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Psychological and occupational consequences of workplace bullying and harassment among radiographers practising in the United Kingdom

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Abstract

Introduction

Workplace bullying and harassment (WBH) are recognised occupational hazards linked to adverse psychological and organisational outcomes, yet profession-specific evidence on these consequences among radiographers remains limited. This study examined associations between WBH and psychological distress, sickness absence, and presenteeism among radiographers practising in the United Kingdom, a workforce facing shortages and increasing pressures.

Method

A cross-sectional survey of UK-registered radiographers was conducted between December 2025 and February 2026. WBH exposure was measured using the Negative Acts Questionnaire–Revised (NAQ-R), and psychological distress was assessed using a 12-item GHQ-derived symptom measure adapted to a three-category response format. Work-related outcomes comprised self-reported sickness absence due to work-related stress, bullying or harassment and presenteeism due to workload or pressure. Multivariable logistic and negative binomial regression models were adjusted for demographic and occupational covariates.

Results

A total of 385 radiographers participated. Weekly/daily behaviourally defined WBH exposure was identified in 41.8% of the sample. Among respondents completing all 12 GHQ-derived items, 29.9% (109/364) met the prespecified ≥ 4 criterion for probable psychological distress. Weekly/daily WBH exposure was strongly associated with GHQ-derived probable psychological distress in the complete-item adjusted model (aOR 7.85, 95% CI 4.52–13.64, $p < 0.001$). WBH exposure was also associated with sickness absence due to work-related stress, bullying or harassment and presenteeism due to workload or pressure. Continuous NAQ-R scores showed graded associations with all three outcomes.

Conclusion

WBH was common within this UK-wide radiographer sample and was strongly associated with GHQ-derived probable psychological distress and self-reported occupational outcomes. Prospective studies using independently validated psychological measures and objective occupational outcomes are warranted.

Implication for practice

The findings support prospective evaluation of organisational strategies aimed at strengthening psychological safety, leadership accountability and confidential reporting mechanisms

BACKGROUND

Workplace bullying and harassment (WBH) are increasingly recognised as significant occupational health hazards in healthcare systems. Conceptually, WBH refers to repeated exposure to negative acts, such as intimidation, exclusion, or persistent criticism, in contexts where individuals are unable to defend themselves because of power imbalances or organisational constraints. [1] Unlike isolated interpersonal conflict, WBH is characterised by its chronicity and cumulative impact, making it a sustained psychosocial stressor rather than a discrete event.

A substantial body of evidence demonstrates that exposure to WBH is linked to adverse mental health outcomes. Meta-analyses across occupational sectors have consistently found strong associations between bullying and psychological distress, including depression, anxiety, and emotional exhaustion. [2–4] Recent longitudinal and meta-analytic evidence suggests that workplace bullying is associated with subsequent psychological morbidity, sickness absence, presenteeism, and reduced productivity. [5, 6] These findings have contributed to the framing of WBH as a preventable occupational exposure within contemporary models of work-related psychosocial risk.[7]

Beyond mental health, WBH may also impair work functioning. Two key manifestations are sickness absence and presenteeism. While sickness absence reflects withdrawal from work due to ill health, presenteeism, defined as reduced productivity while at work, has been identified as a substantial yet often less visible contributor to organisational burden. [8] Evidence suggests that psychosocial stressors, including WBH, are important determinants of both outcomes, with implications for workforce capacity, well-being, performance, and patient safety.

Although WBH has been examined extensively in several healthcare professions, considerably less is known about its psychological and work-functioning correlates within radiography. This distinction is important because documenting the occurrence and forms of WBH does not establish the extent to which exposure is associated with psychological distress or impaired capacity to work. [9, 10] Radiographers practise within technically demanding and frequently resource-constrained services, making sickness absence and working while unwell potentially relevant not only to individual wellbeing but also to workforce sustainability.

This gap is particularly relevant given ongoing workforce pressures within UK imaging services. National reports have highlighted significant workforce shortages, rising demand, and concerns about staff retention. [11] In parallel, national staff survey data continue to indicate persistent levels of workplace bullying and harassment across the UK NHS, [12–14] with differential exposure reported across demographic groups. However, empirical evidence on how these dynamics translate into psychological and functional outcomes remains limited, particularly within the radiography workforce.

Accordingly, this study aims to examine associations between WBH, psychological distress, and work functioning among radiographers practising in the United Kingdom. Using validated behavioural and psychological measures and multivariable modelling, the study addresses the following research questions: *1. Is exposure to workplace bullying and harassment associated with greater psychological distress among radiographers? 2. Is exposure to workplace bullying and harassment associated with higher rates of sickness absence and presenteeism? 3. Do these associations vary by ethnicity and country of professional training?* By addressing these questions, this study seeks to extend the evidence base on workplace bullying to a profession-specific context and to quantify its potential implications for workforce wellbeing and service delivery in radiography.

METHOD

Study design and data source

This study presents a secondary analysis of data from a UK-wide cross-sectional survey of WBH among practising radiographers. The study design, recruitment procedures, participant characteristics and the primary analysis of WBH prevalence and patterns have been reported previously. [15] The present analysis addresses a distinct set of research questions examining associations between WBH exposure and psychological distress, sickness absence and presenteeism.

Eligible participants were Health and Care Professions Council (HCPC)-registered diagnostic or therapeutic radiographers practising in the United Kingdom at the time of data collection. Participants were recruited via non-probability sampling through professional organisations and networks, including the British Medical Ultrasound Society, Society of Radiographers special-interest groups, LinkedIn and other professional social media channels. [16] Because invitations were distributed through multiple professional networks and open online channels, the number of eligible radiographers exposed to the invitation could not be established, and a conventional response rate could not be calculated.

Data were collected via JISC Online Surveys between 18 December 2025 and 3 February 2026. The parent survey covered demographic and occupational characteristics, behavioural exposure to WBH, and questions about participants' workplace experiences. Ollawa et al [15] provide full details of survey development, recruitment, and administration. This study uses variables required to investigate psychological distress and work-functioning outcomes. The final parent-study sample comprised 385 radiographers; model-specific analytic samples varied by outcome completeness. [17]

Measures and Instrumentation

Exposure to workplace bullying and harassment was measured using the Negative Acts Questionnaire–Revised (NAQ-R), a validated behavioural measure assessing such exposure over the preceding six months. [18] The instrument comprises 22 items rated on a five-point frequency scale from “never” to

"daily." The NAQ-R demonstrates strong reliability and construct validity across occupational and healthcare populations.[18] Psychological distress was assessed using 12 items adapted from the GHQ-12. [19] The original instrument informed item selection, but the survey used a three-category response structure following cognitive pre-testing; the resulting measure is therefore described as GHQ-derived rather than as the unmodified validated GHQ-12.

For the primary psychological-distress analysis, scores were calculated only for respondents completing all 12 GHQ-derived items; no missing-item imputation or prorating was undertaken. Responses indicating greater-than-usual symptom burden were coded 1 and the remaining response categories 0, yielding a score ranging from 0 to 12. Scores ≥ 4 were classified as GHQ-derived probable psychological distress. An alternative ≥ 3 threshold was examined in a sensitivity analysis.

Work functioning was assessed using two self-report measures: sickness absence days in the preceding 12 months and presenteeism. These indicators are widely used in occupational health research to assess functional work impairment. [8, 20, 21] Covariates were selected a priori from the occupational health literature and included: age, gender, ethnicity, years of professional experience, job band, employment setting, modality or role, and country of professional training.

Current job level was recorded using NHS Agenda for Change (AfC) bands, where applicable (Bands 5, 6, 7, and ≥ 8), with separate categories for non-AfC and other roles; these categories were subsequently combined for regression analyses due to sparse cells.

Cognitive Pre-testing and Pilot Testing

Pilot testing with 10 radiographers led to revisions to the survey questions to enhance clarity and ensure their relevance to the UK radiography setting. Additionally, cognitive pre-testing with another group of 15 radiographers evaluated how well they understood the questions and their suitability.

Statistical analysis

Candidate covariates included age and years of professional experience. Because these variables were strongly correlated in this sample (Spearman $\rho = 0.64$), they were not entered simultaneously; professional experience was retained in the primary models because it was considered more directly relevant to occupational exposure and workplace seniority.

Analyses used model-specific complete cases. Participants were excluded from a given model only when data required for that model were unavailable. For sickness-absence and presenteeism day counts, free-text responses that could not be converted unambiguously to a numerical value using prespecified cleaning rules were treated as missing. Consequently, analytic denominators differed across outcomes.

Free-text sickness-absence and presenteeism responses were converted to numeric day counts using predefined, reproducible cleaning rules (Supplementary Table S1). Exact numeric responses were

retained, while text-based durations were converted only where a unique numerical value could be derived using the specified conversion rules. Responses that were non-quantifiable or insufficiently precise for defensible conversion were treated as missing for count analyses. Analyses used model-specific complete cases, resulting in differing denominators across outcomes.

To reduce sparse-data problems and improve model stability, categories with small cell counts were combined before modelling: ethnicity (White vs other ethnic groups), sector (NHS vs non-NHS), experience (≤ 5, 6–15 and > 15 years), current Agenda for Change job band (Bands 5–6, Band 7 and Band 8+/other), and role (diagnostic, sonography, therapeutic radiography and mixed/other). These groupings were pragmatic statistical categories and were not intended to imply homogeneity within the aggregated groups. Table S2 shows how the cleaning rules were applied to Q30 (workdays missed due to work-related stress, bullying or harassment) and Q31 (days worked while unwell due to workload/pressure).

Sensitivity analyses (Table S3) assessed the robustness of the free-text outcome coding. For bounded numerical ranges, alternative lower and upper bounds were tested alongside the midpoint used in the primary count analysis. Because the conditional count models had substantially smaller analytic samples than the binary models, reduced models including WBH exposure and a parsimonious set of demographic and occupational covariates were also examined to assess sensitivity to model specification. Using a reduced conditional model with WBH, gender, professional experience and job band, the association with the number of presenteeism days was imprecisely estimated and sensitive to model specification. Conditional count-model findings were treated as secondary and interpreted primarily from effect estimates and 95% confidence intervals. Details are in Table 5.

Workplace bullying and harassment exposure

WBH exposure variable was operationalised as exposure to at least one negative act at least weekly over the preceding 6 months. A secondary continuous exposure variable was the NAQ-R total score.

Psychological distress outcome

Psychological distress was assessed using 12 items adapted from the GHQ-12. Following cognitive pre-testing, each item was presented using three response categories: “more than usual”, “same as usual” and “less than usual”. Items were phrased so that “more than usual” indicated greater symptom burden; this response was coded 1, and the other two categories were coded 0, yielding a symptom-count score ranging from 0 to 12.

A threshold of ≥ 4 was used for the primary analysis, with ≥ 3 examined in a sensitivity analysis. Because the response structure differs from the original four-category GHQ-12 and the adapted form has not undergone independent validation, results are described as GHQ-derived probable psychological distress rather than as an unmodified validated GHQ-12 outcome. The primary analysis was restricted to

respondents with complete responses to all 12 GHQ-derived items; no missing-item imputation or prorating was undertaken.

Work functioning outcomes

Work functioning was assessed using two self-reported outcomes covering the preceding 12 months. Q30 asked respondents to report the number of workdays missed because of work-related stress, bullying or harassment, whereas Q31 asked for the number of days they worked while unwell because of workload or pressure. Responses were entered as free text and recoded using a transparent coding protocol. Exact numerical responses were retained; text-based durations were converted only where a defensible numerical value could be derived. Responses that established occurrence but did not permit a defensible exact-day count were retained for binary analyses but treated as missing in conditional count analyses. Supplementary Table S1 presents the full coding rules.

Because the outcomes contained substantial numbers of zero values and over-dispersed positive counts, a two-part modelling approach was used. Logistic regression examined whether respondents reported any WBH-attributed sickness absence or presenteeism, while negative-binomial regression examined the number of days among respondents with quantifiable non-zero counts. Analyses used model-specific complete cases.

Descriptive analysis

Descriptive statistics summarised the sample and psychological distress, sickness absence, and presenteeism. Internal consistency of the NAQ-R and the 12-item GHQ-derived symptom measure was assessed using Cronbach's alpha. Because of sparse cells, some variables were collapsed before modelling the following: ethnicity (White vs ethnically diverse group); sector (NHS vs non-NHS); experience (≤ 5 years, 6–15 years, > 15 years); band (Band 5–6, Band 7, Band 8+/other); role group (diagnostic, sonography, therapeutic radiography, mixed/other).

Exploratory analysis

Exploratory associations among ordinal items assessing perceived effects of WBH on teamwork, communication, work performance and patient-care processes were examined using Spearman's rank correlation coefficient (ρ). These analyses were exploratory and were not used to infer causal relationships.

Multivariable analysis

The primary multivariable model examined the association between weekly/daily WBH exposure and probable psychological distress using logistic regression. The primary psychological-distress model used the complete-item GHQ-derived outcome (all 12 items completed; threshold ≥ 4). An alternative

threshold of ≥ 3 was examined as a sensitivity analysis. Additional logistic models examined the association between WBH exposure and any sickness absence and any presenteeism. Secondary negative binomial models estimated the association between WBH exposure and the number of absence or presenteeism days among respondents reporting non-zero counts. Dose-response analyses replaced the binary WBH variable with the NAQ-R total score.

Interaction terms were tested for WBH by ethnicity and by country of professional training. Adjusted odds ratios (aORs) or adjusted incidence-rate ratios (aIRRs) with 95% confidence intervals were reported. Statistical significance was set at $p < 0.05$. Negative binomial regression was chosen to address overdispersion and skewness in count data, consistent with recommended practices for modelling absence outcomes. [22] All models were adjusted for predefined covariates. Effect sizes and 95% confidence intervals were reported.

Ethical considerations

The Health Sciences University Research Ethics Committee granted ethical approval (HRS-2025-YHAiR). Participation in the study was voluntary and anonymous, in accordance with the Declaration of Helsinki. The research posed minimal risk, though participants who experienced distress when recalling adverse events were signposted to appropriate health support systems. Before beginning the questionnaire, participants were shown an ethics-approved information sheet that explained the study's purpose, the voluntary nature of participation, anonymity, possible distress, data management, and available support resources. They then gave electronic consent before continuing.

RESULTS

Participant Demographics and Professional Characteristics

A total of 385 radiographers completed the survey. The mean age was 39.8 years (SD = 8.4). Women comprised 52.2% (n = 201) of the sample, and men 47.3% (n = 182). 61.8% (n = 238) identified as Black, Black British, Caribbean, or African, and 55.1% (n = 212) were trained outside the UK. Most respondents were working in the NHS (83.4%; n = 321), and the largest career group was Band 7 (40.8%; n = 157). See Table 1 for more details.

Table 1
Participant demographics data (N = 385)

Demographics		Frequency	Percentage
Age	Under 25	5	1.3
	25–34	90	23.4
	35–44	209	54.3
	45–54	65	16.9
	55–64	16	4.2
Gender	Male	182	47.3
	Female	201	52.2
	Non-binary	1	0.3
	Prefer not to say	1	0.3
Ethnicity	Asian / Asian British	12	3.1
	Black, Black British, Caribbean or African	238	61.8
	Mixed / Multiple ethnic groups	8	2.1
	White	120	31.2
	Other ethnic group	7	1.8
Country of Radiography Education	UK	173	44.9
	Non-UK	212	55.1
Primary Employment setting	NHS Trust	321	83.4
	Private Hospital/Clinic	29	7.5
	University/Academic	11	2.9
	Locum/Agency	14	3.6
	Other/missing (please specify)	10	2.6
Years of Experience	Less than 1 year	4	1.0
	1–5 years	52	13.5
	6–10 years	91	23.6
	11–15 years	119	30.9
	16–20 years	54	14.0

Demographics		Frequency	Percentage
	Over 20 years	61	15.8
	Missing	4	1.0
Current Job Level	Band 5	28	7.3
	Band 6	132	34.3
	Band 7	157	40.8
	Band 8 or above	52	13.5
	Non-AFC role	13	3.4
	Other (please specify)	3	0.8
Country of Practice	England	358	93.0
	Scotland	16	4.2
	Wales	4	1.0
	Northern Ireland	5	1.3
	Missing	2	0.05
Employment pattern	Full-time	302	78.4
	Part-time	64	16.6
	Bank/Locum	16	4.2
	In-sourcing companies	3	0.8
Primary role (multiple responses, n= 495)	X-ray/Projectional radiography	77	15.6
	CT	91	18.4
	MRI	76	15.4
	Mammography	11	2.2
	Nuclear Medicine	5	1.0
	Therapeutic Radiographer	34	6.9
	Sonographer	120	24.2
	Managers	14	2.8
	Practice Educator	11	2.2
	DEXA	5	1.0
	Reporting Radiographer	23	4.6

Demographics		Frequency	Percentage
	Other (please specify)	28	5.7

Reliability

The NAQ-R showed excellent internal consistency (Cronbach's α = 0.94). The 12-item GHQ-derived symptom measure also demonstrated high internal consistency (α = 0.96).

GHQ-derived psychological distress

Twenty-one respondents had at least one missing GHQ-derived item. The primary descriptive analysis was therefore restricted to the 364 respondents who completed all 12 items. Of these, 109 (29.9%) met the ≥ 4 criterion for GHQ-derived probable psychological distress. Using the alternative ≥ 3 threshold, 126/364 (34.6%) met the criterion. These findings indicate modest sensitivity of estimated prevalence to the threshold and missing-item definition.

In the complete-item adjusted logistic model (n = 353), weekly/daily WBH exposure was strongly associated with GHQ-derived probable psychological distress (aOR 7.85, 95% CI 4.52–13.64, p < 0.001). No other demographic or occupational covariate showed a statistically detectable association with the outcome. Model discrimination was acceptable (AUC = 0.779). Details are in Table 2.

Table 2
Complete-item psychological-distress model

Predictor	aOR	95% CI	p
Male (vs female)	0.63	0.34–1.16	0.138
White (vs other ethnic groups, aggregated)	1.20	0.54–2.66	0.654
UK-trained (vs non-UK-trained)	0.96	0.44–2.08	0.915
Non-NHS sector (vs NHS)	1.20	0.58–2.47	0.618
Experience ≤ 5 years (vs 6–15 years)	1.65	0.76–3.56	0.206
Experience > 15 years (vs 6–15 years)	1.45	0.78–2.69	0.246
Band 7 (vs Bands 5–6)	1.09	0.54–2.22	0.804
Band 8+/other (vs Bands 5–6)	1.44	0.59–3.53	0.429
Mixed/other role (vs diagnostic)	0.97	0.42–2.23	0.935
Sonography (vs diagnostic)	1.31	0.61–2.81	0.489
Therapeutic radiography (vs diagnostic)	1.35	0.48–3.77	0.564
Weekly/daily WBH exposure	**7.85**	**4.52–13.64**	**< 0.001**

Note: The model discrimination remains good: McFadden pseudo-R^2 ≈ **0.182**, AUC ≈ **0.779**

Repeat complete-item model using the alternative ≥3 threshold with n=353 and 121 cases: WBH aOR 10.72, 95% CI 6.18–18.59, p <0 .001, AUC ≈ 0.801

Exploratory associations among perceived-impact items

Exploratory correlations suggested that respondents who perceived greater adverse effects of WBH on one aspect of work functioning also tended to report greater perceived effects on related aspects of teamwork, communication and performance (Spearman's ρ generally moderate to strong; Supplementary Table S4).

Multivariable Regression

Multivariable association with psychological distress

In the adjusted logistic model, weekly/daily WBH exposure was strongly associated with probable psychological distress (aOR 7.85, 95% CI 4.52–13.64, p < 0.001). After adjustment for demographic and occupational covariates, weekly/daily WBH exposure showed a strong adjusted association with probable psychological distress. The model showed acceptable discrimination and calibration (AUC 0.77; Hosmer-Lemeshow p = 0.634), and there was no evidence of problematic multicollinearity (all VIFs < 2.4, aside from the intercept). Details are in Table 3.

Table 3
Adjusted logistic regression model for GHQ-derived probable psychological distress among complete-item respondents (n = 353)

Predictor	aOR	95% CI	p
Male (vs female)	0.63	0.34–1.16	0.138
White (vs other ethnic groups, aggregated)	1.20	0.54–2.66	0.654
UK-trained (vs non-UK-trained)	0.96	0.44–2.08	0.915
Non-NHS sector (vs NHS)	1.20	0.58–2.47	0.618
Experience ≤ 5 years (vs 6–15 years)	1.65	0.76–3.56	0.206
Experience > 15 years (vs 6–15 years)	1.45	0.78–2.69	0.246
Band 7 (vs Bands 5–6)	1.09	0.54–2.22	0.804
Band 8+/other (vs Bands 5–6)	1.44	0.59–3.53	0.429
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Sonography (vs diagnostic)	1.31	0.61–2.81	0.489
Therapeutic radiography (vs diagnostic)	1.35	0.48–3.77	0.564
Weekly/daily WBH exposure	**7.85**	**4.52–13.64**	**< 0.001**

Model diagnostics: n=353; AUC≈0.779; McFadden pseudo-R^2≈0.182.

Multivariable associations with self-attributed sickness absence and presenteeism. Weekly/daily WBH exposure was associated with higher odds of reporting any sickness absence attributed to WBH aOR 3.88 22.16–6.95, $p < 0.001$) and any presenteeism attributed to WBH (aOR 4.37, 95% CI 2.86–7.45, $p < 0.001$). Respondents in Bands 8 + and other bands had lower odds of reporting sickness absence than respondents in Bands 5–6 (aOR 0.34, 95% CI 0.12–0.99, $p = 0.048$). No other demographic or occupational covariate showed a statistically detectable association with either binary outcome. Table 4 presents full model estimates.

Table 4
Adjusted logistic regression models for self-reported sickness absence and presenteeism attributed to workplace bullying and harassment

Predictor	Any sickness absence due to work-related stress and WBH (n = 350)			Any presenteeism due to workload/pressure(n = 345)		
	aOR	95% CI	p	aOR	95% CI	P
Male (vs female)	1.72	0.93–3.20	0.086	1.03	0.60–1.76	0.914
White (vs other ethnic groups, aggregated)	1.51	0.55–4.11	0.424	0.80	0.38–1.65	0.540
UK-trained (vs non-UK-trained)	0.42	0.16–1.08	0.072	1.13	0.56–2.29	0.729
Non-NHS sector (vs NHS)	1.02	0.51–2.05	0.958	0.94	0.48–1.82	0.850
Experience ≤ 5 years (vs 6–15 years)	0.82	0.38–1.77	0.617	1.55	0.79–3.04	0.199
Experience > 15 years (vs 6–15 years)	0.76	0.38–1.53	0.440	1.41	0.79–2.50	0.244
Band 7 (vs Bands 5–6)	0.62	0.29–1.29	0.198	1.46	0.76–2.82	0.261
Band 8+/other (vs Bands 5–6)	0.34	0.12–0.99	0.048	0.99	0.41–2.35	0.976
Mixed/other role (vs diagnostic)	1.10	0.42–2.91	0.840	1.80	0.84–3.87	0.133
Sonography (vs diagnostic)	1.33	0.61–2.91	0.477	1.00	0.50–1.99	0.993
Therapeutic radiography (vs diagnostic)	0.69	0.18–2.67	0.588	1.02	0.39–2.67	0.967
Weekly/daily WBH exposure	3.86	2.16–6.90	< 0.001	4.61	2.86–7.45	< 0.001

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; NHS, National Health Service; WBH, workplace bullying and harassment.

Note: 1. Q30 and Q31 were self-reported, attribution-specific occupational outcomes with different questionnaire wording and should not be interpreted as independently verified general absenteeism or productivity measures

2. Models were based on model-specific complete cases of the free-text occupational outcomes. The sickness-absence model included 350 participants, of whom 73 reported the outcome; the presenteeism model included 345 participants, of whom 146 reported the outcome. Reference categories are shown in parentheses. Bold values indicate $p < 0.05$. The occupational outcomes represent self-reported sickness absence and presenteeism explicitly attributed by respondents to WBH and should not be interpreted as independently verified general absence or productivity outcomes.

Conditional analyses of sickness-absence and presenteeism days.

Among respondents with quantifiable non-zero sickness-absence counts, weekly/daily WBH exposure was not statistically associated with the number of days reported in the fully adjusted model (aIRR 1.34, 95% CI 0.78–2.31, p = 0.294). Among respondents with quantifiable non-zero presenteeism counts, the corresponding estimate was larger but imprecise (aIRR 1.59, 95% CI 0.99–2.55, p = 0.056). In reduced-model sensitivity analysis, the sickness-absence estimate remained non-significant (aIRR 1.27, 95% CI 0.77–2.09), whereas the presenteeism estimate increased to aIRR 1.88 (95% CI 1.18–2.97). The conditional presenteeism association was therefore sensitive to model specification and should not be interpreted as definitively absent or present. Table 5 presents these conditional models.

For sickness-absence days, the WBH estimate was similar in the fully adjusted and reduced models and remained imprecise (full model aIRR 1.34, 95% CI 0.78–2.31; reduced model aIRR 1.27, 95% CI 0.77–2.09). For presenteeism days, however, the estimate was sensitive to model specification: the fully adjusted model yielded an aIRR of 1.59 (95% CI 0.99–2.55), whereas the reduced model yielded 1.88 (95% CI 1.19–2.97). Conditional presenteeism findings should therefore be regarded as exploratory and interpreted cautiously.

Table 5
Adjusted negative-binomial regression models for number of sickness-absence and presenteeism days among respondents reporting non-zero days

Predictor	Q30 sickness-absence days (n = 66)			Q31 presenteeism days (n = 127)		
	aIRR	95% CI	p	aIRR	95% CI	p
Male (vs female)	0.73	0.39–1.39	0.337	0.74	0.43–1.27	0.277
White (vs other ethnic groups, aggregated)	0.85	0.35–2.03	0.709	3.29	1.82–5.92	< 0.001
UK-trained (vs non-UK-trained)	0.92	0.40–2.11	0.840	0.69	0.41–1.15	0.154
Non-NHS sector (vs NHS)	1.62	0.68–3.87	0.279	1.01	0.54–1.87	0.978
Experience ≤ 5 years (vs 6–15 years)	2.46	1.08–5.56	0.031	1.65	0.86–3.15	0.132
Experience > 15 years (vs 6–15 years)	0.75	0.42–1.34	0.333	0.96	0.57–1.61	0.880
Band 7 (vs Bands 5–6)	0.82	0.38–1.79	0.621	0.79	0.45–1.40	0.426
Band 8+/other (vs Bands 5–6)	0.92	0.32–2.62	0.868	0.69	0.34–1.40	0.302
Mixed/other role (vs diagnostic)	0.96	0.45–2.02	0.910	1.83	0.96–3.49	0.068
Sonography (vs diagnostic)	1.73	0.74–4.01	0.204	0.79	0.41–1.51	0.473
Therapeutic radiography (vs diagnostic)	0.21	0.06–0.82	0.025	0.79	0.34–1.81	0.578
Weekly/daily WBH exposure	**1.34**	**0.78–2.31**	**0.294**	**1.59**	**0.99–2.55**	**0.056**

Abbreviations: aIRR, adjusted incidence-rate ratio; CI, confidence interval; NHS, National Health Service; WBH, workplace bullying and harassment**.**

Note: 1. GHQ completeness was not used as an eligibility criterion for these models because psychological distress was not included as either an outcome or covariate. Restricting the occupational models according to missingness on an unrelated GHQ-derived measure would unnecessarily reduce the

analytic sample. Models were restricted to respondents with quantifiable non-zero outcome counts and model-complete covariates. Q30 measured workdays missed due to work-related stress, bullying or harassment; Q31 measured days worked while unwell due to workload or pressure. Accordingly, these outcomes should not be labelled as identically WBH-attributed. Given the small Q30 analytic sample and relatively parameter-rich specification, interpret conditional count-model estimates as secondary and exploratory.

2. Models were restricted to respondents reporting non-zero outcome days and adjusted for the demographic and occupational covariates displayed. Reference categories are shown in parentheses. Bold values indicate $p < 0.05$. Because the conditional sickness-absence model included only 66 respondents, interpret its estimates with caution due to the limited sample size and potential model instability. Supplementary Table S3 presents sensitivity analyses using reduced models.

3. Professional experience was modelled as a three-category variable, with 6–15 years as the reference category; hence, two coefficient rows are reported. Age was not entered simultaneously because of its correlation with professional experience (Spearman's $\rho = 0.64$). Therefore, professional experience was retained as the occupationally more relevant covariate and age was omitted to avoid redundant adjustment.

Interaction analyses

No statistically detectable interaction was observed between WBH exposure and ethnicity for GHQ-derived probable psychological distress (likelihood-ratio $p = 0.975$), nor between WBH exposure and country of professional training ($p = 0.489$). Given the aggregated subgroup categories and limited statistical power, these findings do not establish equivalence of associations across groups.

Dose-response analyses

When binary WBH exposure was replaced with continuous NAQ-R total score, higher scores were associated with higher odds of complete-item GHQ-derived probable psychological distress (aOR 1.08 per one-point increase, 95% CI 1.06–1.10), any sickness absence due to work-related stress, bullying or harassment (aOR 1.05, 95% CI 1.03–1.07), and any presenteeism due to workload or pressure (aOR 1.07, 95% CI 1.04–1.09); all $p < 0.001$ (Table 6).

Table 6
Adjusted dose-response models using continuous NAQ-R total score

Outcome	Analytic n	Effect per 1-point increase in NAQ-R total	95% CI	p
GHQ-derived probable psychological distress, complete-item ≥ 4 definition	335	aOR 1.08	1.06–1.10	< 0.001
Any sickness absence due to work-related stress, bullying or harassment	332	aOR 1.05	1.03–1.07	< 0.001
Any presenteeism due to workload or pressure	325	aOR 1.07	1.04–1.09	< 0.001

Note: All models were adjusted for gender, ethnicity, country of professional training, employment sector, professional experience, job band and professional role. The psychological-distress model was restricted to respondents completing all 12 GHQ-derived items. The occupational models used model-specific complete cases based on the final question-specific cleaning of Q30 and Q31.

Perceived Impact of Workplace Bullying and Harassment

1. Perceived Impact on staff wellbeing

Figure 1 presents the distribution of responses to the 12 psychological-impact items. The highest proportion reporting a symptom “more than usual” was approximately 30% for disrupted sleep and feeling unhappy in their role. Item denominators ranged from 378 to 385 because of small amounts of item-level missing data.

In response to the question, ‘*To what extent has bullying impacted your mental health?’*, 64.2% (n = 240) reported being slightly to severely impacted mentally. Forty per cent (154/385) reported having considered leaving their job because of WBH, while 12.5% (48/385) reported having already left. Details are in Table S4.

2. Perceptions of WBH in relation to teamwork and patient-care processes

Respondents perceived adverse consequences of WBH across several aspects of teamwork and patient-care processes (Fig. 2). Among respondents to the relevant items, 66.4% (255/384) strongly agreed that WBH discouraged teamwork and cooperation, while 62.5% (232/371) strongly agreed that it reduced staff willingness to support colleagues during patient care. Similar patterns of agreement were observed for items concerning communication breakdowns, work performance and an increased likelihood of errors in tense or hostile workplace situations. These findings reflect respondents' perceptions and should not be interpreted as independently verified evidence of clinical errors, delays or patient harm. Supplementary Table S4 provides descriptive findings on respondents' awareness of organisational anti-bullying policies.

DISCUSSION

This UK-wide cross-sectional study identified a strong association between weekly/daily WBH exposure and GHQ-derived probable psychological distress, together with higher odds of self-reported sickness absence due to work-related stress, bullying or harassment and presenteeism due to workload or pressure. Higher NAQ-R scores were also associated with progressively higher odds of these outcomes. These findings extend the profession-specific evidence concerning WBH among radiographers; however, the non-probability sampling strategy, cross-sectional design and self-reported outcomes mean the findings should be interpreted as associations rather than evidence that WBH caused the observed outcomes.

By integrating validated behavioural measures with multivariable modelling, the findings extend the broader occupational health literature and offer important insights into how WBH manifests in radiography practice. However, because NAQ-R exposure referred to the preceding six months while self-attributed absence and presenteeism referred to the preceding 12 months, some reported occupational-impact days may have preceded the exposure window captured by the NAQ-R; therefore, temporal ordering cannot be inferred.

Association with psychological distress

The adjusted association between weekly/daily WBH exposure and GHQ-derived probable psychological distress was large (aOR 7.85, 95% CI 4.52–13.64). Importantly, this complete-item estimate was similar to the original estimate obtained under the less restrictive missing-item definition, indicating that the principal association was not materially dependent on missing-item handling. Nevertheless, the magnitude warrants cautious interpretation because same-source measurement, sample composition, residual confounding and the adapted, independently unvalidated GHQ-derived response structure may all have influenced the estimate.

This finding corroborates a substantial body of evidence demonstrating that exposure to WBH is associated with depression, anxiety, emotional exhaustion, psychological distress and suicidal ideation.[3, 4, 28–31] The findings are also consistent with allostatic load theory, which posits that chronic psychosocial stressors may lead to a cumulative physiological and psychological burden through prolonged activation of stress-response systems.[34]

Self-attributed sickness absence and presenteeism

Weekly/daily WBH exposure was associated with higher odds of reporting sickness absence due to work-related stress, bullying or harassment and presenteeism due to workload or pressure. Among respondents with quantifiable non-zero-day counts, the corresponding duration associations were less precise. In the fully adjusted conditional models, WBH exposure was associated with an aIRR of 1.34

(95% CI 0.78–2.31) for sickness-absence days and 1.59 (95% CI 0.99–2.55) for presenteeism days. Reduced-model sensitivity analyses yielded a similar sickness-absence estimate but a larger presenteeism estimate, indicating that the conditional presenteeism association was sensitive to model specification. These analyses therefore do not support a firm conclusion regarding the association between WBH exposure and duration of work impairment.

Among respondents with quantifiable non-zero-day counts, the association between weekly/daily WBH exposure and sickness-absence duration was imprecisely estimated and remained non-significant in both the fully adjusted model (aIRR 1.34, 95% CI 0.78–2.31) and the reduced-model sensitivity analysis (aIRR 1.27, 95% CI 0.77–2.09). For presenteeism duration, however, the estimate was sensitive to model specification: the fully adjusted model yielded an aIRR of 1.59 (95% CI 0.99–2.55), whereas the reduced model yielded 1.88 (95% CI 1.19–2.97). Accordingly, the conditional analyses do not support a firm conclusion regarding the association between WBH exposure and presenteeism duration. These findings should be regarded as exploratory, particularly given the comparatively small conditional analytic samples.

Presenteeism was reported approximately twice as frequently as sickness absence among classifiable respondents (43.4% vs 21.4%). However, the two items differed in wording and attribution; Q30 referred to work-related stress, bullying or harassment, whereas Q31 referred to workload or pressure, so their frequencies should not be interpreted as directly comparable estimates of the same WBH-related construct. [5, 20] AIn the NHS, presenteeism is reportedly driven by a range of factors, including staffing shortages and perceived organisational expectations to continue working despite ill health. [21] This suggests that much of the burden of WBH may remain hidden, with staff continuing to work despite distress, which has implications for performance and patient safety.

Lui et al.[6] recently identified that the relationship between WBH and presenteeism may be bidirectional, with each reinforcing the other over time. This cyclical dynamic has important implications, as it may contribute to the persistence of both bullying and impaired performance within healthcare teams. Notwithstanding, the observed associations concern self-reported, attribution-specific occupational outcomes rather than objectively verified productivity losses and should therefore be interpreted as reflecting respondents' perceived occupational impact.

Dose–response relationship

The observed dose-response relationship is consistent with, but does not establish, a potential causal association between cumulative exposure to WBH and adverse occupational outcomes. Each incremental increase in WBH exposure (NAQ-R score) was associated with higher odds of psychological distress, sickness absence, and presenteeism. The continuous NAQ-R analyses showed graded statistical associations across all three outcomes. Each one-point increase in NAQ-R total score was associated with approximately 8% higher odds of GHQ-derived probable psychological distress, 5% higher odds of sickness absence, and 7% higher odds of presenteeism. These findings are compatible with a graded exposure–outcome relationship but do not establish causality or a temporal dose-

response mechanism. [35] This is particularly important for informing risk assessment frameworks and intervention thresholds to ensure that staff are protected from WBH exposure and supported to overcome subsequent impacts.

Demographic and interaction findings

Band 8+/other respondents had lower adjusted odds of reporting sickness absence than those in Bands 5–6, broadly consistent with evidence that less-experienced healthcare professionals may be disproportionately exposed to power asymmetries and adverse workplace behaviours. [34] However, the estimate was imprecise and should be interpreted cautiously given the heterogeneous category and multiple comparisons of covariates. Conversely, no demographic or occupational covariate showed a statistically detectable association with GHQ-derived probable psychological distress in the complete-item model. These interpretations should remain tentative given the lack of statistically significant associations for several demographic covariates.

No statistically detectable effect modification was observed by ethnicity or country of professional training for GHQ-derived probable psychological distress (interaction $p = 0.975$ and 0.489, respectively); however, aggregated subgroup categories and limited power mean that meaningful subgroup differences cannot be excluded. Evidence from wider NHS data indicates that minority staff may experience higher levels of WBH. Future research with more granular subgroup analysis is therefore warranted. [35]

Perceived wider workforce/patient-care consequences

A substantial proportion of participants reported sleep disruption and reduced well-being; consideration of leaving (40%; N = 154) or actual departure (12.5%; N = 48); and impaired teamwork and communication, all of which are highly consequential. Workforce attrition in healthcare systems linked to WBH is well documented, with exposure to negative workplace behaviours associated with increased turnover intentions and/or exit from the profession. [9, 24] However, given existing radiography workforce shortages and other impactful factors, this represents a critical system-level risk. [9, 33]

Participants perceived that hostile work environments increased the likelihood of errors and adversely affected teamwork and communication. [24] These findings concern perceived patient-care processes [36] rather than independently verified clinical errors or patient outcomes and should therefore be interpreted as signals warranting further prospective investigation.

Collectively, these findings suggest that WBH should be conceptualised not merely as an interpersonal conflict but as a broader organisational and occupational health issue. Contemporary psychosocial safety models propose that workplace bullying emerges more readily in environments characterised by excessive demands, inadequate support, and ineffective leadership structures. The strong associations observed with psychological distress, sickness absence, and presenteeism therefore suggest that WBH may represent both an indicator and consequence of wider organisational dysfunction.

Strengths and Limitations

Strengths include use of the validated NAQ-R behavioural measure, a UK-wide sample spanning diagnostic and therapeutic radiography practice, and multivariable analyses incorporating binary, conditional-count and dose-response approaches. Several limitations materially constrain interpretation. To avoid making assumptions about missing responses on the adapted measure, the primary psychological-distress analysis was restricted to respondents who completed all 12 GHQ-derived items.

First, the cross-sectional design precludes establishing temporal sequence or causality and cannot exclude reverse or reciprocal relationships. Second, exposure and outcomes were self-reported within the same survey, creating potential common-method variance. Third, the six-month NAQ-R exposure window was not aligned with the 12-month occupational-outcome recall period. Fourth, sickness absence and presenteeism were attribution-specific self-reported outcomes rather than independently verified organisational measures, and exact day counts were subject to recall error.

Fifth, the psychological-distress measure used 12 GHQ-derived items with an adapted three-category response structure that has not been independently validated. Sixth, purposive non-probability recruitment may have introduced selection bias, prevented calculation of a conventional response rate and limited generalisability to the broader UK radiography workforce. Seventh, aggregation of demographic categories, particularly ethnicity, may obscure subgroup heterogeneity, and the interaction analyses may have had limited power to detect effect modification.

Finally, the conditional count models had comparatively small samples, particularly for sickness absence, and estimates were sensitive to model specification; these analyses should therefore be considered secondary. Residual confounding remains possible despite multivariable adjustment.

Implications for Practice

The present study identifies strong associations between WBH and perceived psychological and occupational burden but did not evaluate organisational interventions. The findings therefore support prospective evaluation of strategies intended to prevent and respond to WBH rather than demonstrating the effectiveness of any particular intervention. Future studies should evaluate organisational reporting systems, leadership approaches and workforce-support interventions using prospective or experimental designs and objectively measured outcomes where feasible.

The present analyses did not evaluate leadership structures, reporting systems or support-service effectiveness. Nevertheless, the associations observed between WBH and staff outcomes indicate a need for prospective evaluation of organisational approaches to prevention and response. Evidence-informed candidates include psychologically safe reporting mechanisms, leadership and civility interventions, and accessible staff-support pathways; their effectiveness in radiography settings remains to be established, rather than demonstrated by the current study.

The high frequency of self-reported presenteeism supports further investigation of organisational factors that may contribute to staff working while unwell, including workload, staffing pressures and workplace norms. Prospective intervention studies are needed before specific organisational strategies can be recommended based on the present findings.

Conclusion

This study identified frequent behaviourally defined WBH exposure within a UK-wide radiographer sample and strong cross-sectional associations with GHQ-derived psychological distress and self-reported work-functioning outcomes. Higher NAQ-R scores were also associated with progressively higher odds of adverse outcomes. These findings support further prospective investigation of WBH as an occupational-health concern in radiography.

Declarations

1. **Ethics approval and consent to participate**

Ethical approval was obtained from the Health Sciences University Ethical Committee (HRS-2025-YHAiR). Informed consent was obtained from all participants who took part in the study.

2. Consent for publication

Not applicable

3. **Funding**

This article received no funding support.

4. **Conflicts of interest**

There are no conflicts of interest to declare

5. **Availability of data and materials**

The data supporting the findings of this study can be made available on reasonable request

6. **Author contributions**

CO: Conceptualisation, project administration, software, investigation, methodology, writing – original draft preparation, visualisation, resources, data curation

OL: Supervision, resources, data curation and review/editing

RE: Validation, formal analysis, review/editing, data curation

NJ: Validation, review/editing

BN: Resources, investigation, review/editing

RM: Supervision, resources, methodology, data curation, and review/editing

EI: Investigation, formal analysis, software, review/editing, data curation, visualisation

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8. **Generative AI use**

During the preparation of this work, the author(s) used Grammarly to improve readability. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the published article.

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37. SUPPLEMENTARY TABLES.

Figures

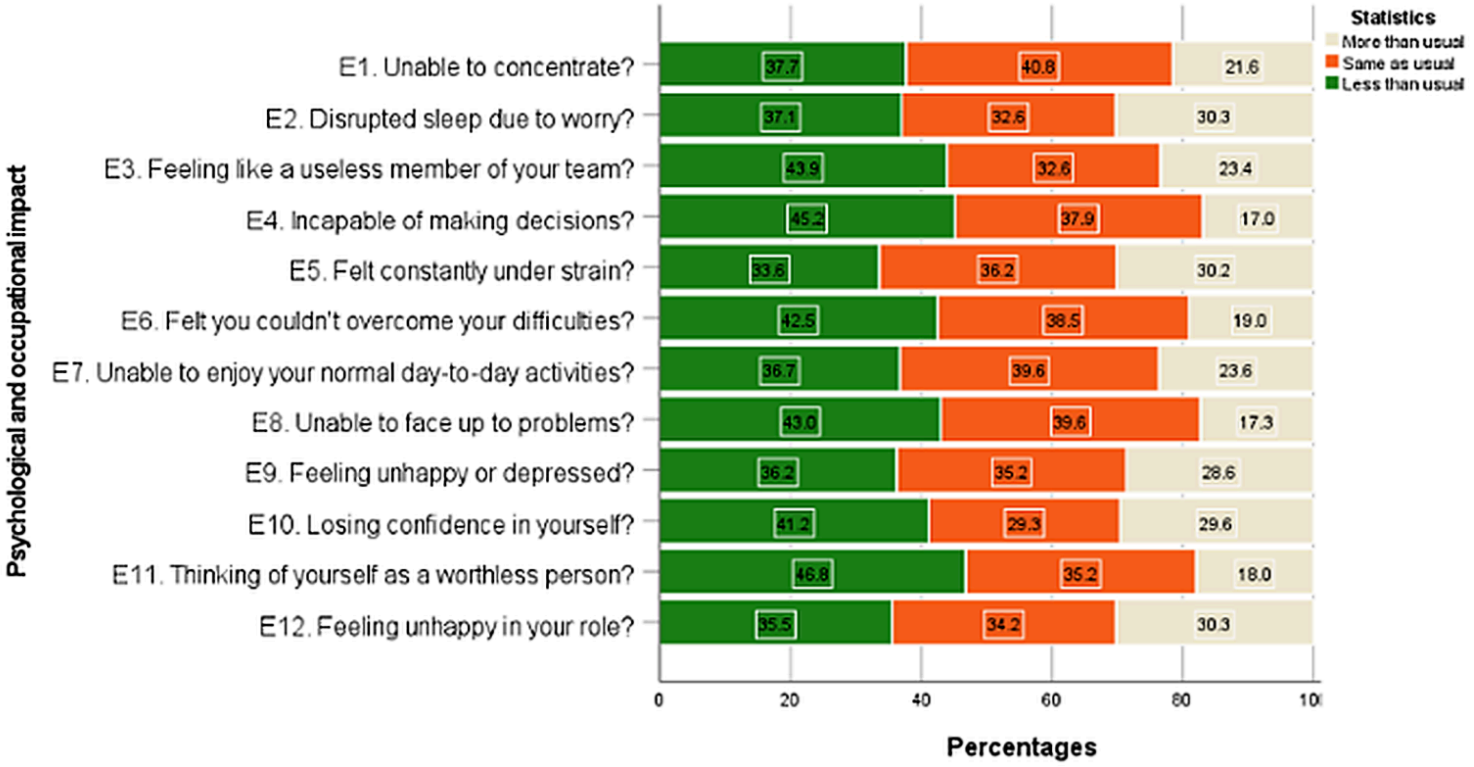


Figure 1

Distribution of responses to the 12 GHQ-derived psychological-distress items

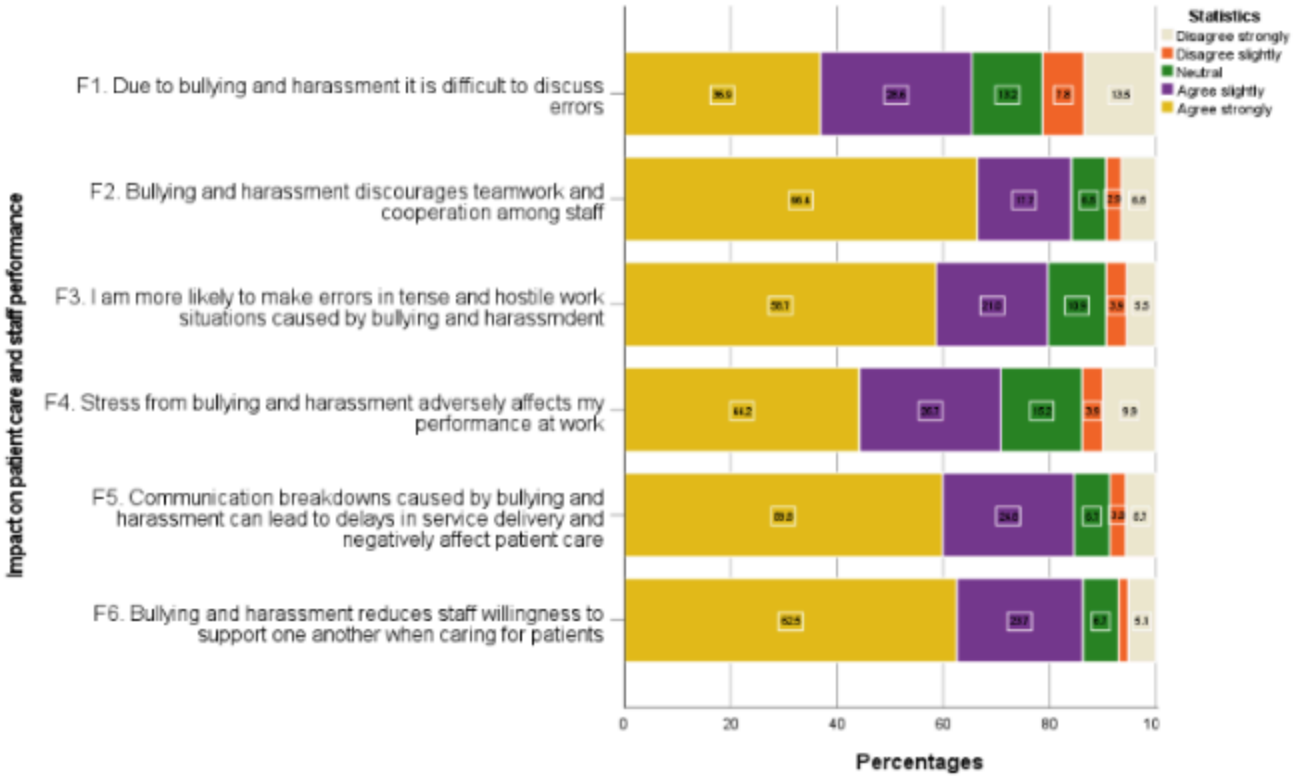


Figure 2

Perception of workplace bullying and harassment in relation to patient care and staff performance

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryTables.docx