to the risks of negative exam outcomes.[6]

Addressing differential exam performance

While it is recognised by HEE and the Royal College of Radiologists (RCR) that LTFT trainees may require extra support, the focus has largely been on 1) trainees who take extended periods of time out of training and subsequently return, and 2) supporting LTFT trainees by advocating for contractual compliance and addressing rota issues.[22,23] However, this study brings to light that there is a need for additional interventions to support these trainees to reduce disparities in exam outcomes that have thus far not been known. Such interventions can be considered at the three levels in which accumulation of disadvantage is known to occur: at a national or macro level; at a local or meso level, and at a personal or miso level.[24]

On a national level, it will be essential for LTFT exam outcomes to also be examined in other medical and surgical specialties (e.g. at the MRCP, MRCS and MRCGP examinations). Royal Colleges, including the RCR, have an ethical obligation to facilitate fairness and address group-level barriers to training success.[25] Within the RCR specifically, LTFT trainees are currently represented by a consultant LTFT Training and Working Adviser, as well as by a LTFT trainee representative on the Junior Radiologists' Forum.[22] As points of contact for LTFT trainees, these representatives are well-placed to leverage the exam outcomes data to advocate for their needs on a national level.

On a meso or local level, it will be important to raise awareness of the challenges faced by LTFT trainees among trainers, particularly Educational Supervisors and Radiology Programme Directors. The purpose of this would be two-fold; 1) by informing trainers of the barriers faced, they can take steps to reduce implicit bias in teaching provisions and allocation of training opportunities, and 2) for local programmes to consider how the exam outcomes of these trainees can be optimised. For example, LTFT trainees may benefit from personalised learning plans and organised mentoring schemes within their programmes. The latter have been shown to be associated with better exam outcomes in prior studies.[27-30] For example, a study of core medical trainees found that mentored trainees showed significantly higher pass rates at the Membership of the Royal College of Physicians (MRCP) Part 1 exam, compared to non-mentored trainees.[27] Similar work exploring the role of organised mentoring to improve FRCR outcomes would be of great interest, however any such initiatives would need to be done with great care to not stigmatise participants.

On an individual level, further qualitative and mixed-methods studies of LTFT trainees are needed to best understand any personal or inter-personal factors that act as barriers to exam success. This can also help explore differences between groups who train LTFT for different reasons (e.g. trainees with caring responsibilities versus trainees who train LTFT to have more time to study for exams). We further found that both LTFT training and age over 34 were independently associated with lower pass rates at the FRCR exams, therefore highlighting an accumulation of risk for trainees who fit both characteristics. These trainees would likely benefit from early, pro-active support to prevent exam failure. While female trainees also showed significantly lower pass rates at the FRCR 2B exam compared to male trainees, female gender was an independent predictor of higher 2B pass-rates after

adjusting for other demographic factors, suggesting that the univariate association is due to the influence of another characteristic.

Other findings of differential outcomes in this study replicate those of prior studies of postgraduate medical assessments.[18,31-34] Ethnic minority and IMG trainees had lower pass rates compared to White trainees and UK graduates respectively. More granular analysis of the award gaps is required to fully characterise the patterns of results, which should be adjusted for measures of socio-economic status. Socio-economic factors have recently been found to impact performance at other medical assessments (parental education, fee-paying versus state school, entitlement to free school meals, geographic variation in regional depravity, and geographic variation in regional access to higher education for example).[18,35]

Limitations

As a large retrospective cohort study of a national database, this study is limited by the availability of information. Where data was missing this has been explicitly stated and all analyses were performed on a complete-case basis. Of note, the number of LTFT trainees in our study is relatively small compared to FT trainees. Data on the LTFT percentage was not available (e.g. whether a trainee was 60% versus 80% full-time etc). A further limitation of the dataset is that variables were categorised e.g. ethnicity. This is not an ethical decision, but one based on necessity and the requirement for large cohort sizes in order to conduct statistically meaningful analyses. While academic trainees face several challenges similar to LTFT trainees, these trainees are not currently classified as LTFT. However, further work should investigate if similar award gaps exist for these trainees.

Conclusion:

LTFT trainees have lower pass rates at the FRCR 2A and 2B exams, even after adjusting for other demographic factors. They were half as likely to pass these exams compared to their FT counterparts. Royal Colleges and Training Programmes should further explore the root causes of this award gap and consider LTFT trainees as part of national and local efforts to facilitate iequity in training. This will be of increasing importance as the proportion of LTFT trainees is expected to continue to expand.

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