



The
University
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Sheffield.

**Exploring Factors Associated with Occupational Burnout experienced by Healthcare
Professionals**

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Declaration

I declare that this work has not been submitted for any other degree at the University of Sheffield, or any other institution. The work presented is original and all other sources have been references accordingly.

Structure and Word Count

Meta-analysis

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With references and tables: 21,258

Research Report

Without references and tables: 7,999

With references and tables: 14,773

Lay Summary/Abstract

Occupational burnout is prevalent and problematic in healthcare. Burnout is a psychological syndrome encompassing emotional exhaustion, depersonalisation, and diminished sense of personal accomplishment due to prolonged exposure to occupational stressors (Maslach, 1982). For individuals, burnout has psychological, psychosomatic, physiological, and relational consequences. Burnout has economic implications for healthcare organisations due to staff absenteeism and turnover. Importantly, burnout has serious repercussions in terms of patient care, safety and satisfaction.

Low job satisfaction is associated with burnout amongst healthcare professionals. Job satisfaction is considered a pleasurable and positive state of affect resulting from the appraisals of work experiences (Lock, 1967). As with burnout, low job satisfaction has ramifications for the quality of care received by patients, patient satisfaction and staff turnover.

The relationship between job satisfaction and burnout has been studied in specific populations of healthcare professionals. In light of the limitations of previous reviews, the association between burnout and job satisfaction in healthcare professionals more generally was explored in this systematic review and meta-analysis.

Fifty-eight studies were eligible for inclusion in the review. Fifty-four studies were included in the meta-analysis whilst four met the inclusion criteria for the narrative synthesis only. The results of the meta-analysis revealed a small-to-medium negative association between burnout and job satisfaction. The unique associations between job satisfaction and emotional exhaustion, depersonalisation, and personal accomplishment were also reported. Further analysis demonstrated that methodological differences accounted for differences in the data. Studies included in the narrative synthesis corroborated the findings of the meta-analysis.

The thesis research was a secondary analysis of data from a randomised control trial called the

UpLift Trial. The research aimed to investigate whether healthcare professionals could be accurately prescribed (or “matched”) to either a Cognitive Behaviour Therapy (CBT) intervention for burnout or a novel Job Crafting (JC) intervention for burnout risk factors, based on their individual pre-intervention characteristics and their response to intervention. The pre-intervention characteristics included demographic data (such as age, gender, ethnicity and occupation), burnout profiles, and the results of questionnaires relating to job satisfaction, stress and mental wellbeing, turnover intentions, job autonomy, self-efficacy, work-family conflict, overcommitment, social support and personality. Two models were developed for each intervention. These models demonstrated which pre-intervention characteristics predicted an individual’s response to intervention (i.e., their post-intervention burnout scores) for each respective intervention. A sophisticated algorithm was developed and evaluated in terms of its clinical utility in matching healthcare professionals to interventions for burnout.

Both models included disengagement and exhaustion subdomains of burnout, stress, satisfaction with the work and satisfaction with the job role as predictors of intervention response. The JC intervention included the addition of pre-intervention turnover intentions, whilst the CBT intervention included the addition of pre-intervention mental wellbeing and stress. Through evaluating the utility of these models, CBT was predicted to be the most beneficial intervention for burnout for all participating healthcare professionals. These results are discussed, particularly in relation to this research demonstrating little evidence for the developing ways of prescribing interventions for burnout to healthcare professionals in a personalised way.

Acknowledgements

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My thanks also extend to my colleagues who worked tremendously hard supporting the UpLift Trial. I am grateful that I was given the opportunity to work alongside such passionate and enthusiastic individuals. Without the hard work they all put in to recruiting and engaging participants, I would not have been able to conduct my research thesis which relied on the secondary analysis of outcome measure data completed by motivated participants who engaged in the UpLift Trial.

I wish to express my profound gratitude to my partner Kate, my son Ruben, my ever-expanding family and my wonderful friends. Thank you for your unwavering support, not only throughout the process of researching and writing of my thesis, but throughout the entirety of my academic career, particularly in years that I have been on the Doctor of Clinical Psychology during a global pandemic. My passions, motivations, and goals could not have been achieved without their continuous love and encouragement. This accomplishment would not have been possible without them, and I dedicate this piece of work to them.

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Section 1: Systematic Review Chapter

Association between Job Satisfaction and Occupational Burnout amongst Healthcare

Professionals: A Systematic Review and Meta-Analysis

Abstract

Objectives. This systematic review and meta-analysis sought to explore the magnitude and direction of associations between occupational burnout and job satisfaction amongst healthcare professionals.

Method. The research literature was systematically screened across three electronic databases (Scopus, PsycINFO, Web of Science) in July 2021. Quantitative studies were included that analysed the association between occupational burnout and job satisfaction, as measured by validated outcome measures, across healthcare professionals in accordance with the inclusion criteria. Random-effects meta-analyses and sensitivity analyses were performed based on reported and transformed r -coefficients denoting the association between job satisfaction and occupational burnout. All studies were assessed for methodological quality. Heterogeneity was explored across clinical and methodological characteristics, and methodological quality ratings. Narrative synthesis was performed on studies not eligible for inclusion in the meta-analysis.

Results. Following PRISMA guidelines, 58 eligible studies were reviewed, of which 54 (N = 27,667 participants) were included in meta-analysis. The majority of eligible studies were evaluated as having ‘*moderate*’ methodological quality (n = 36). The primary meta-analysis demonstrated a significant small-to-medium negative correlation between occupational burnout and job satisfaction amongst healthcare professionals; $r = -.29$, 95% CI [-.35; -.22], $z = -8.35$, $p < .001$. Sensitivity analyses revealed that clinical and methodological differences (e.g., measures used, setting, professional discipline and location) accounted for significant proportions of the heterogeneity in the meta-analytic results.

Conclusion. Increased burnout is associated with decreased job satisfaction amongst healthcare professionals.

Keywords Occupational Burnout, Job Satisfaction, Healthcare Professionals

Practitioner Points:

- There exists an inverse association between job satisfaction and occupational burnout amongst healthcare professionals. This should be considered in light of potential consequences for staff retention and patient care.
- Healthcare organisations should invest resources into interventions targeting burnout, particularly “personal accomplishment”, “emotional exhaustion”, and job satisfaction. This could improve staff retention, which would support the continued viability of the NHS which experiences staff resourcing issues.

Introduction

According to the King's Fund (2022), the National Health Service (NHS) is in '*crisis*'. Over the last decade, the NHS has been subjected to a '*prolonged funding squeeze*' combined with '*poor workforce planning*', '*weak policy*' and '*fragmented responsibilities*' resulting in an '*endemic*' of staff turnover (The King's Fund, 2022). In an already under-resourced system, COVID-19 has exacerbated the insurmountable pressures and backlogs faced by the NHS (Health and Social Care Committee, 2021), putting the NHS at risk of a '*mass exodus*' of staff (Dr Chaand Nagpaul, British Medical Association Media Team, 2021). Unfortunately, prolonged staff shortages and high staff turnover increases the workload and pressures experienced by existing staff. This places staff at an increased risk of occupational burnout (hereafter referred to as 'burnout'), risks the quality of care received by patients and further increases staff turnover in a self-perpetuating cycle (Buchanan et al., 2019; Humphries et al., 2014; Ferry et al., 2020). According to the NHS Staff Survey (2021), 46.8% of staff reported feeling unwell as a result of work-related stress in the last 12 months, 31.1% of staff contemplated leaving their NHS organisation, 22.9% expressed that they will probably look for a job at a new organisation in the next twelve months, and 16.6% said that they will leave the NHS as soon as they can find another job. As of the 31st December 2021, the NHS staff vacancy rate was 10.3% (39,652 vacancies), an increase from 9.7% (36,277 vacancies) at the same time point the year prior (NHS Digital, 2022a). The most frequently cited reason for leaving during this period was '*Voluntary Resignation – Other/Not Known*' (cited by 34,985 staff; NHS Digital, 2022b). Overall, the NHS is under-funded, under-resources and under-staffed, struggling with high staff turnover for reasons not necessarily captured by NHS surveys.

According to the Job Demands-Resources model (Demerouti et al., 2001; Bakker & Demerouti, 2007), burnout emerges as a result of high job demands yet low job resources (Demerouti et al., 2001; Bakker et al., 2007). Given the current NHS landscape, it is not surprising that burnout (also termed '*the cost of caring*' (Maslach, 1982)), is widespread amongst healthcare professionals (Jenkins & Baird, 2002; Maedors et al., 2010; O'Connor et al., 2018; De Hert, 2020).

Burnout is described as a state of mental and physical exhaustion caused by one's professional life (Freudenberger, 1974). It has been conceptualised as a psychological syndrome of (1) *emotional exhaustion* (EE), (2) *depersonalisation* (DP) and (3) *a diminished sense of personal accomplishment* (PA) emerging in response to chronic occupational stressors (Maslach & Jackson, 1981; Maslach, 1982; 2016). Demerouti et al. (2001) and Demerouti & Bakker (2008) conceptualized burnout as a two-factor construct ranging from (1) *vigour* to *exhaustion* and (2) *dedication* to *disengagement*. Prevalence rate estimates of burnout vary between 11.23% to 77.10% amongst mental and physical healthcare professionals (Adriaenssens et al., 2015; O'Connor et al., 2018; Rotenstein et al., 2018; Low et al., 2019; Woo et al., 2020). In a recent study by Vincent et al. (2019), out of 997 healthcare professionals in the UK 38% were at high-risk of EE, compared with 34% for DP and 37% for reduced PA. During COVID-19, it was reported that burnout amongst healthcare professionals rose to 52%, with the highest rates of burnout experienced by nurses and/or physicians at 66% (Gahramani et al., 2021). According to Taris et al. (2005), healthcare professionals are at an increased risk of burnout (between 15.1% - 41.4%) in comparison to police (7%) and social workers (17.7%); suggesting that burnout is particularly problematic in healthcare. Although prevalence rates differ across studies, countries, and professional disciplines, it is obvious that burnout amongst healthcare professionals is problematic.

Burnout has far-reaching consequences. It has been associated with increased anxiety, depression, and feelings of helplessness, hopelessness and powerlessness (Ahola et al., 2005; Bianchi et al., 2014; Hakanen & Schaufeli, 2012; Schaufeli & Buunk, 2004; Peterson et al., 2008), substance use (Beschoner et al., 2019), sleep disturbance, fatigue, and elevated cortisol (Grossi et al., 2003; Melamed et al., 1999; Söderström et al., 2004; Peterson et al., 2008), and cardiovascular disease, hypothalamic-pituitary-adrenal axis dysregulation, suppressed immunity, headaches, and musculoskeletal problems (Ahola et al., 2010; Melamed et al., 2006; Acker, 2010). Significantly, higher levels of burnout predict increased rates of physical health deterioration (Kim et al., 2011).

Burnout is also considered “*economically wasteful*” (Gilbody et al., 2006). It comes at a significant cost to healthcare organisations and public health due to poor staff retention and recruitment, use of agency staff in lieu of permanent staff during staff vacancies, and staff training (Leiter & Maslach, 2009; Janssen et al., 1999; Hayes et al., 2012). Burnout impacts service proficiency and provisions due to high levels of sickness absenteeism (Schouteten, 2016; Schaufeli et al., 2009; Borritz et al., 2006, 2010), poor workplace engagement (i.e., job withdrawal; Schaufeli et al., 2009), reduced commitment to the job and/or organisation (Burke & Richardson, 1993), reduced fidelity to evidence-based practice (Aarons et al., 2009; Kim et al., 2018), poor job performance (Taris, 2006; Bakker & Heuven, 2006), and suboptimal patient care, patient safety, and patient satisfaction (Leiter et al., 1998; Shanafelt et al., 2002; Panagioti et al., 2018; Garman et al., 2002).

Job satisfaction is conceptually distinct from burnout. Research has consistently demonstrated that job satisfaction is inversely associated with burnout amongst healthcare professionals (Maslach et al., 2001; Prosser et al., 1997; Schulz et al., 1995; Rosales et al., 2013; West et al., 2018). Psychological, physiological, and environmental factors are purported to influence feelings of satisfaction with one’s work (Hoppock, 1935). Most commonly cited in the literature, Locke (1976) defined job satisfaction as a pleasurable and positive state of affect resulting from the appraisal of one’s work experiences. According to the two-factor Motivation-Hygiene theory (Herzberg et al., 1959), job satisfaction consists of (1) *hygiene factors* (e.g., pay and benefits, workplace policies, supervision, relationships with colleagues, working conditions, job security) that are associated with a need to avoid unpleasantness (Alshmemri et al., 2017) and (2) *motivational factors* (e.g., the work itself, recognition, achievement, responsibility, advancement, growth) that are associated with a need for self-growth and self-actualisation (Alshmemri et al., 2017).

Arguably, Herzberg's theory is simplistic (Graham & Messner, 1998; Matzler et al., 2004). It ignores the influence of situational factors, individual differences and preferences (Matzler et al., 2004; Worlu & Chidozie, 2012), and assumes a relationship between job satisfaction and productivity/performance despite equivocal findings (Chan et al., 2000). However, it makes the important distinction that job satisfaction and job dissatisfaction are independent constructs that lie on discrete continuums (Herzberg et al., 1959). Such that, job satisfaction depends on motivational factors intrinsic to the job, the absence of which results in no job satisfaction, whilst job dissatisfaction depends on hygiene factors extrinsic to the job, the absence of which results in no job dissatisfaction (Dhanapal et al., 2013; Herzberg et al., 1959; Tietjen & Myers, 1998; Lacy & Sheehan, 1997). In support of Herzberg's Motivation-Hygiene theory, research has demonstrated that motivational factors exert a greater influence on job satisfaction than hygiene factors amongst nurses (Lu et al., 2019; Alshmemri et al., 2017; Kacel et al., 2005). In a recent study using structural equation modelling, Lee & Lee (2022) identified that individual motivational factors, and not hygiene factors, contributed to job satisfaction which subsequently had the greatest impact intentions to stay amongst nurses.

Job satisfaction amongst healthcare professionals is associated with person-centred care (van Diepen et al., 2020), increased social capital, work engagement, and employee engagement in clinical improvements of care quality (Strömngren et al., 2016), good relationships with patients (Lu et al., 2016; Mo et al., 2015; Williams & Skinner, 2003), and quality of patient care and patient satisfaction (Mrayyan, 2006; Williams et al., 2003). Alternatively, job satisfaction amongst healthcare professionals is negatively associated with turnover intentions (Hoff et al., 2019; Davis, 2020), work-family conflict (Lu et al., 2016), work stress (Lu et al., 2016; James-Scotter et al., 2019), and occupational burnout (Lu et al., 2005, 2012).

The relationship between job satisfaction and burnout has been studied amongst subpopulations of healthcare professionals; including nurses (Khamisa et al., 2015, 2016; Zhang et

al., 2014), physicians (Chen et al., 2013; Weng et al., 2011; Bahadırli & Sagaltici, 2021), occupational therapists (Scanlan & Still, 2013; Abaoğlu et al., 2021), mental health professionals (Ogresta et al., 2008) and psychiatrists (Kumar et al., 2007). Thus far, however, systematic reviews and meta-analyses have failed to quantify the strength and direction of associations between job satisfaction and burnout (Hayes & Boner, 2010; Onyett, 2011; Koy et al., 2015; Ewan et al., 2021), have focused solely on nurses (Hayes et al., 2010; Koy et al., 2015; Toh et al., 2012; Friganović et al., 2019; Khamisa et al., 2013; Vargas et al., 2014; Yu et al., 2019), and have focused on prevalence rate estimates and other factors associated with burnout (Epp, 2012; Adriaenssens et al., 2015; Cañadas-De la Fuente et al., 2015).

Despite the abundance of research, the overall association between burnout and job satisfaction amongst healthcare professionals has not yet been systematically reviewed. Therefore, the current study sought to explore the association between burnout and job satisfaction amongst healthcare professionals, provide an estimated strength of association (effect size) via meta-analysis and provide a coherent insight into the sources of heterogeneity within the research reporting on this relationship.

Methods

The protocol for this review was pre-registered on the Open Science Framework (OSF; see Appendix A) in June 2021, prior to performing database searches:

https://osf.io/39ycz/?view_only=ef82e8db71284cd1be9926c0df0089ea

The structure and contents of the abstract and review were checked against the PRISMA 2020 Abstract Checklist (Page et al., 2021; see Appendix B) and PRISMA 2020 Statement Checklist (Page et al., 2021; see Appendix C), respectively.

Search Strategy

A preliminary review of the research literature and existing meta-analyses informed the

development of the current search strategy to identify eligible studies for inclusion; taking note of language to inform search terms. In July 2021, three electronic databases (Scopus, PsycINFO, Web of Science) were screened for relevant literature using search terms related to burnout, job satisfaction and healthcare professionals (see Appendix D). Databases were selected on the basis of optimally guaranteeing adequate and efficient coverage of research, relevance to the focus of this review topic, and acceptability of use across meta-analyses and systematic reviews (Bramer et al., 2017). Searches were limited to papers published in peer-reviewed journals and in the English language. There were no restrictions on publication date. Forwards and backwards citation searches were completed on all eligible full-text papers that met the inclusion criteria.

Inclusion/Exclusion Criteria

The selection process was undertaken independently by the author. Studies were eligible for inclusion in line with the following criteria: quantitative research involving healthcare professionals working in mental and/or physical health across public or private settings who were aged 18 years and over; observational (e.g., cohort, cross-sectional designs) or experimental designs (e.g., randomised control trials) in which outcomes relating to burnout and job satisfaction were recorded using validated and reliable measures; publication in a peer-reviewed journal; and written in the English language.

Studies were excluded according to the following criteria: qualitative research; quantitative research involving participants whose professional discipline was not healthcare (e.g., social workers, police etc.); more than 50% of participants were aged under 18 years; outcomes relating to burnout and job satisfaction were not recorded using valid or reliable instruments; not published in peer-reviewed journals; and not written or translated into the English language.

Data Extraction and Transformations

Data extraction and transformation were undertaken independently by the author. Research articles identified from database searches were collated using Mendeley Desktop Software (Version

1.19.8). Duplicates, studies not written or translated into English or studies not published in peer-reviewed journals were removed. The titles and abstracts of the remaining articles were screened in accordance with the inclusion/exclusion criteria. The remaining full texts were retrieved and screened according to the inclusion/exclusion criteria.

Data extraction of study and sample characteristics was informed by guidance published in the Cochrane Handbook for Systematic Reviews of Interventions version 6.3 (Li et al., 2022; Higgins & Thomas, 2022). In accordance with the statistical analyses undertaken to investigate the association between burnout and job satisfaction, correlation coefficients (*r*-coefficients), standardized regression coefficients (β -coefficients), odds ratios (OR) and path coefficients were extracted. Sample sizes were extracted to compare effect sizes. Odds ratios were converted into *r*-coefficients, via Cohen's *d* (Borenstein et al., 2009; Cohen, 1988). Although β -coefficients are not generally included in meta-analyses because they do not reflect simple bivariate or zero-order relationships between two variables, exclusion of studies reporting β -coefficients can be even more problematic (Peterson & Brown, 2005). For increased accuracy of conversion into the common metric (*r*), transformation of β -coefficients into *r*-coefficients was restricted within the range of .5 to -.5 (Peterson et al., 2005). Therefore, it was not possible to transform all β . For these reasons, some data from the studies conducted by Alrawashdeh et al. (2021), Oliviera et al. (2018) and Opoku & Apenteng (2014) were omitted from the meta-analysis. Where associations between subdimensions of job satisfaction and/or burnout or sub-samples were reported using *r*-coefficients, these were combined into a single pooled *r*-coefficient using MAVIS (version 1.1.3), which runs R statistical software (version 4.0.3; <http://kylehamilton.net/shiny/MAVIS/>). First authors or authors listed for correspondence were contacted via email where clarification of study data was required.

A forest plot was used to visually display the results from individual studies that were inputted into the meta-analysis and an estimate of pooled effect size was used to aid interpretation (Akobeng, 2005).

Methodological Quality Appraisal

Methodological quality was assessed using the Critical Appraisal Skills Program (CASP) Cohort Study Checklist (CASP, 2018; see Appendix E). This tool comprises of fourteen questions (twelve questions plus two sub-questions) to appraise the quality of research; reporting whether each paper fulfils the requirements of each question using 'Yes', 'Can't Tell' or 'No' responses. The majority of papers eligible for inclusion in this review used a cross-sectional design. For consistency, all studies were appraised using this tool. Some of the CASP checklist questions were not applicable to cross-sectional design. To not bias the appraisal of studies towards more negative ratings, questions 3, 5b, 6a, and 6b were removed leaving a total of ten questions. Although a scoring system was not recommended for this tool, it facilitated an overview of the quality of research. Studies were rated based on the number of 'Yes' ratings. Ratings of six or above indicated 'high' methodological quality, ratings greater than three but less than six indicated 'moderate' methodological quality and ratings of three or less indicated 'low' methodological quality.

Due to the large number of eligible studies, the quality of a random sample (10%) of studies was appraised by an independent researcher. Cohen's Kappa statistic was used to determine interrater reliability. Inconsistencies were discussed and resolved without the need for moderation.

Narrative Synthesis

A narrative synthesis approach was adopted where it was not feasible to convert data accurately into r -coefficients to allow for inclusion in the meta-analysis (Popay et al., 2006; Higgins et al., 2022).

Meta-analysis

A random-effects meta-analytic model accounts for sources of unobservable sampling variation/error across studies (between-study heterogeneity) and sampling variability/error (within-study heterogeneity; Riley et al., 2011; Borenstein & Higgins, 2013). A meta-analysis was performed, using a random-effects model, to estimate a pooled effect size (i.e., r -coefficient) of the

association between burnout and job satisfaction synthesised across 54 studies with data appropriate for inclusion in the meta-analysis. MAVIS (version 1.1.3), that runs R statistical software (version 4.0.3), was used to perform the meta-analysis (<http://kylehamilton.net/shiny/MAVIS/>). Confidence intervals (95%) were used to assess the degree of certainty/uncertainty in the sampling method. Standardised z -statistics were used to allow for comparison across studies, demonstrate the probability of the results occurring within a normal distribution, and assess how many standard deviations results were from the overall mean.

To test for heterogeneity, I^2 statistic and Cochran's (1954) Q -statistic were computed. The I^2 statistic measures the total variation (or relative degree of inconsistency) across studies due to heterogeneity as opposed to chance (Higgins & Thomas, 2002; Higgins et al., 2003). According to Higgins et al. (2003), heterogeneity is considered low at an I^2 of 25%, moderate at 50% and substantial at 75%. Cochran's (1954) Q -statistic measures the difference between observed study effect sizes and the fixed-effect model pooled estimate of the effects sizes across studies (Cochran, 1954). A significant Q -statistic indicates evidence of heterogeneity (Borenstein et al., 2009). Publication bias was assessed using a weighted regression test for funnel plot asymmetry (Egger et al., 1997), a rank correlation test (Begg & Mazumdar, 1994), and a trim-and-fill method (Duval & Tweedie, 2000a, 2000b; Duval, 2005). A likelihood ratio test was conducted to estimate publication bias based on effect size (Vevea & Hedges, 1995). A Fail-safe N calculation was computed using the Rosenthal Approach to estimate the number of non-significant studies necessary to render the results non-significant (Rosenthal, 1979).

Further analyses were conducted to explore the pooled r -coefficients between the three domains of burnout (i.e., EE, DP, PA) and job satisfaction. Different measures of burnout have used different descriptive labels synonymous with DP (e.g., cynicism, disengagement, dehumanisation). For the purpose of analysis, these descriptors were included in the random-effects model for the pooled effect size between DP and job satisfaction.

Sensitivity Analysis

Fixed-effects models have a high risk of false-positive results when comparing subgroups and there exists large variation across study sample sizes (Higgins & Thompson, 2004). Therefore, sensitivity analyses were performed using random-effects models to investigate sources of clinical heterogeneity (i.e., differences at the level of participants), methodological heterogeneity (i.e., differences in study characteristics) and heterogeneity of methodological quality appraisal ratings. Sensitivity analyses were also informed by Cochran's Q-test and the I^2 statistic (Borenstein et al., 2013; Higgins et al., 2003). According to Deeks et al. (2019), sensitivity analyses are only recommended when there are at least ten observations (i.e., studies) available for each characteristic modelled. Therefore, sensitivity analyses were performed for the type of burnout measure, type of job satisfaction measure, occupation, setting, specialism, location, and methodological quality appraisal ratings.

Results

Narrative Synthesis

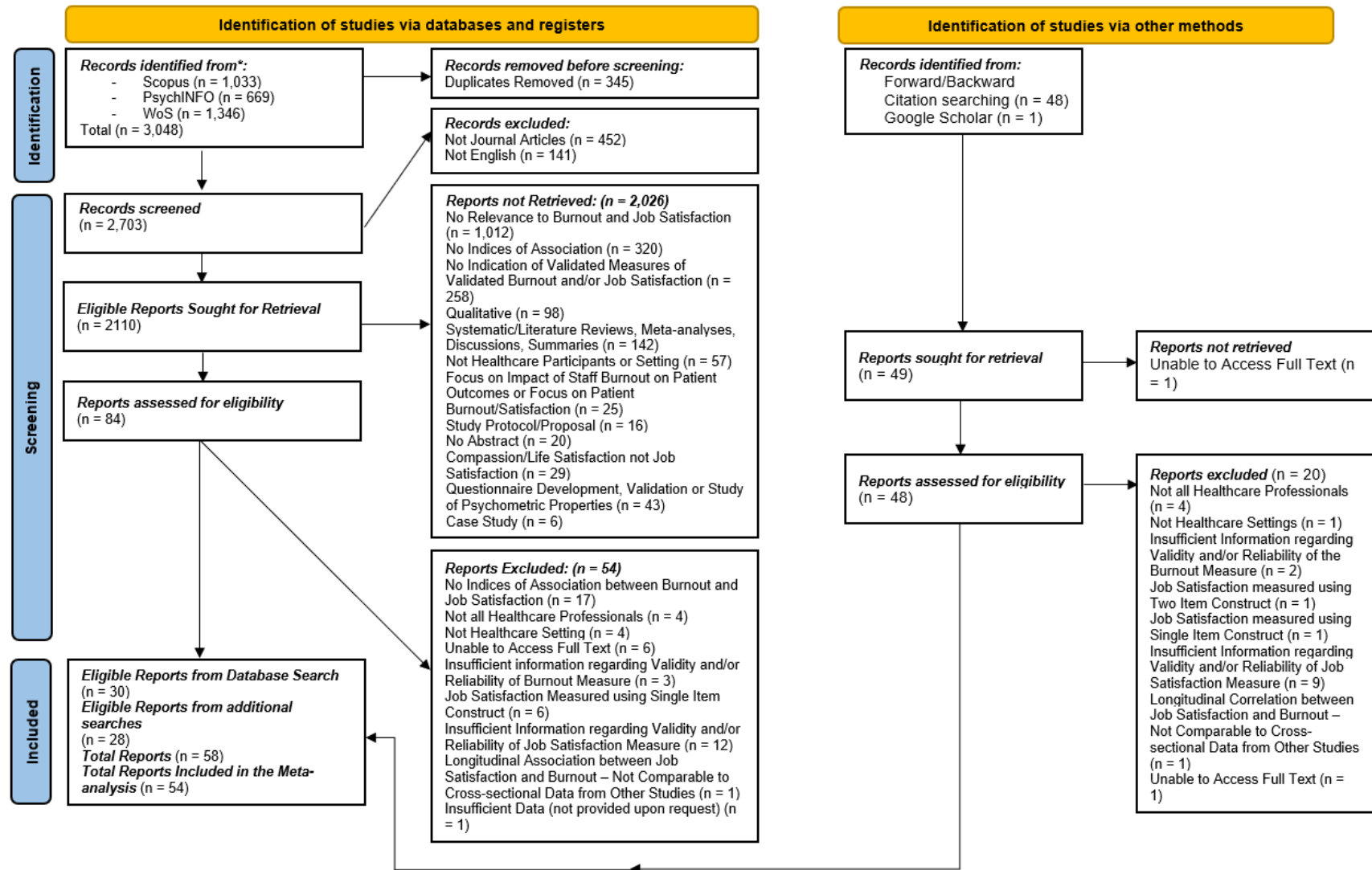
Search Results

Database searches identified 3,048 potentially eligible studies (see Figure 1). Following the removal of 345 duplicates, 452 non-journal articles and 141 studies not written or translated into English, 2,110 studies were sought for retrieval. Initial screening of the titles and abstracts in accordance with the inclusion/exclusion criteria resulted in the exclusion of 2,026 studies. Full texts of the remaining 84 studies were screened using the same eligibility criteria; resulting in the removal of 54 studies (see Appendix F). Thirty studies met the requirements of inclusion from database searches. Through a process of forward and backward citation searching, a further 27 studies were identified as eligible whilst 20 were screened but subsequently excluded (see Appendix G). One additional study was found through a google scholar search. Out of the 58 eligible studies, 53 studies met criteria for inclusion in the meta-analysis and one met partial

inclusion in which some of the data was eligible for inclusion in the meta-analysis and some was not (Opoku et al., 2014). Four studies were eligible for narrative synthesis only.

Figure 1

PRISMA Flow Diagram (Page et al., 2021)



Clinical and Methodological Characteristics

Study Design, Participants and Setting

Most studies were cross-sectional (n = 52). One study used a screening model design whilst three studies did not state the research design, although they appeared cross-sectional in nature. The majority of studies were conducted in East Asia (n = 17) and West Asia (n = 17). Studies were also conducted in Africa (n = 2), Europe (n = 5), the Middle East (n = 3), North America (n = 1), Australia and/or New Zealand (n = 2), South America (n = 5), South Asia (n = 4) and South-East Asia (n = 2). Most participants were recruited from hospitals (n = 30). Other studies recruited participants from inpatient (n = 9), outpatient (n = 7), or mixed inpatient/outpatient (n = 6) settings. Studies also recruited from a medical centre (n = 1), public health clinic (n = 1), surgery clinic (n = 1) and across public and private sector healthcare (n = 1). Two studies did not state the setting from which participants were recruited. Participant occupational disciplines included nurses (n = 27), mixed healthcare professionals (n = 12), physicians (n = 7), psychiatrists (n = 2), general practitioners (n = 2), doctors (n = 3), mental health therapists (n = 1), occupational therapists (n = 1), midwives (n = 1), pharmacists (n = 1), and anaesthesiologist (n = 1). Participant specialisms included mixed specialisms (n = 14), emergency medicine (n = 6), critical care (n = 5), paediatrics (n = 5), mental health (n = 3), renal care (n = 2) anaesthesiology (n = 1), midwifery (n = 1), and pharmaceutical (n = 1). Participant specialisms were not stated in 20 studies. For most studies, the majority (i.e., 50% and above) of participants were female (n = 40). Other studies reported percentages of female participants between 40-49% (n = 4), 30-39% (n = 6), 20-29% (n = 1) and 10-19% (n = 1). Five studies did not state the percentage of female participants and Sahin et al. (2019) reported 29%, 9.7% and 61.3% of participants were female across Sirnak, Hakkari and Canakkale State Hospitals, respectively. Only three studies reported participant ethnicity in which 93.3% of participants were White British (Delgadillo et al., 2017), 46% were Black (Khamisa et al., 2015), and 88% were European/Other, 9% were Asian/Indian, 2% were Māori, and 1% did not specify their ethnicity (Kumar et al., 2007).

Measures

In accordance with Table 1, the majority of studies ($n = 49$) used full, abbreviated, or selected subscales of the Maslach Burnout Inventory (MBI; Maslach et al., 1981; Maslach & Jackson, 1986; Maslach & Jackson, 1996; Maslach et al., 2001). Other studies used the Oldenburg Burnout Inventory (OLBI; $n = 1$; Demerouti et al., 2001), Copenhagen Burnout Inventory (CBI; $n = 2$; Kristensen et al., 2005), Professional Quality of Life Survey (ProQOL; $n = 3$; Stamm, 2009), Burnout Measure ($n = 1$; Pines & Aronson, 1988), Burnout Measure-Short ($n = 1$; Maslach-Pines, 2005), and Burnout Characterisation Scale ($n = 1$; Tamayo & Tróccoli, 2009). All measures were translated and validated across countries where appropriate.

To measure job satisfaction, the majority of studies ($n = 24$) used a full or abbreviated Minnesota Satisfaction Questionnaire (MSQ; Weiss et al., 1967). Other studies used full or abbreviated versions of the Job Satisfaction Survey (Spector, 1997; $n = 6$), Job Satisfaction Scale (Warr & Cook, 1979; $n = 3$), Index of Job Satisfaction (Brayfield & Rothe, 1951; $n = 3$), Safety Attitudes Questionnaire (Sexton et al., 2006; $n = 3$), Job Diagnostic Survey (Hackman & Oldham, 1975; $n = 2$), Job Satisfaction Questionnaire Brazilian Version (Carlotto & Câmara, 2008; $n = 2$), Index of Work Satisfaction (IWS; Stamps, 1978, 1998; $n = 2$), McCloskey-Mueller Job Satisfaction Scale (MMSS; Mueller & McCloskey, 1990; $n = 1$), Work Satisfaction Questionnaire (Hackman & Oldham, 2980; $n = 2$), Job Discrepancy and Satisfaction Scale (Nagy, 2002; $n = 1$), Chinese Nurse Job Satisfaction Scale (Liu, 2017; $n = 1$), Job Satisfaction Survey (Powell, 2001; $n = 1$), Physician Work Life Survey (Linzer et al., 2001, $n = 1$), Nursing Job Satisfaction Scale Korean Version (Paula, 1978; Han & Mun, 1996; $n = 1$), Job Descriptive Index (JDI; Smith et al., 1969; Schneider & Dachler, 1978; $n = 1$), Japan Hospital Physicians Satisfaction Scale (JHPSS; Ozaki et al., 2008; $n = 1$), and Job Satisfaction Scale (Shi et al., 2014; $n = 1$). One study created a 14-item Adjusted Satisfaction Scale (Ran et al., 2020) which comprised of three job satisfaction measures combined together; the MSQ (Weiss et al., 1967), the Job Satisfaction Survey (Tsounis & Sarafis, 2018) and Job Descriptive Index (Lopes et al., 2015). Another study used the Job Satisfaction Survey (Spector,

1997) and MSQ (Weiss et al., 1967) combined (Zhao et al., 2020). All measures were translated and validated across countries where appropriate.

Studies examined the association between overall burnout and overall job satisfaction (n = 12), burnout subscales and job satisfaction subscales (n = 16), overall burnout and job satisfaction subscales (n = 2), overall job satisfaction and burnout subscales (n = 16), or a mixture of subscales and overall job satisfaction and/or burnout (n = 9). Of the three studies that used Structural Equation Modelling (SEM) resulting in a standardized path coefficient, two uniquely focused on the path between overall burnout and overall job satisfaction (Chen et al., 2019; Oliveira et al., 2018) and one focused on the path between overall job satisfaction and EE (Samad et al., 2021).

Table 1

Summary of Study and Sample Characteristics for Burnout and Job Satisfaction Measure

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Abaoğlu et al. (2021)	Cross-sectional	OTs /Public Hospitals	54 (50)	80.00	25.62	Turkey	21-item The Burnout Measure (Pines et al., 1988)	MSQ-T	Pearson's Correlation	§IJS-Burnout ($r = -.15$) EJS-Burnout ($r = -.50^{**}$) GJS - Burnout ($r = -.34^*$)	
Akman et al. (2016)	Cross-sectional	Paediatric Nurses /NICU, PICU, Paediatric Clinics, Paediatric Surgery Clinics, Emergency Clinics	(165)	-	28.95	Turkey	MBI-T	MSQ-T	Unspecified Correlation Analysis Regression Analysis	§ IJS-EE ($r = -.58^{***}$) IJS-DP ($r = -.47^{***}$) IJS -PA ($r = .21^{***}$) EJS-EE ($r = -.58^{***}$) EJS-DP ($r = -.36^{***}$) EJS-PA ($r = .13$) GJS-EE ($r = -.63^{***}$) GJS-DP ($r = -.46^{***}$) GJS-PA ($r = .19^{***}$)	JS-Burnout ($\beta = 0.431^{***}$)
Alharbi et al. (2016)	Cross-sectional	Critical Care Nurses /ER, ICU, Coronary Care Units, PICU	278 (150)	87.00	48.00 /26-30	Saudi Arabia	MBI Arabic Version	JSS	Pearson's Correlation Stepwise Multiple Regression	§EE-Contingent Rewards ($r = -.34^{***}$) EE-Operating Conditions ($r = -.24^{**}$) EE-Communication ($r = -.29^{***}$) DP-Supervision ($r = -.24^{**}$) DP-Co-workers ($r = -.16^*$) DP-Nature of Work ($r = -.25^{**}$)	EE predicted JS ($F(1, 148) = 16.84^{***}$); accounting for approx. 10% of the variance in JS ($R^2 = .102$, adjusted $R^2 = .096$). JS-EE ($\beta = -0.41$, $t(19) = 2.53^*$)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Alimoglu & Donmez (2005)	Cross-sectional	Nurses /ICU, Emergency, Operating Rooms, Inpatients, Outpatients in a University Hospital	149 (141)	100.00	29.70	Turkey	MBI-T	WSQ	Pearson's Correlation	PA-Supervision ($r = .31^{***}$) PA-Co-workers ($r = .24^{**}$) PA-Nature of Work ($r = .43^{***}$) PA-Fringe Benefits ($r = -.23^{**}$) PA-Contingent Rewards ($r = -.18^*$) PA-Operating Conditions ($r = -.30^{***}$) §EE-JS ($r = -.47^*$) DP-JS ($r = -.40^*$) PA-JS ($r = .27^*$)	
Alrawashdeh et al. (2021)	Cross-sectional	Physicians /Public, Private Sector Healthcare	1,037 (973)	30.20	34.60	Jordan	10-item Burnout Measure - Short (Maslach-Pines, 2005)	IJSS	Multivariate Logistic Regression		‡Burnout-JS ($\beta = -0.60^{***}$)
Alves & Guirardello (2016)	Cross-sectional	NPs /Inpatients, ICUs in Paediatric Hospitals	267 (267)	91.80	34.90	Brazil	MBI EE Subscale Only	SAQ-Short	Spearman's ρ	EE-JS ($r = -.45^{***}$)	
Alvi et al.	Cross-	Doctors	215	50.00	45.00	Pakistan	MBI	5-item JDS	Pearson's	Burnout-JS	JS-Burnout

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
(2018)	sectional	/Public, Private Hospitals	(200)						Correlation	($r = -.17^*$)	($F(1, 298) = 5.63^*$); accounting for 3% of the variance in burnout ($R^2 = .03$).
Bahadirli & Sagaltic (2021)	Cross-sectional	Emergency Physicians /Public, University Hospitals	365 (331)	42.90	- /29	Turkey	MBI-T	MSQ-T	Multiple Linear Regression		†§ EE-JS ($\beta = -.12^*$) DP-JS ($\beta = -.12^*$) PA-JS ($\beta = 0.41^{***}$) Low JS predicted 16.3% of variance in PA ($R^2 = .163$, $F(2, 328) = 31.92^{***}$).
Baumgardt et al. (2015)	Cross-sectional	Psychiatrists /Single, Group Practices	352 (347)	37.20	55.50	Switzerland	21-item MBI-G	17-item WSQ German Version (Bovier & Perneger, 2003)	Pearson's Product Moment Correlation	§EE-JS Patient Care ($r = -.221^{**}$) EE-JS Burden ($r = -.634^{**}$) EE-JS Income Prestige ($r = -.363^{**}$) EE-JS Personal Rewards ($r = -.361^{**}$) EE-JS Professional Relations ($r = -.116^*$) EE-Overall JS ($r = -.474^{**}$) DP-JS Patient Care ($r = -.251^{**}$)	

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
										DP-JS Burden ($r = -.274^{**}$) DP-JS Income Prestige ($r = -.143^{**}$) DP-JS Personal Rewards ($r = -.320^{**}$) DP-JS Professional Relations ($r = -.110^*$) DP-Overall JS ($r = -.213^{**}$) PA-JS Patient Care ($r = .283^{**}$) PA-JS Burden ($r = .224^{**}$) PA-JS Income Prestige ($r = .142^{**}$) PA-JS Personal Rewards ($r = .307^{**}$) PA-JS Professional Relations ($r = .203^{**}$) PA-Overall JS ($r = .297^{**}$)	
Chen et al. (2019)	Cross-sectional	HPs /Primary Care	1402 (1370)	68.91	36.98	China	15-item MBI (Schutte et al., 2000)	18-items from MSQ and JSS	SEM using Bootstrap Method		‡Burnout-JS (Standardized Path Coefficient = $-.41^{***}$)
Delgado et al. (2017)	Cross-sectional	Therapists /Psychological Therapy Service	Therapists 56 (49) Patients 3,728 (2,509)	65.50	38.40	England	OLBI	JDSS	Unspecified Correlation Analysis Linear Regression	Burnout Disengagement-JS ($r = -.51^{***}$)	Burnout- JS ($\beta = -0.533^*$) JS explained approx. 34% of the variance in Burnout.

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Duan et al. (2019)	Cross-sectional	Physicians /Tertiary Public Hospitals	1486 (1257)	46.40	64.70 /31-50	China	15-item MBI-GS	20-item MSQ-SS (Hirschfeld, 2000)	Pearson's Correlation	JS-Burnout ($r = -.491^{**}$)	
Dutra et al. (2018)	Cross-sectional	NPs /General Hospitals	484 (450)	76.00	37.40	Brazil	MBI-HSS Portuguese (Brazilian Version)	SAQ-P Job Satisfaction Subscale	Logistic Regression Odds Ratio	†§ <u>Model 1</u> High EE-Job Dissatisfaction (OR = 6.19 ^{***}) <u>Model 2</u> High EE-Job Dissatisfaction (OR = 4.74 ^{***}) <u>Model 3</u> High EE-Job Dissatisfaction (OR = 4.47 ^{***})	
Ebling & Carlotto (2012)	Cross-sectional	HPs /Public Hospital	234 (212)	70.90	33.84	Brazil	MBI-HSS (Brazilian Portuguese Version)	JSQ	Pearson's Correlation	§EE-HRS ($r = -.433^{**}$) EE-WES ($r = -.396^{**}$) EE-WISPGO ($r = -.437^{**}$) DP-HRS ($r = -.269^{**}$) DP-WES ($r = -.225^{**}$) DP-WISPGO ($r = -.259^{**}$) PA-HRS ($r = .263^{**}$) PA-WES ($r = .227^{**}$) PA-WISPGO ($r = .268^{**}$)	

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Friganović & Selic (2021)	Cross-sectional	Nurses /ICU in University Hospitals	(620)	87.70	33.50	Croatia	MBI	5-item Job Satisfaction Questionnaire (Judge et al., 2001)	Ordinal Logistic Regression	†§Higher EE- <i>Neutral</i> JS (OR = 0.33*) Higher EE- <i>Satisfied</i> JS (OR = 0.06 ***) Higher EE- <i>Very Satisfied</i> JS (OR = 0.01 ***) Higher DP- <i>Neutral</i> JS (OR = 0.18***) Higher DP- <i>Satisfied</i> JS (OR = 0.07***) Higher DP- <i>Very Satisfied</i> JS (OR = 0.04***) Higher PA- <i>Neutral</i> JS (OR = 1.35, $p = .487$) Higher PA- <i>Satisfied</i> JS (OR = 4.04**) Higher PA- <i>Very Satisfied</i> JS (OR = 10.40***) Higher Overall Burnout- <i>Neutral</i> JS (OR = 0.22**) Higher Overall Burnout- <i>Satisfied</i> JS (OR = 0.04***) Higher Overall Burnout- <i>Very Satisfied</i> JS (OR = 0.01 ***)	

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Garcia & Marziale (2021)	Cross-sectional	NPs /Primary Healthcare	130 (122) Nurse Managers (n = 58) Care Nurses (n = 64)	59.00	45.20	Brazil	Burnout Characterization Scale (Tamayo et al., 2009)	JSQ	Spearman's <i>rho</i>	<u>Nurse Managers</u> EE-SHR ($r = -.262^*$) EE-SPWE ($r = -.230$, $p = .083$) EE-IJS ($r = -.368^{**}$) Dehumanisation-SHR ($r = -.305^*$) Dehumanisation-SPWE ($r = -.181$, $p = .173$) Dehumanisation-IJS ($r = -.341^{**}$) Disappointment at work-SHR ($r = -.237$, $p = .073$) Disappointment at work-SPWE ($r = -.259^*$) Disappointment at work-IJS ($r = -.458^{***}$) <u>Care Nurses</u> EE-SHR ($r = -.366^{**}$) EE-SPWE ($r = -.121$, $p = .340$) EE-IJS ($r = -.408^{**}$) Dehumanisation-SHR ($r = -.048$, $p = .706$) Dehumanisation-SPWE ($r = -.088$, $p = .489$) Dehumanisation-IJS ($r = -.195$, $p = .123$) Disappointment at	

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
										work-SHR ($r = -.387^{**}$) Disappointment at work-SPWE ($r = -.147, p = .246$) Disappointment at work-IJS ($r = -.447^{***}$)	
Ge et al. (2011)	Cross-sectional	HPs /Urban Community Health Centres	2,100 (1694) Shenyang (1010) Benxi (684)	Shenyang 77.80 Benxi 84.20	Shenyang 55.00 /40+ Benxi 56.00 /40+	China	15-item MBI-GS Chinese Version (Maslach et al., 1986; Li, 2003)	MSQ	Pearson's Correlation Hierarchical Regression	<u>Total</u> IJS-EE ($r = -.301^{**}$) IJS-Cynicism ($r = -.358^{**}$) IJS-PA ($r = .086^{**}$) EJS-EE ($r = -.278^{**}$) EJS-Cynicism ($r = -.314^{**}$) EJS-PA ($r = .037$) <u>Shenyang</u> IJS-EE ($r = -.301^{**}$) IJS-Cynicism ($r = -.384^{**}$) IJS-PA ($r = .140^{**}$) EJS-EE ($r = -.264^{**}$) EJS-Cynicism ($r = -.336^{**}$) EJS-PA ($r = .099^{**}$) <u>Benxi</u> IJS-EE ($r = -.293^{**}$) IJS-Cynicism ($r = -.316^{**}$) IJS-PA ($r = -.014$) EJS-EE ($r = -.296^{**}$) EJS-Cynicism	<u>Total</u> IJS-EE ($\beta = -0.07^*$) IJS-Cynicism ($\beta = -0.24^{***}$) EJS-EE ($\beta = -0.09^{**}$) EJS-Cynicism ($\beta = -0.21^{***}$) <u>Shenyang</u> IJS-Cynicism ($\beta = -0.27^{***}$) IJS-PA ($\beta = 0.05^*$) EJS-Cynicism ($\beta = -0.23^{***}$) <u>Benxi</u> IJS-Cynicism ($\beta = -0.20^{**}$) EJS-EE ($\beta = -0.18^{**}$) EJS-Cynicism ($\beta = -0.18^{**}$)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Görgülü & Akilli (2016)	NS	HPs /Public, University, Research Hospitals	(370)	64.60	-	Turkey	MBI	MSQ	Pearson's Correlation	($r = -.281^{**}$) EJS-PA ($r = -.067$) §EE-IJS ($r = -.405^{**}$) EE-EJS ($r = -.464^{**}$) DP-IJS ($r = -.358^{**}$) DP-EJS ($r = -.251^{**}$) PA-IJS ($r = .433^{**}$) PA-EJS ($r = .295^{**}$)	
Hayes et al. (2015)	Cross-sectional	Haemo-dialysis NPs /In-centre, Satellite or Home	795 (417)	90.90	37.50 /41-50	Australia and New Zealand	MBI	IWS	Pearson's Correlation	EE- JS ($r = -.56^{**}$) DP-JS ($r = -.30^{**}$) PA-JS ($r = .29^{**}$)	
Karakose (2014)	Screening Model	GPs	123 (71)	12.68	54.95 /31-45	Turkey	MBI	MSQ	Pearson's Correlation	§EE-IJS ($r = -.238^{**}$) EE-EJS ($r = .076$) EE-GJS ($r = -.137$) DP-IJS ($r = -.102$) DP-EJS ($r = .018$) DP-GJS ($r = -.067$) PA-IJS ($r = .378^{**}$) PA-EJS ($r = .293^{*}$) PA-GJS ($r = .407^{**}$)	
Kaya & Dalgic (2021)	Cross-sectional	Paediatric Nurses /Public, Private, University Hospitals	750 (326)	95.10	31.42	Turkey	MBI-T	MSQ-T	Unspecified Correlational Analyses Multiple Regression Analysis	§EE-GJS ($r = -.472^{**}$) EE-IJS ($r = -.420^{**}$) EE-EJS ($r = -.424^{**}$) DP-GJS ($r = -.441^{**}$) DP-IJS ($r = -.518^{**}$) DP-EJS ($r = -.246^{**}$) PA-GJS ($r = .479^{**}$) PA-IJS ($r = .598^{**}$) PA-EJS ($r = .224^{**}$)	Burnout explained 35.4% of the variance in GJS ($R^2 = .595$, adjusted $R^2 = .354$, $F = 58.743^{**}$) GJS-EE ($\beta = -0.295^{**}$) GJS-DP

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Kelleci et al. (2011)	Cross-sectional	Nurses /Hospitals	718 (439)	-	30.32	Turkey	MBI	MSQ	Unspecified Correlational	§IJS-EE ($r = -.54^{***}$)	($\beta = -0.235^*$) GJS-PA ($\beta = 0.324^{**}$) Burnout explained 45.1% of the variance in IJS ($R^2 = .671$, adjusted $R^2 = .451$, $F = 99.110^{**}$) IJS-EE ($\beta = -0.148^{**}$) IJS-DP ($\beta = -0.239^{**}$) IJS-PA ($\beta = 0.443^{**}$) Burnout explained 18.9% of the variance in EJS ($R^2 = .435$, adjusted $R^2 = .189$, $F = 24.980^{**}$) EJS-EE ($\beta = -0.042^{**}$) EJS-DP ($\beta = -0.022$, $p = .732$) EJS-PA ($\beta = 0.016$, $p = .062$)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
									Analyses	IJS-DP ($r = -.35^{***}$) IJS-PA ($r = .46^{***}$) EJS-EE ($r = -.50^{***}$) EJS-DP ($r = -.27^{***}$) EJS-PA ($r = .31^{***}$) GJS-EE ($r = -.57^{***}$) GJS-DP ($r = -.35^{***}$) GJS-PA ($r = .43^{***}$)	
Khamisa et al. (2015)	Cross-sectional	Nurses /Public, Private Hospitals	1200 (895)	85.00	28.00 /50+	South Africa	MBI-HSS	JSS	Multiple Linear Regression Analysis		†EE-Satisfaction with Communication ($\beta = -0.36^*$) EE explained 14% of the variance in Satisfaction with Communication ($R^2 = .14$, $F(3, 850) = 44.38^*$)
Kim et al. (2017)	Cross-sectional	Nurses /Tertiary Hospital	1000 (875)	98.50	31.26	South Korea	ProQOL	IJSS	Pearson's Correlation, Path Analysis using Maximum Likelihood Estimation, Bootstrap Method with 200 Samples	JS-Burnout ($r = -.57^{***}$)	Direct effect between JS-Burnout ($\beta = -0.147^{**}$) Indirect effect between JS-Burnout ($\beta = -0.063^{**}$) Total effect between JS-Burnout ($\beta = -0.210^{**}$)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Kim et al. (2019)	Cross-sectional	Nurses /Tertiary Hospital	360 (310)	99.70	34.10	South Korea	ProQOL	IJSS	Pearson's Correlation Path analysis	JS-Burnout ($r = -.717^{***}$)	Direct effect between JS-Burnout ($\beta = -0.339^{**}$) Indirect effect between JS-Burnout ($\beta = -0.265^{**}$) Total Effect between JS-Burnout ($\beta = -0.603^{**}$)
Koy et al. (2020)	Cross-sectional	Nurses /ICU, Surgical, Internal Medicine, Paediatric, Maternity, Gynaecology Units in Tertiary Government Hospitals	(375)	62.70	36.82	Cambodia	CBI	IWS	Pearson's Correlation, SEM	JS-Burnout ($r = .23^{**}$)	Burnout- JS (Direct effect = 0.02)
Kumar et al. (2007)	Cross-sectional	Psychiatrists	426 (239)	37.00	48.00 /41-50	New Zealand	MBI	JDS	Spearman's ρ	§JS-EE ($r = -.38^{***}$) JS-DP ($r = -.38^{***}$) JS-PA ($r = .29^{***}$)	
Li et al. (2018)	Cross-sectional	Anaesthesiologists Anaesthesia Residents /Tertiary, Non-tertiary Hospitals	4,111 (2,873)	Total 55.00 Beijing 59.00 Tianjin 52.00	Total 48.00 /30-39 Beijing 48.00 /30-39 Tianjin 42.00 /30-39	China	MBI-HSS	MSQ	Spearman's ρ	§JS-EE ($r = -.57^{***}$) JS-DP ($r = -.43^{***}$) JS-PA ($r = .40^{***}$) IJS-EE ($r = -.53^{***}$) IJS-DP ($r = -.40^{***}$) IJS-PA ($r = .43^{***}$) EJS-EE ($r = -.53^{***}$) EJS-DP ($r = -.39^{***}$) EJS-PA ($r = .31^{***}$)	

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Liu & Aunguroch (2017)	Cross-sectional	Nurses /Surgical, Medical, OBGYN, Paediatric, EENT, ER, ICU in Tertiary Hospitals	537 (510)	99.22	Hebei 51.00 Hebei 53.00 /30-39 59.98 /20-29	China	MBI-HSS Chinese Version (Maslach et al., 1996; Li & Liu, 2000)	34-item Chinese Nurse Job Satisfaction Scale (CNJSS; Liu et al., 2017)	Unspecified Correlation Analysis, SEM, Path Coefficients, Squared Multivariate Correlation (R ²)	JS-Burnout ($r = -.49^{**}$)	JS-Burnout (Direct Effect = $-.70^{***}$)
Liu et al. (2015)	Cross-sectional	Nurses /Cardiac Critical Care Units of large General Hospitals	(215)	98.60	62.33 /<30	China	MBI Chinese Translation	MMSS Chinese Translation	Spearman's ρ Stepwise Multiple Regression	§EE-JS ($r = -.488^{***}$) DP-JS ($r = -.334^{***}$) PA-JS ($r = .328^{***}$)	<u>Model 3</u> JS-EE ($\beta = -0.258^{***}$) <u>Model 4</u> JS-EE ($\beta = -0.259^{***}$) JS-PA ($\beta = 0.156^{**}$) <u>Model 5</u> JS-EE ($\beta = -0.276^{***}$) JS-PA ($\beta = 0.161^{**}$)
Mijakoski et al. (2021)	Cross-sectional	Doctors, Nurses /Hospital Surgery Clinic	(160)	68.00	44.85	Republic of Macedonia	EE and DP subscales of the MBI (Maslach, et al., 2001)	39-item Job Satisfaction Survey (Powell, 2001)	Hierarchical Multiple Regression Analyses	†§EE-JS	Planning Issues ($\beta = -0.26^*$) EE-JS General Attitudes ($\beta =$

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
											-.44***) DP-General Attitudes (β = -0.06) EE-JS Performance Issues (β = -0.34***) DP-JS Performance Issues (β = -0.15) EE-JS Management Issues (β = -0.40***) DP-JS Management Issues (β = -0.02) EE-JS Supervisory Issues (β = -0.29*) DP-JS Supervisory Issues (β = -0.06) EE-JS Training and Salary Issues (β = -0.39***) DP-JS Training and Salary Issues

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Myhren et al. (2013)	Cross-sectional	Nurses and Physicians /University Hospital ICU	196 (145)	84.00	-	Norway	25-item MBI (Maslach, et al., 2001)	10-item Job Satisfaction Scale (Warr & Cook, 1979)	Pearson's Correlation, Linear Regression, Bivariate Regression, Multivariate Regression	§EE-JS ($r = -.414^{***}$) DP-JS ($r = -.313^{***}$) PA-JS ($r = .122$, $p = .145$)	($\beta = -0.01$) EE-JS Benefits Issues ($\beta = -0.31^{**}$) DP-JS Benefits Issues ($\beta = -0.08$) <u>Bivariate</u> JS-EE ($\beta = -0.02^{***}$) <u>Multi-variate</u> JS-EE ($\beta = -0.01^{***}$) JS-DP ($\beta = -0.02^{**}$)
Oliviera et al. (2018)	Cross-sectional	HPs /Teaching Hospital	305 (271)	78.60	42.10 /36-50	Brazil	MBI-HSS Brazilian Version (Maslach et al., 1981; Benevides-Pereira, 2003)	36-item JSS Brazilian Version (Spector, 1997; Souza et al., 2015; Van Saane et al., 2003)	Partial Least Squares SEM Pearson's Correlation (R^2), Predictive Relevance (Q^2), Effect size coefficients (f^2), Goodness of Fit (GoF)	‡Burnout-JS (Path Coefficient = $-.57^{***}$, $R^2 = .38$). Adequate predictive relevance ($Q^2 = 0.15$), large effect size ($f^2 = .46$), and acceptable quality of adjustment (GoF = 0.42).	
Oncel et al. (2007)	Cross-sectional	Midwives /Public Health Clinics	450 (325)	-	34.10	Turkey	MBI-T	MSQ	Pearson's Correlation	§EE-GJS ($r = -.36^{**}$) EE-IJS ($r = -.32^{**}$) EE-EJS ($r = -.37^{**}$) DP-GJS ($r = -.19^{**}$) DP-IJS ($r = -.16^{**}$)	

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
										DP-EJS ($r = -.22^{**}$) PA-GJS ($r = -.04^{**}$) PA-IJS ($r = -.08^{**}$) PA-EJS ($r = .05^{**}$)	
Opoku et al. (2014)	Cross-sectional	Physicians /Public, Private Healthcare	1403 (200)	33.50	49.50 /18-29	Ghana	9-item Abbreviated MBI (Maslach et al., 1981; McManus et al., 2002)	21-item Physician Work Life Survey (PWLS; Linzer et al., 2001)	Multivariate Tobit Regression		‡JS-EE ($\beta = -1.478^{***}$) JS-DP ($\beta = -0.733^*$) JS-low PA ($\beta = -1.263^{**}$) Low PA-GJS ($\beta = -0.705^{***}$) ‡§DP-JS Relationship with Colleagues ($\beta = -0.038$) DP-JS Nursing Support ($\beta = -0.172^*$) DP-JS Resource Adequacy ($\beta = -0.122$) DP-JS Compensation ($\beta = -0.198^*$) DP-JS Work-life Balance ($\beta = -0.086$) DP-GJS ($\beta = -0.193$)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
											EE-JS Relationship with Colleagues ($\beta = -0.052$) EE-JS Nursing Support ($\beta = -0.201^{**}$) EE-JS Resource Adequacy ($\beta = -0.276^{***}$) EE-JS Compensation ($\beta = -0.332^{***}$) EE-JS Work-life Balance ($\beta = -0.363^{***}$) EE-GJS ($\beta = -0.40^{***}$) Low PA-JS Relationship with Colleagues ($\beta = -0.403^{***}$) Low PA-JS Nursing Support ($\beta = -0.192^*$) Low PA-JS Resource

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
											Adequacy ($\beta = -0.177$) Low PA-JS Compensation ($\beta = 0.091$) Low PA-JS Work-life Balance ($\beta = 0.124$)
Özden et al. (2013)	Cross-sectional	Nurses /ICUs in Teaching Hospitals	(206)	94.90	29.17	Turkey	MBI-T	MSQ-T	Unspecified Correlation Analysis	§JS-EE ($r = -.416^{***}$) JS-DP ($r = -.324^{***}$) JS-PA ($r = .336^{***}$)	
Ozyurt et al. (2006)	Cross-sectional	Physicians /Public Hospitals, Private Hospitals, University Hospitals, Primary Healthcare	768 (598)	36.00	41.00 /40-49	Turkey	MBI-T	MSQ-T	Unspecified Correlation Analysis	§JS-EE ($r = -.559^{***}$) JS-DP ($r = -.368^{***}$) JS-PA ($r = .359^{***}$)	
Peng et al. (2016)	NS	Nurses /General Hospitals	(583)	100.00	21.17	China	15-item MBI-GS	MSQ	Unspecified Correlation Analysis, SEM using Sobel Test and Bootstrap Method	JS-Burnout ($r = -.489^{**}$)	<u>Model 1</u> JS-Burnout (Path Coefficient = $-.18^*$) <u>Model 2</u> JS-Burnout (Path Coefficient = $-.19^*$) JS-Burnout (Direct effect)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Polat & Terzi (2018)	NS	Beginner Nurses /University Hospital	220 (218)	91.28	23.83	Turkey	MBI-T	MSQ-T	Pearson's Correlation	§IJS-EE ($r = -.417^{**}$) IJS-DP ($r = .395^{**}$) IJS-PA ($r = -.376^{**}$) EJS-EE ($r = -.500^{**}$) EJS-DP ($r = .249^{**}$) EJS-PA ($r = -.324^{**}$) GJS-EE ($r = -.499^{**}$) GJS-DP ($r = .363^{**}$) GJS-PA ($r = -.388^{**}$) JS-EE ($r = -.64^{***}$)	= -.316*)
Profit et al. (2014)	Cross-sectional	Nurses, Nurse Practitioners, Respiratory Care Providers, Physicians /Hospital NICU	3294 (2073)	84.80	-	United States of America	4-item Abbreviated EE subscale of MBI (Maslach et al., 1981; Block et al., 2013)	Job Satisfaction Subscale of the 30-item SAQ (Sexton et al., 2006)	Pearson's Zero-Order Correlations		EE Item 1 ('I feel fatigued when I get up in the morning and have to face another day on the job')-JS ($r = -.51^{***}$) EE Item 2 ('I feel burned out from my work')-JS ($r = -.54^{***}$) EE Item 3 ('I feel frustrated by my job')-JS ($r = -.68^{***}$) EE Item 4 ('I feel I am working too hard on my

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Ran et al. (2020)	Cross-sectional	HPs /Primary Healthcare	1300 (1279)	66.50	34.09 /41-50	China	9-items of the MBI-GS EE subscale (Maslach et al., 1981; Schutte et al., 2000)	14-item scale comprising the MSQ, Job Satisfaction Survey (Tsounis et al., 2018) & Job Descriptive Index (Lopes et al., 2015)	Pearson's Correlation, SEM using Bootstrap Method	JS-Burnout ($r = -.387^{**}$)	<i>job</i>)-JS ($r = -.45^{**}$) JS (<i>Working Environment</i>)-Burnout ($r = -.298^{**}$) JS (<i>Welfare</i>)-Burnout ($r = -.356^{**}$) JS (<i>Prospect of my Job</i>)-Burnout ($r = -.370^{**}$) JS (<i>Training and Learning Opportunities</i>)-Burnout ($r = -.342^{**}$) JS (<i>Income Distribution</i>)-Burnout ($r = -.350^{**}$) JS (<i>Management System and Business Process</i>)-Burnout ($r = -.386^{**}$) Burnout (Item ' <i>My work is heavy</i> ')-JS ($r = -.134^{**}$) Burnout (Item ' <i>I can't find</i>

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
											<i>personal accomplishment in my job</i>)-JS <i>(r = -.319**)</i> Burnout (Item <i>I'm indifferent to my job</i>)-JS <i>(r = -.352**)</i> Burnout (Item <i>I feel anxious and fretful</i>)-JS <i>(r = -.373**)</i> <u>SEM</u> Burnout-JS (Direct Effect = -.409***)
Rosales et al. (2013)	Cross-sectional	Nurses /Government Hospitals	(48)	95.83	25.00 /45-49	Philippines	MBI	JSS	Pearson's Correlation	§EE-JS (<i>r = -.632*</i>) DP-JS (<i>r = -.598*</i>) PA-JS (<i>r = .306*</i>)	
Sahin et al. (2019)	Cross-sectional	Doctors /State Hospitals	(158)	Sirnak 29.00 Hakkari 9.70 Canakkale 61.30	Sirnak 47.70 /30-34 Hakkari 56.30 /25-29 Canakkale 82.10 /40-44	Turkey	MBI-T	MSQ-T	Pearson's Correlation, Hierarchical Regression	§IJS-EE (<i>r = -.577***</i>) IJS-DP (<i>r = -.426***</i>) IJS-PA (<i>r = .494***</i>) EJS-EE (<i>r = -.445***</i>) EJS-DP (<i>r = -.298***</i>) EJS-PA (<i>r = .187*</i>) GJS-EE (<i>r = -.565***</i>) GJS-DP (<i>r =</i>	EE-GJS ($\beta = -0.257***$) DP-GJS ($\beta = -0.035$) PA-GJS ($\beta = 0.004**$)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Samad et al. (2021)	Cross-sectional	Nurses /Public Hospitals	315 (265)	-	-	Pakistan	9-item MBI EE Subscale Only	15-item Job Satisfaction Scale (Warr et al.,1979)	Partial Least Squares SEM using Bootstrap Method	-.401***) GJS-PA ($r = .407^{***}$)	†EE-JS ($\beta = -0.333^{***}$, $t = 5.726$, $f^2 = .152$)
Savanabavan et al. (2019)	Cross-sectional	HPs /Tertiary Care Hospital ICUs	264 (204)	75.49	83.33 /<30 yrs	South India	MBI-HSS	10-item Job Satisfaction Scale (Warr et al, 1979)	Pearson's Correlation	§EE-Job Dissatisfaction ($r = -.29^{**}$) PA- Job Dissatisfaction ($r = -.34^{**}$) DP- Job Dissatisfaction ($r = -.23^{**}$)	
Sok et al. (2020)	Cross-sectional	Nurses caring for Do Not Resuscitate (DNR) patients /Hospitals ICU	120 (115)	92.20	29.75	South Korea	Copenhagen Burnout Inventory Korean Version (Kristen et al., 2005)	Nursing Job Satisfaction Scale Korean Version (Stamps, 1978; Han & Mun, 1996)	Pearson's Correlation	JS-Burnout ($r = -.11$)	
Srivastava et al. (2019)	Cross-sectional	Doctors Medical colleges /Private Hospitals, Clinics	(240)	41.70	47.40 /21-30	India	MBI	JSS	Exploratory Factor Analysis, Unspecified Correlation Analysis, Unspecified Mediation Regression Analysis	JS-Burnout ($r = -0.36^{**}$)	

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Tarcan et al. (2017a)	Cross-sectional	HPs /ERs in Public Hospitals	(250)	46.00	34.78	Turkey	MBI-T	MSQ-T	Unspecified Correlational Analysis, Regression Analysis	§EE-IJS ($r = -.527^{***}$) EE-EJS ($r = -.537^{***}$) EE-GJS ($r = -.552^{***}$) DP-IJS ($r = -.470^{***}$) DP-EJS ($r = -.416^{***}$) DP-GJS ($r = -.447^{***}$) PA-IJS ($r = -.110$) PA-EJS ($r = -.176^{**}$) PA-GJS ($r = -.134^*$)	Burnout-GJS ($F = 38.514^{**}$, $R^2 = .320$). EE-GJS ($\beta = -0.424^{***}$) DP-GJS ($\beta = -0.112$) PA-GJS ($\beta = -0.114$) Burnout-IJS ($F = 27.5488^{**}$, $R^2 = .252$). EE-IJS ($\beta = -0.337^{***}$) DP-IJS ($\beta = -0.186^*$) PA-IJS ($\beta = -0.046$) Burnout-EJS ($F = 38.215^{**}$, $R^2 = .319$). EE-EJS ($\beta = -0.451^{***}$) DP-EJS ($\beta = -0.030$) PA-EJS ($\beta = -0.131^{**}$)
Tarcan et al., (2017b)	Cross-sectional	HPs /ERs in Public Hospitals	(250)	Eskisehir State Hospital 54.80	Eskisehir State Hospital 35.20	Turkey	MBI-T	MSQ-T	Bivariate Pearson's Correlation, Multiple Regression	§EE-IJS ($r = -.597^{**}$) EE-EJS ($r = -.573^{**}$) EE-GJS ($r = -.621^{**}$) DP-IJS ($r = -.479^{**}$)	EE-IJS ($\beta = -0.397^{***}$) EE-EJS ($\beta =$

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
									Analysis	DP-EJS ($r = -.390^{**}$) DP-GJS ($r = -.467^{**}$) PA-IJS ($r = -.311^{**}$) PA-EJS ($r = -.378^{**}$) PA-GJS ($r = -.359^{**}$)	-0.428***) EE-GJS ($\beta =$ -0.433***) DP-IJS ($\beta = -0.086$) DP-EJS ($\beta = 0.031$) DP-GJS ($\beta = -0.044$) PA-IJS ($\beta = -0.034$) PA-EJS ($\beta = -0.113^*$) PA-GJA ($\beta = -0.071$)
Tavakoli et al. (2018)	Cross-sectional	NPs /ERs in Educational Hospitals	788 (709)	58.90	33.00	Iran	MBI-HSS	Job Descriptive Index (JDI; Smith et al., 1969; Schneider et al., 1978)	Pearson's Correlation	JS-Burnout ($r = -.41^{***}$)	
Tokuda et al. (2009)	Cross-sectional	Physicians /Hospitals	336 (236)	25.40	40.90	Japan	MBI Japanese Version (Higashiguchi et al., 1998)	28-item Japan Hospital Physicians Satisfaction Scale (JHPSS; Ozaki et al., 2008)	SEM using Maximum Likelihood Estimations for Path Coefficient		‡All Physicians JS-EE (Unstandardized Path Coefficient = -.106***) JS-EE (Standardized Path Coefficient = -.60*)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
											<u>Male Physicians</u> JS-EE (Unstandardized Path Coefficient = -.105***) JS-EE (Standardized Path Coefficient = -.61*) <u>Female Physicians</u> JS-EE (Unstandardized Path Coefficient = -.114***) JS-EE (Standardized Path Coefficient = -.58*)
Topbaş et al. (2019)	Cross-sectional	Haemodialysis Nurses	126 (82)	89.00	34.50	Turkey	MBI-T	MSQ-T	Unspecified Correlation Analysis	§EE-JS ($r = -.564^{**}$) DP-JS ($r = -.427^{**}$) PA-JS ($r = .182$)	
Torun & Çavuşoğlu (2018)	Cross-sectional	Paediatric Nurses / Paediatric Hospitals	274 (235)	89.90	39.60 /25 – 29	Turkey	MBI-T	MSQ-T	Pearson's Correlation, Multiple Regression Analysis	§EE-IJS ($r = -.469^{***}$) EE-EJS ($r = -.435^{***}$) EE-GJS ($r = -.504^{***}$) DP-IJS ($r = -.352^{***}$) DP-EJS ($r = -.186^{**}$)	GJS-EE ($\beta = -0.432^*$) GJS-DP ($\beta = -0.260^*$) GJS-PA ($\beta = 0.366^*$) EE-GJS ($\beta = -0.366^*$)

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
										DP-GJS ($r = -.317^{***}$) PA-IJS ($r = .396^{***}$) PA-EJS ($r = .229^{***}$) PA-GJS ($r = .366^{***}$)	PA-GJS ($\beta = 0.265^*$)
Wang et al. (2020b)	Cross-sectional	Haemodialysis Nurses /Public, Private Hospitals	300 (283)	100.00	Public Hospitals 27.15 Private Hospitals 27.26	China	ProQOL Chinese Version (Dang et al., 2015)	MSQ Chinese Version (Ge et al., 2011; Jiang et al., 2019; Zhou et al., 2019)	Pearson's Correlation	§ <u>Public Hospitals</u> Burnout-IJS ($r = -.643^{**}$) Burnout-EJS ($r = -.675^{**}$) Burnout-GJS ($r = -.427^{**}$) Burnout-Total JS ($r = -.712^{**}$) <u>Private Hospitals</u> Burnout-IJS ($r = -.709^{**}$) Burnout-EJS ($r = -.792^{**}$) Burnout-GJS ($r = -.514^{**}$) Burnout-Total JS ($r = -.814^{**}$)	
Xiao et al. (2014)	Cross-sectional	Physicians /ERs in Public Hospitals	(205)	39.02	Male 37.60 /30-39 Female 43.70 /30-39	China	15-item MBI-GS	MSQ Chinese Version (Weiss et al., 1967; Ge et al., 2011)	Pearson's Correlation	§IJS-EE ($r = -.483^*$) IJS-Cynicism ($r = -.301^*$) IJS-PA ($r = .044$) EJS-EE ($r = -.355^*$) EJS-Cynicism ($r = -.336^*$) EJS-PA ($r = .048$)	

Authors (year)	Design	Population /Setting	Total N (Analysed n)	Female (%)	Mean Age (years)/ Median Age (% /years)	Country	Measure of Occupational Burnout	Measure of Job Satisfaction	Analyses	Correlations between Burnout and Job Satisfaction	Additional Findings
Yoon & Sok (2016)	Cross-sectional	Nurses /Emergency Medical Centres	240 (236)	-	33.53 /20-25	Korea	21-item MBI Revised (Maslach et al., 1981; Yang, 2009)	19-item MSQ Revised (Weiss et al., 1967)	Pearson's Correlation	JS-Burnout ($r = -.435^{***}$)	
Zhang et al. (2021)	Cross-sectional	GPs /Community	3244 (3236)	63.80	45.40 /31-40	China	MBI-HSS	11-item Job Satisfaction Scale (Shi et al., 2014)	Pearson's Correlation, Multiple Regression Analysis, SEM using Bootstrap Method	§EE-JS Basic Demands ($r = -.340^{***}$) EE-JS Relationship ($r = -.376^{***}$) EE-JS Personal Development ($r = -.283^{***}$) DP-JS Basic Demands ($r = -.219^{***}$) DP-JS Relationship ($r = -.282^{***}$) DP-JS Personal Development ($r = -.194^{***}$) PA-JS Basic Demands ($r = .092^{***}$) PAE-JS Relationship ($r = .200^{***}$) PA-JS Personal Development ($r = .109^{***}$)	JS-Burnout (Direct Effect = $-.42^{***}$) JS-Burnout (Total Effect = $-.42^{***}$)
Zhao et al. (2020)	Cross-sectional	Pharmacists /Hospitals	1786 (1394)	60.20	40.90 /31-40	China	MBI-HSS	15-items from JSS & MSQ	Pearson's Product-Moment Correlations	§EE-JS ($r = .16^*$) DP-JS ($r = .27^*$) PA-JS ($r = .28^*$)	

Note. Correlation coefficients (i.e., *r*-coefficients) are reported as stated in the original paper in relation to decimal places for accuracy and transparency (i.e., as 2 *d.p.* or 3 *d.p.*). SEM – Structural Equation Modelling; HRS – Hierarchical Relations Satisfaction; WES – Work Environment Satisfaction; WISPGO – Work Intrinsic Satisfaction and Professional Growth Opportunities; SHR – Satisfaction with Hierarchical Relations; SPWE – Satisfaction with Physical Work Environment; IJS – Intrinsic Job Satisfaction; EJS – Extrinsic Job Satisfaction; GJS – General Job Satisfaction; EE – Emotional Exhaustion; DP – Depersonalization; PA – Personal Accomplishment; OT – Occupational Therapists; NICU(s) – Neonatal Intensive Care Unit(s); PICU(s) – Paediatric Intensive Care Unit(s); ICU(s) – Intensive Care Unit(s); ER(s) – Emergency Rooms/Department(s); EENT – Eyes, Ears, Nose and Throat Department(s); GPs – General Practitioners; OBGYN - Obstetrics and Gynaecology Department; HP(s) – Healthcare Professional(s); NP(s) – Nursing Professional(s); MSQ – Minnesota Satisfaction Questionnaire (Weiss et al., 1967); MSQ-T – Minnesota Satisfaction Questionnaire Turkish Version (Weiss et al., 1967; Dawis et al., 1967; Baycan, 1985); JSS – Job Satisfaction Survey (Spector, 1997); JSQ – Job Satisfaction Questionnaire Brazilian Version (Carlotto et al., 2008); CNJSS – Chinese Nurse Job Satisfaction Scale (Liu, 2017); MMSS – Mueller-McCloskey Satisfaction Scale (Mueller & McCloskey, 1990); WSQ – Work Satisfaction Questionnaire (Hackman & Oldham, 1980); IJSS – Index of Job Satisfaction Scale (Brayfield & Rothe, 1951); SAQ – Safety Attitudes Questionnaire (Sexton et al., 2006); SAQ-Short – 5-item Safety Attitudes Questionnaire (Sexton et al., 2006; Carvalho & Casiani, 2012); SAQ-P – Safety Attitudes Questionnaire Portuguese (Brazilian) version (Carvalho & Cassiani, 2012); JDS – Job Diagnostic Survey (Hackman & Oldham, 1975); JDSS – Job Discrepancy and Satisfaction Scale (Naggy, 2002); IWS – Index of Work Satisfaction (Stamps, 1978; 1998); 5-item JSS – Job Satisfaction Questionnaire (Judge et al., 2001); MBI – Maslach Burnout Inventory (Maslach et al., 1981; Maslach et al., 1996); MBI-HSS – MBI-Human Services Survey ((Maslach et al., 1996); MBI-GS – MBI-General Survey; MBI-T – MBI Turkish Version (Maslach et al., 1981; Ergin, 1992; Cam, 1991); MBI-G – MBI German Version (Maslach et al., 1981; Büssing, Perrar & Die, 1992); ProQOL – Professional Quality of Life Survey (Stamm, 2009); CBI – Copenhagen Burnout Inventory (Kristen et al., 2005; Borritz, 2006); OLBI – Oldenburg Burnout Inventory (Demerouti et al., 2001).

†Converted effects sizes into *r*; ‡Narrative synthesis only; §Data that was pooled to give one pooled *r*-coefficient to enter into the meta-analysis using MAVIS (version 1.1.3) which runs R software; - Missing Data.

p* < .05; *p* < .01; ****p* < .001

Methodological Quality Appraisal

Table 2 summarises the results of quality appraisal using the modified CASP Cohort Checklist (CASP, 2018). Ratings ranged from three to eight, with a maximum score of nine. Of the 54 studies included in the meta-analysis, 36 were rated as *'moderate'* in methodological quality, 14 were rated as *'high'* and four were rated as *'low'*. Of the four studies not included in the meta-analysis, three were rated as *'high'* in methodological quality and one was rated as *'moderate'*. Since these studies met the inclusion criteria related to the research question, these studies were included in the narrative synthesis to reduce inevitable bias should these studies be omitted.

The total sample size of studies eligible for inclusion in the meta-analysis was 27,667. Forty-nine studies included over 100 participants. Studies with sample sizes of less than 100 participants failed to address this in the limitations or correct for this (Abaoğlu et al., 2021; Delgadillo et al., 2017; Karakose, 2014; Rosales et al., 2013; Topbaş et al., 2019). Studies also failed to conduct power calculations. However, given that most studies had a sample size greater than 100 it is likely that they were appropriately powered to find true results.

Several themes appeared to contribute to lower quality ratings. Given the nature of cross-sectional design, studies did not identify or control all important confounding variables that may have influenced the association between job satisfaction and burnout. For example, demographic and organisational factors (Tarcan et al., 2017a), stress (Khamisa et al., 2016; Friganović et al., 2019), personality (Mahoney et al., 2020; Li & Xie, 2020; Zhao et al., 2020), emotional intelligence (Weng et al., 2011), turnover intentions (Scanlan et al., 2013; Wang et al., 2020a), and quality of life (Li et al., 2020). Generalisability of study findings also proved problematic due to selection bias, non-representative samples of participants (e.g., proportions of male/female participants), participant bias, and lack of reporting on participant characteristics (e.g., ethnicity). Insufficient consideration of the implications for clinical practice also impacted quality ratings.

Recommendations were not supported by referenced evidence, recommendations appeared vague

(e.g., suggesting unspecified policy change), or the implications were linked to research findings. Participant recruitment was sub-optimal across the majority of studies. Lower ratings were due to a limited age range of participants, researcher bias (e.g., researchers directly asking participants to participate), sampling method (e.g., snowball sampling or recruitment of participants via social media), insufficient details about the recruitment procedure, and participants being selected from institutions/settings that the researchers were affiliated with.

The Cohen's Kappa statistic for interrater reliability based on 10% of studies was .76 ($p < .001$, 95% CI [.59, .92]). According to Altman (1999), adapted from Landis & Koch (1977), this represents a '*substantial*' or '*good*' level of agreement.

Table 2*Quality Appraisal and Risk of Bias Evaluations*

Paper	Q1 - Focused Research Question	Q2 - Recruitment of Participants	Q4 - Outcome Accurately Measured	Q5a - Identified Important Confounds	Q7 - Results	Q8 - Precision of Results	Q9 - Believe Results	Q10 - Generalisability	Q11 - Fits with Existing Literature	Q12 - Implications	Total 'Y'	Total Quality Rating
Abaoğlu et al. (2021)	Y	Y	Y	N	Y	N	Y	Y	Y	N	7	HIGH
Akman et al. (2016)	Y	N	Y	N	Y	N	N	N	N	Y	4	MODERATE
Alharbi et al. (2016)	Y	Y	Y	N	N	N	N	Y	N	Y	5	MODERATE
Alimoglu et al. (2005)	N	N	Y	N	Y	N	Y	N	Y	N	4	MODERATE
Alves et al. (2016)	Y	N	Y	N	Y	N	Y	N	Y	Y	6	MODERATE
Alvi et al. (2018)	Y	N	Y	N	N	Y	N	N	N	N	3	LOW
Bahadirli et al. (2021)	Y	Y	Y	N	N	Y	Y	Y	N	N	6	MODERATE
Baumgardt et al. (2015).	Y	Y	Y	N	Y	N	Y	Y	Y	Y	8	HIGH
Delgadillo et al. (2018)	Y	Y	Y	N	Y	Y	Y	Y	Y	N	8	HIGH
Duan et al. (2019)	Y	Y	Y	N	Y	N	Y	Y	Y	N	7	HIGH
Dutra et al. (2018)	N	N	Y	N	Y	Y	Y	Y	Y	N	6	MODERATE
Ebling et al. (2012)	Y	N	Y	N	Y	N	Y	Y	Y	N	6	MODERATE
Frganović et al. (2021)	Y	Y	Y	N	Y	Y	Y	Y	Y	N	8	HIGH
Garcia et al. (2021)	Y	N	Y	N	N	N	N	Y	Y	N	4	MODERATE
Ge et al. (2011)	Y	Y	Y	N	N	N	Y	Y	N	Y	6	MODERATE
Görgülü et al. (2016)	N	N	Y	N	Y	Y	Y	N	Y	Y	6	MODERATE
Hayes et al. (2015)	Y	Y	Y	N	Y	N	Y	N	Y	Y	7	HIGH
Karakose et al. (2014)	Y	N	Y	N	N	N	N	N	N	N	2	LOW
Kaya et al. (2021)	Y	Y	Y	N	Y	N	Y	N	Y	Y	7	HIGH
Kelleci et al. (2011)	Y	N	Y	N	Y	N	Y	N	Y	N	5	MODERATE
Khamisa et al. (2015)	N	N	Y	N	N	N	N	Y	N	Y	3	LOW
Kim et al. (2017)	Y	Y	Y	N	Y	N	Y	N	Y	Y	8	HIGH
Kim et al. (2019)	Y	Y	Y	N	Y	Y	Y	N	Y	Y	4	MODERATE
Koy et al. (2019)	Y	Y	Y	N	N	N	N	N	N	Y	4	MODERATE
Kumar et al. (2007)	Y	Y	Y	N	Y	N	Y	Y	Y	N	7	HIGH
Li et al. (2018)	Y	N	Y	N	Y	Y	Y	Y	N	N	6	MODERATE
Liu et al. (2017)	Y	Y	Y	N	Y	N	Y	N	Y	N	6	MODERATE
Liu et al. (2015)	Y	N	Y	N	Y	Y	Y	N	Y	N	6	MODERATE
Mijakoski et al. (2021)	Y	N	Y	N	Y	Y	N	N	Y	Y	6	MODERATE
Myhren et al. (2013)	Y	N	Y	N	Y	N	Y	Y	N	N	5	MODERATE
Oncel et al. (2007)	Y	N	Y	N	Y	N	Y	N	N	N	4	MODERATE
Opoku et al. (2014)‡	Y	Y	Y	N	N	N	N	Y	N	N	4	MODERATE
Özden et al. (2013)	Y	N	Y	N	Y	N	Y	N	Y	Y	6	MODERATE

Paper	Q1 - Focused Research Question	Q2 - Recruitment of Participants	Q4 - Outcome Accurately Measured	Q5a - Identified Important Confounds	Q7 - Results	Q8 - Precision of Results	Q9 - Believe Results	Q10 - Generalisability	Q11 - Fits with Existing Literature	Q12 - Implications	Total 'Y'	Total Quality Rating
Ozyurt et al. (2006)	Y	Y	Y	N	Y	Y	Y	Y	Y	N	8	HIGH
Peng et al. (2016)	Y	N	Y	N	Y	Y	Y	N	Y	N	6	MODERATE
Polat et al. (2018)	Y	N	Y	N	N	N	N	Y	N	Y	4	MODERATE
Profit et al. (2014)	Y	Y	Y	N	Y	N	Y	Y	Y	N	7	HIGH
Ran et al. (2020)	Y	N	Y	N	Y	N	Y	Y	Y	N	6	MODERATE
Rosales et al. (2013)	Y	Y	Y	N	Y	N	N	N	N	N	4	MODERATE
Sahin et al. (2019)	Y	N	Y	N	Y	Y	Y	Y	Y	N	7	HIGH
Samad et al. (2021)	Y	N	Y	N	Y	N	Y	N	Y	Y	6	MODERATE
Savanabavan et al. (2019)	Y	N	Y	N	N	N	N	N	N	N	2	LOW
Sok et al. (2020)	Y	Y	Y	N	N	N	N	Y	N	N	4	MODERATE
Srivastava et al. (2019)	Y	N	Y	N	Y	N	Y	N	N	Y	5	MODERATE
Tarcan et al. (2017a)	Y	N	Y	N	Y	N	N	Y	N	Y	4	MODERATE
Tarcan et al. (2017b)	Y	N	Y	N	Y	N	N	Y	N	N	6	MODERATE
Tavakoli et al. (2018)	Y	Y	Y	N	Y	N	Y	N	Y	N	6	MODERATE
Topbaş et al. (2019)	Y	N	Y	N	Y	N	N	Y	Y	Y	6	MODERATE
Torun et al. (2018)	Y	N	Y	N	Y	N	Y	N	Y	Y	6	MODERATE
Wang et al. (2020b)	Y	Y	Y	N	Y	N	Y	N	Y	N	6	MODERATE
Xiao et al. (2014)	Y	N	Y	N	Y	N	Y	Y	Y	Y	7	HIGH
Yoon et al. (2016)	Y	N	Y	N	Y	Y	Y	N	Y	N	6	MODERATE
Zhang et al. (2021)	Y	Y	Y	N	Y	N	Y	Y	Y	Y	8	HIGH
Zhao et al. (2020)	Y	Y	Y	N	N	N	Y	Y	N	N	5	MODERATE
Alrawashdeh et al. (2021)†	Y	N	Y	N	Y	Y	Y	N	Y	Y	7	HIGH
Chen et al. (2019)†	Y	Y	Y	N	Y	N	Y	Y	Y	N	7	HIGH
Tokuda et al. (2009)†	Y	N	Y	N	Y	Y	Y	N	Y	Y	7	HIGH
Oliveira et al. (2018)‡	Y	N	Y	N	Y	Y	Y	N	Y	N	6	MODERATE

Note: Y - represents 'Yes' (i.e., the study met criteria for that CASP Cohort Checklist quality appraisal item and was given a score of one); N - represents 'No' (i.e., the study did not demonstrate evidence that it met criteria for that CASP Cohort Checklist quality appraisal item and was given a score of zero); All papers are scored out of a maximum of nine; Ratings of six or above indicate 'high' methodological quality; Ratings greater than three but less than six indicate 'moderate' methodological quality; Ratings of three or less indicate 'low' methodological quality.

†Studies only included in the narrative synthesis; ‡Study in which some of the data was included in the meta-analysis and some in the narrative synthesis.

Narrative Synthesis

Two studies conducted multivariate logistic regression. Alrawashdeh et al. (2021), rated as 'high' in methodological quality, demonstrated a significant negative association between job satisfaction and burnout amongst physicians working across public and private sector healthcare in Jordan ($\beta = -0.6, p < .001$). Given the magnitude of this β -coefficient it could not be converted into an r -coefficient for inclusion in the meta-analysis (Peterson et al., 2005). The same was true for Opoku et al. (2014), who found a significant negative association between job satisfaction and EE ($\beta = -1.48, p < .001$) and PA ($\beta = -1.26, p < .01$), respectively, amongst physicians working in public and private settings in Ghana. This study was rated as 'moderate' in methodological quality.

Three studies used Structural Equation Modelling (SEM) to analyse the relationship between job satisfaction and burnout amongst healthcare professionals. These analyses produced standardized path coefficients that were not possible to convert into r -coefficients. Two studies found significant negative associations between burnout and job satisfaction amongst healthcare professionals working in primary care in China (path coefficient = $-0.41, p < .001$; Chen et al., 2019) and a teaching hospital in Brazil (path coefficient = $-0.57, p < .001$; Oliveira et al., 2018). These studies were rated as 'high' and 'moderate' in methodological quality, respectively. Tokuda et al. (2009) found a significant negative relationship between job satisfaction and EE amongst physicians working in hospitals in Japan (path coefficient = $-0.60, p < .05$). This study was rated as 'high' in methodological quality.

Meta-Analysis¹

Primary Analysis

In accordance with Cohen (1988, 1992), the effect sizes (i.e., r -coefficients) of studies included in the meta-analysis ($n = 54$) demonstrated large variability, ranging from a large negative

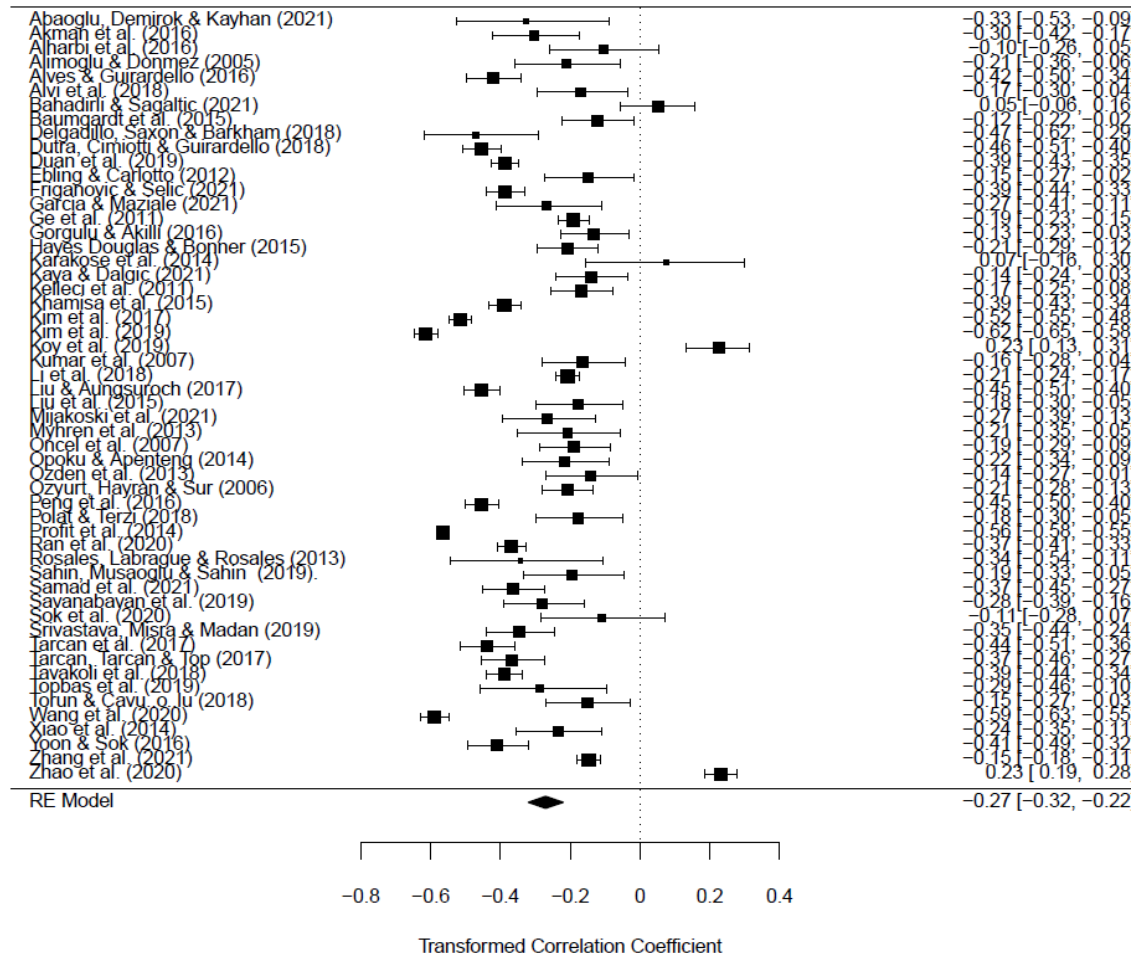
¹ See Appendix H for the results from the standardisation of statistical data.

correlation ($r = -.72$) to a small positive correlation ($r = .24$). Random-effects analysis revealed a significant small-to-medium negative pooled r -coefficient between job satisfaction and burnout ($r = -.29$; 95% CI [-.35; -.22], $z = -8.35$, $p < .001$; see Figure 2). Cochran's Q-test ($Q[53] = 1697.31$, $p < .001$) and the I^2 statistic (96.9%; 95% CI [96.4%; 97.3%]) indicated large and significant heterogeneity.

Secondary random-effects analyses revealed a significant medium negative pooled r -coefficients between EE and job satisfaction ($r = -.40$; 95% CI [-.47; -.33], $z = -9.85$, $p < .001$), with the I^2 statistic (97.0%; 95% CI [96.5%; 97.5%]) and Cronbach's Q-test ($Q[37] = 1235.45$, $p < .001$) demonstrating large and significant heterogeneity. Additionally, a significant small-to-medium negative pooled r -coefficient was found between DP and job satisfaction ($r = -.29$; 95% CI [-.36; -.21], $z = -7.42$, $p < .001$), with the I^2 statistic (95.7%; 95% CI [94.7%; 96.4%]) and Cronbach's Q-test ($Q[33] = 750.62$, $p < .001$) demonstrating large and significant heterogeneity. In contrast, random-effects analysis revealed a significant small positive r -coefficient between PA and job satisfaction ($r = .20$; 95% CI [.13; .26], $z = 5.47$, $p < .001$), with the I^2 statistic (94.7%; 95% CI [93.4%; 95.7%]) and Cronbach's Q-test ($Q[31] = 581.81$, $p < .001$) demonstrating large and significant heterogeneity.

Figure 2

Forest Plot showing the Associations (r) between Job Satisfaction and Burnout amongst Healthcare Professionals.



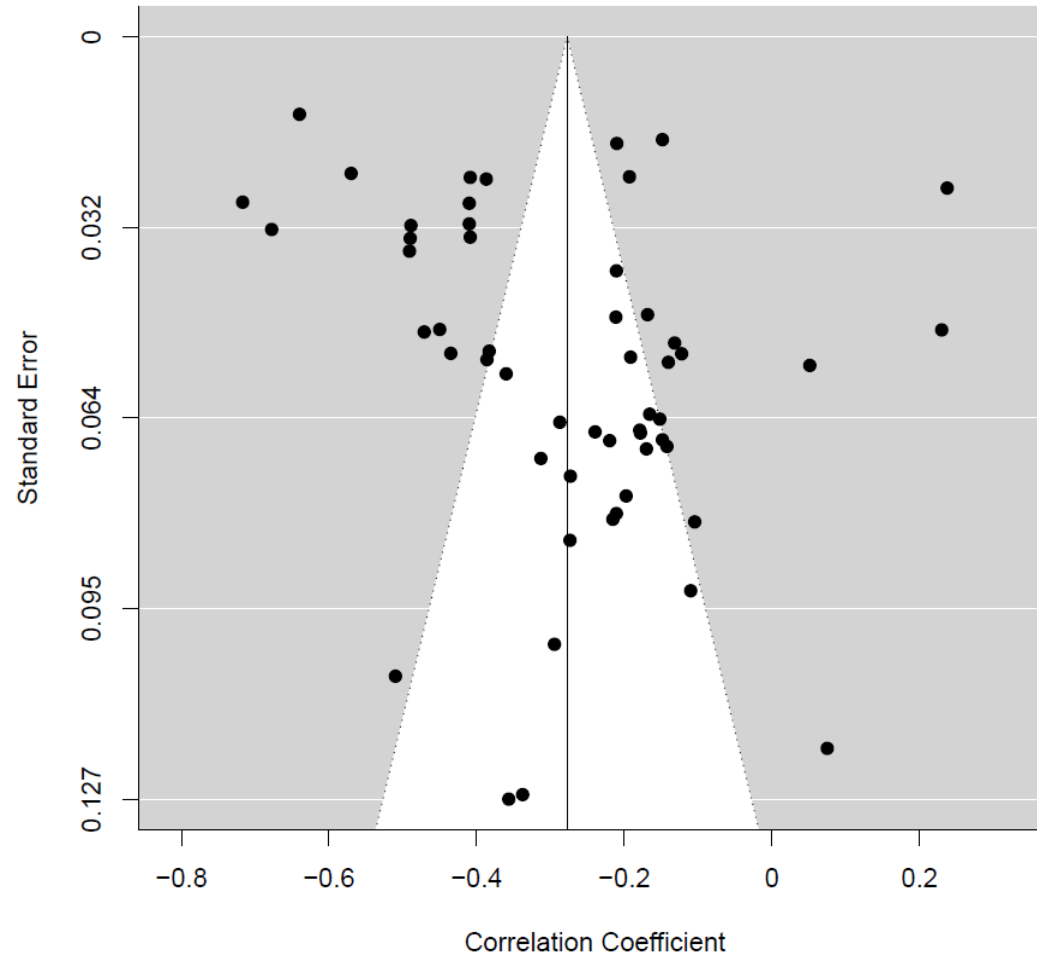
Note. Squares show individual study *r*-coefficients with 95% confidence intervals. The pooled correlation coefficient (*r*) is represented by the black diamond.

Publication Bias

Publication bias was not indicated through visual analysis of the random-effects funnel plot or trim-and-fill (Duval et al., 2002a, 2002b; Duval, 2005; see Figure 3). The weighted regression test (Egger et al., 1997) was significant at $p < .05$ ($t(52) = 2.19, p = .033$) whilst the rank correlation test (Begg et al., 1994) was non-significant ($\tau = 0.19, p = .305$). The weighted Fail-safe N, using the Rosenthal approach (Rosenthal, 1979), estimated that 55,483 non-significant studies would be required to render the results of this meta-analysis non-significant.

Figure 3

Random-effects Funnel Plot to Examine Publication Bias.



Note. Circles show individual studies included in the random-effects meta-analysis. Open circles would have demonstrated missing null studies estimated with the trim-and-fill method.

Sensitivity Analysis

In accordance with Table 3, sensitivity analysis revealed that the pooled effect size (i.e., r -coefficient) for studies using the MBI ($n = 46$) was similar to the primary random-effects analysis ($r = -.25$; 95% CI $[-.31; -.20]$, $z = -8.50$, $p < .001$). The between-groups Q-test was significant at $p < .01$ ($Q = 17.05$, $p = .004$) and, comparably, the I^2 statistic (95%) and Q-test for group heterogeneity ($Q = 998.80$, $p < .001$) was substantial and significant. The pooled r -coefficient for studies using the MSQ ($n = 23$) was also similar to the primary random-effects analysis ($r = -.25$; 95% CI $[-.31; -.20]$, $z = -8.48$, $p < .001$) and the between-groups Q-test was significant ($Q = 61.01$, $p < .001$). The I^2 statistic (89%) and Q-test ($Q = 202.97$, $p < .001$) demonstrated that heterogeneity was substantial and significant.

On the basis of overlapping 95% CI, further sensitivity analyses demonstrated pooled r -coefficients similar to the primary random-effects meta-analysis. Studies appraised as 'moderate' ($r = -.26$; 95% CI $[-.33; -.19]$, $z = -7.02$, $p < .001$) and 'high' ($r = -.30$; 95% CI $[-.40; -.18]$, $z = -4.98$, $p < .001$) in methodological quality were not significantly different ($Q = 0.56$, $p = .756$). They demonstrated similar I^2 statistics (95% and 97%, respectively) and the Q-test for heterogeneity was significant for studies appraised as 'moderate' ($Q = 769.32$, $p < .001$) and 'high' ($Q = 419.72$, $p < .001$). Studies that recruited participants from hospital settings ($r = -.27$; 95% CI $[-.35; -.19]$, $z = -6.47$, $p < .001$) demonstrated a non-significant between-groups Q-test ($Q = 2.52$, $p = .926$) with an I^2 of 97% and significant Q-statistic for heterogeneity ($Q = 834.43$, $p < .001$). Studies recruiting nurses ($r = -.31$, 95% CI $[-.38; -.24]$, $z = -8.01$, $p < .001$) and mixed healthcare professionals ($r = -.31$, 95% CI $[-.42; -.19]$, $z = -4.88$, $p < .001$) were not significantly different ($Q = 13.22$, $p = .212$). The I^2 and Q-statistic for heterogeneity for nurses were 93% and 365.71 ($p < .001$), respectively, and the I^2 and Q-statistic for heterogeneity for healthcare professionals were 96% and 242.12 ($p < .001$), respectively. Finally, studies conducted in East Asia ($r = -.32$, 95% CI $[-.41; -.23]$, $z = -6.29$, $p < .001$) and West Asia ($r = -.20$, 95% CI $[-.29; -.10]$; $z = -3.85$, $p < .001$) were not significantly different ($Q = 10.45$, $p = .315$). Although the Q-statistic for heterogeneity were significant for both

East Asia ($Q = 710.50, p < .001$) and West Asia ($Q = 60.62, p < .001$), the I^2 statistic for East Asia was substantial at 98%, whilst the I^2 statistic for West Asia was just below what would be considered substantial heterogeneity at 74% (Higgins et al., 2003).

Table 3*Sensitivity Analysis based on Clinical and Methodological Characteristics and Quality Appraisal*

Sensitivity	<i>r</i>	95% CI	Between-groups Q-statistic	k	<i>z</i>	I ²	Q-statistic for Group Heterogeneity
Burnout Measure							
MBI	-.25***	-.31, -.20	17.05**	46	-8.50	95%	998.80***
Job Satisfaction Measure							
MSQ	-.25***	-.31, -.20	61.01***	23	-8.48	89%	202.97***
Quality Appraisal Rating							
High	-.30***	-.40, -.18	0.56	14	-4.98	97%	522.46***
Moderate	-.26***	-.33, -.19		36	-7.02	95%	592.69***
Setting							
Hospital	-.27***	-.35, -.19	2.52	28	-6.47	97%	834.43***
Occupation							
Nurse	-.31***	-.38, -.24	13.22	27	-8.01	93%	365.71***
Mixed Healthcare Professional	-.31***	-.42, -.19		10	-4.88	96%	242.12***
Location							
East Asia	-.32***	-.41, -.23	10.45	15	-6.29	98%	710.50***
West Asia	-.20***	-.29, -.10		17	-3.85	74%	60.62***

Note. All results rounded to 2 d.p.**p*<.05, ***p*<.01, ****p*<.001.

Discussion

Summary of Evidence

This systematic review and meta-analysis sought to explore the strength and direction of associations between burnout and job satisfaction amongst healthcare professionals by pooling together correlational data from relevant and accessible research. Relatively few reviewed studies received 'low' methodological quality ratings, indicating that the evidence-base related to this topic is generally of 'moderate'-to-'high' quality. Overall, this meta-analysis evidenced a significant small-to-medium negative association between burnout and job satisfaction amongst healthcare professionals ($r = -.29$). Although the rank correlation test for funnel plot asymmetry (Begg et al., 1994) indicated some evidence of publication bias, visual analysis of the funnel plot and further statistical analyses suggested no significant evidence of publication bias. In addition, the Fail-safe N calculation suggested that 55,482 studies with null results would be required to contradict the findings of the primary meta-analysis. The five studies included in the narrative synthesis showed a pattern that supported the results of the primary analysis. However, the standardized path coefficients and regression coefficients (β -coefficients) suggest a stronger more negative relationship between the burnout and job satisfaction.

Further analyses revealed a significant medium negative, small-to-medium negative, and small positive associations between EE ($r = -.40$), DP ($r = -.29$) and PA ($r = .20$), and job satisfaction, respectively. Given the differences in the strength and direction of associations between MBI subscales and job satisfaction, it could be that the small positive association between PA and job satisfaction attenuated the medium negative association between EE and job satisfaction, resulting in a weaker overall pooled r -coefficient between burnout and job satisfaction. This may reflect the debate in the research – whether PA is a core feature or consequence of burnout (Brookings et al., 1985; Densten, 2001). Some researchers argue that burnout is represented by EE at its core (van Dierendonck et al., 1994; Rohlan et al., 2004; Dolan et al., 2015), some argue

that burnout is best represented by EE and DP together (Schaufeli et al., 2001; West et al., 2009; West et al., 2012), and others argue that PA is by-product of burnout that sits independently of burnout (Lee & Ashford, 1996; Kalliath et al., 2000; Demerouti et al., 2001). These arguments may explain the reduced strength of association witnessed in the primary random-effects analysis. However, without consensus in research community regarding how to conceptualise and measure burnout, any meta-analysis or systematic review is likely to be limited.

The results of this meta-analysis appear consistent with a recent meta-analysis exploring burnout, job satisfaction and intentions to leave in teachers (Madigan & Kim, 2021). Similar significant pooled r -coefficients have also been witnessed between each of the subscales of burnout (i.e., EE, DP and PA) and job satisfaction in a meta-analysis looking at burnout risk-factors amongst nursing professionals (Vargas et al., 2014); although this meta-analysis was limited to studies using the MBI and did not specify the inclusion of validated and reliable measures of job satisfaction.

The large heterogeneity in the primary random-effects meta-analysis suggests that the results be interpreted with caution. However, sensitivity analyses indicated that the burnout measure used (i.e., MBI), job satisfaction measure used (i.e., MSQ), quality appraisal rating (i.e., 'moderate' or 'high'), settings (i.e., hospitals), professional discipline (i.e., nurses and mixed healthcare professionals) and location of the study (i.e., East Asia) accounted for substantial proportions of this heterogeneity at the $p < .001$ level of significance. Therefore, the extent to which study r -coefficients (i.e., effect sizes) varied within this meta-analysis could be due to the large scale between-study heterogeneity across the formations clinical and methodological characteristics.

Methodological, Conceptual, and Theoretical Issues

Discrepancies across eligible studies emerged in relation to the measurement of burnout and job satisfaction. Burnout was measured using EE only, EE and DP together, or alternatively using

an entire validated measure but only reporting on the associations with EE and/or DP. Furthermore, some studies only gave data relating to overall burnout and job satisfaction, thus neglecting to demonstrate a more detailed picture of the association between subdimensions of burnout and job satisfaction. Additionally, job satisfaction was not measured in a consistent way across studies, given the abundance of outcome measures available. Some reported on intrinsic and extrinsic job satisfaction whilst others reported on the particular job aspects that come under the umbrellas of intrinsic and extrinsic factors. This is important because, whilst correlated, satisfaction with one area of the job does not guarantee satisfaction with another (Lum et al., 1998; Kavanaugh et al., 2006), even if they fall under the same umbrella. Although these differences created significant heterogeneity, many researchers are now using single item measures of burnout (West et al., 2009; West et al., 2012) and job satisfaction in studies using healthcare professionals (Shanfelt et al., 2012; Shanfelt et al., 2016; Janssen et al., 2004; Gunnarsdóttir et al., 2009; Liu et al., 2012; Liu et al., 2019; McNeary et al., 2008; Jasperse et al., 2014). Nevertheless, given the aforementioned discrepancies, studies did not offer a consistent and comprehensive understanding of the relationship between burnout and job satisfaction to allow for a seamless comparison across studies.

Studies often erroneously assumed that low job satisfaction scores were indicative of job dissatisfaction. According to Herzber (1968), job satisfaction and job dissatisfaction lie on distinct continuums (i.e., motivational vs. hygiene factors, respectively) from job satisfaction to the absence of job satisfaction and from job dissatisfaction to the absence of job dissatisfaction (Herzberg et al., 1959). Therefore, the evidence supports an association between burnout and an absence of job satisfaction. This may inform the development and efficacy of interventions – by targeting motivational factors to improve job satisfaction as opposed to targeting hygiene factors to reduce job dissatisfaction.

Strengths and Limitations of this Review

To date, this is the most comprehensive systematic review and meta-analysis investigating the association between burnout and job satisfaction amongst healthcare professionals. The breadth of data captured relating to healthcare populations, countries, and settings are likely to reflect ordinary healthcare settings, making the results informative for healthcare organisations. Although studies not accessible in the English language were excluded, the studies included gave rise to a culturally diverse perspective.

Generally, this review demonstrates several hallmarks of good practice. The protocol was pre-registered on the OSF prior to performing database searches, relevant literature was screened using a comprehensive and inclusive criteria across three electronic databases, forwards and backwards citation searches were conducted, quality appraisal assessments were independent corroborated, studies were not restricted by publication date, and a quantitative synthesis was conducted using narrative synthesis and meta-analysis; the contents and structure of which upheld PRISMA guidelines. This research also demonstrated additional rigour by including studies that used validated and reliable measures of burnout and job satisfaction. Finally, secondary analyses were conducted to understand the unique contributions of EE, DP, and PA to the results of the primary random-effects meta-analysis thus providing an additional layer of understanding to add to the evidence base.

However, findings should be considered in the context of its methodological limitations. The database screening process was conducted by one reviewer, which may introduce bias relating to subjective judgments of study eligibility. Therefore, it is not inconceivable that eligible studies were missed in the initial database screening process. Dual screening may have mitigated against this potential bias. However, a comprehensive and transparent log of studies assessed for eligibility and the reasons for inclusion/exclusion were provided to allow for evaluation of the eligibility judgements performed by the reviewer and future replication. Additionally, approximately half of

the eligibility studies included in this review were retrieved from citation searches, which may reflect issues surrounding the comprehensiveness of the search terms used. Extracted data was correlational from studies using cross-sectional design with inconsistent consideration of, and control over, confounding variables. Grey literature was excluded and, although this may have offered protection against the inclusion of potentially low-quality studies, it risked preventing potentially important findings from contributing to this review. Additionally, the association between burnout and job satisfaction amongst healthcare professionals captured in this review may be more complex than is being portrayed here. Research has shown that demographic and organisational factors (Tarcan et al., 2017a), stress (Khamisa et al., 2016; Friganović et al., 2019), personality (Mahoney et al., 2020; Li & Xie, 2020), emotional intelligence (Weng et al., 2011), turnover intentions (Scanlan et al., 2013; Scanlan et al., 2019; Hoff et al., 2019; Davis, 2020), and quality of life (Li et al., 2020) are associated with burnout and/or job satisfaction amongst healthcare professionals. Therefore, it could be that there exists an indirect relationship between job satisfaction and burnout mediated by some extraneous variable(s) or that burnout and job satisfaction simply co-vary. Regardless, suffice it to say that evidence of causation cannot be inferred from the findings of this review.

This review used a modified CASP Cohort Checklist (CASP, 2018) which omitted control over confounding variables as a basis for appraising methodological quality. Given that the majority of studies were of *'moderate'* methodological quality, an alternative critical appraisal tool specifically designed for cross-sectional studies, such as the AXIS (Downes et al., 2016), may have been more appropriate and allowed for a better distinction between *'low'*, *'moderate'* and *'high'* quality cross-sectional studies. Additionally, three out of the four studies included in the narrative synthesis only were rated as *'high'* in methodological quality. These studies demonstrated stronger and significant negative associations between job satisfaction and burnout. Therefore, inclusion of this data may have given more credence to the results of this meta-analysis, resulted in a stronger

negative association between job satisfaction and burnout found in the primary meta-analysis, and meant that the positive association between PA and job satisfaction did not attenuate the strength of association to the degree that it appeared to.

Implications for Research and Clinical Practice

Job satisfaction and burnout have been associated with staff turnover and turnover intentions (Scanlan et al., 2013; Scanlan et al., 2019; Hoff et al., 2019; Davis, 2020). Therefore, should healthcare organisations invest resources into interventions in support of staff wellbeing staff retention may improve. This would have implications in relation to the quality of care received by patients (Buchanan et al., 2019; Humphries et al., 2014; Ferry et al., 2020).

Although some studies have demonstrated equivocal or non-significant results (Moody et al., 2013; Horner et al., 2014; Sabanciogullari & Dogan, 2015; Train et al., 2010) and there is need for more longitudinal data to demonstrate the effectiveness of interventions at follow-up, interventions targeting burnout (Dreison et al., 2018; Klein et al., 2020; Salyers et al., 2011) and job satisfaction (Niskala et al., 2020) amongst healthcare professionals have shown promising results. Given that the strength of association between burnout and job satisfaction overall appeared largely driven by the medium negative association between EE and job satisfaction attenuated by the small positive association between PA and job satisfaction, developing interventions that target EE and/or PA may be avenues of future research to improve intervention efficacy.

Only one study included in this review conducted research in England (Delgadillo et al., 2017). Given that the NHS is the fifth largest employer globally and the single largest employer in Europe (Nuffield Trust, 2021), and is government funded thus having a unique and closely intertwined relationship with the UK government, healthcare professionals working in the NHS may face unique challenges. Therefore, it would be beneficial for research to evaluate the

relationship between job satisfaction and burnout unique to healthcare professionals in the NHS to ascertain whether the strength of association remains true outside of studies conducted across Asia.

Given that the majority of research was conducted on participant samples from nursing professions, future research would benefit from exploring this relationship across a broader range of healthcare professions. Future studies would also benefit from transparency in the recruitment of participants, should seek to use standardized, validated, and reliable measures of burnout and job satisfaction and seek to control for extraneous or confounding variables that may mediate or influence the association between job satisfaction and burnout. Finally, studies should seek to use longitudinal or randomised-control research designs to explore this relationship over-time and improve the standard of research in this field.

Conclusion

Occupational burnout is significantly associated with low job satisfaction in healthcare professionals, and this relationship is consistent across professional discipline, settings, and countries. The EE subscale of burnout had the strongest association with low job satisfaction, and this appeared attenuated by the small positive association between PA and job satisfaction to render the overall association between job satisfaction and burnout more understated. Therefore, EE and PA represent key targets for intervention to improve the occupational health and wellbeing of healthcare professionals.

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Appendices

Appendix A – Registered Protocol

Systematic review

*** Review title.**

Association between Job Satisfaction and Occupational Burnout in Healthcare Professionals.

*** Anticipated or actual start date.**

07/06/2021

*** Named contact.**

Nicole King

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*** Organisational affiliation of the review.**

The University of Sheffield

*** Review team members and their organisational affiliations.**

Nicole King, The University of Sheffield

Dr Jaime Delgado, The University of Sheffield

Dr Victoria Laker, Rotherham Doncaster and South Humber NHS Foundation Trust

*** Funding sources/sponsors.**

N/a

*** Conflicts of interest.**

N/a

*** Review question.**

Is there an association between job satisfaction and occupational burnout amongst healthcare professionals?

*** Searches.**

Titles, abstracts and keywords will be searched across three electronic databases: PsychINFO, Scopus and Web of Science.

Search terms will include variations of those listed below:

P (participants) – "healthcare professional" OR "healthcare practitioner" OR "mental health professional" OR "mental health practitioner" OR "medical practitioner" OR "frontline professionals" OR "frontline staff" OR "consultant" OR "therapist"

This search may be extended to search for more specific mental and physical health professions:

Doctor OR "general practitioner" OR nurse* OR therapist OR psychologist OR "psychodynamic psychotherapist" OR "wellbeing practitioner" OR psychiatrist OR clinician OR "occupational therapist" OR "healthcare assistant" OR "healthcare worker" OR "healthcare staff" OR "healthcare professional" OR "support worker" OR counsellor OR counselor OR registrar OR paramedic* OR physiotherapist or "speech and language therapist" OR chiropodist* OR podiatrist* OR "consultant" OR "therapist"

I (intervention) – N/a

C (Control/Comparison) – N/a

O (Outcome) – “occupational burnout” OR burnout OR burn-out OR “compassion fatigue” OR “burnout syndrome” or “professional burnout” OR “emotional exhaustion” OR “occupational stress” or “work-related stress” OR depersonalization OR “organizational burnout”

O (Outcome) – “job satisfaction” OR “employee satisfaction” OR “job dissatisfaction”

Forwards and backwards citation searching of the reference lists of articles eligible for inclusion in this review will be conducted to manually identify any additional articles. Reference lists of eligible studies will also be searched.

Additionally, corresponding authors (experts in the field) of selected studies will be contacted to ascertain whether any further papers can be identified that have not been identified through the above methods.

All articles will be exported to Mendeley to be managed. Duplications will be removed before articles are screened for eligibility.

Inclusion Criteria:

- Observational studies which include adult participants (aged 18 years and older) whose professional discipline fall under the category of healthcare profession (e.g., concerning mental and physical health) and who therefore work in healthcare.
- Participants across public and private sector healthcare.
- Outcomes are recorded using validated measures of Occupational Burnout (e.g., Maslach Burnout Inventory (Maslach & Jackson, 1981), Oldenburg Burnout Inventory (Demerouti et al., 2002), Copenhagen Burnout Inventory (Kristensen et al., 2005)).
- Outcomes are recorded using validated measures of Job Satisfaction (e.g., Job Satisfaction Survey (Spector, 1985), Job in General Scale (Ironson et al., 1989), Andrew and Withey (1976) Job Satisfaction Questionnaire, Emergency Physician Job Satisfaction Instrument (Lloyd, 1994), McCloskey/Mueller Satisfaction Scale (Mueller & McCloskey, 1990), Measure of Job Satisfaction (Traynor & Wade, 1993), Nurse Satisfaction Scale (Ng, 1993), Job Diagnostic Survey (Hackman & Oldham, 1974, 1975), Job Satisfaction Index (Schriesheim & Tsue, 1980), Global Job Satisfaction (Warr, Cook & Wall, 1979), Minnesota Satisfaction Questionnaire, Job Satisfaction Relative to Expectations (Bacharach, Bamberger & Conley, 1991), Job Descriptive Index (Smith, Kendall & Hulin, 1969)).
- Study Design: Observational (e.g., cohort, cross-sectional, case-control)
- Study Design: Experimental (e.g., Randomized Control Trials)
- A quantitative analysis of associations is included and reported in studies.

Exclusion Criteria:

- Research articles where more than 50% of participants are aged under 18 years.
- Research articles written in languages other than English, or which have not been translated to English, due to lack of resources to commission translations.
- Research articles which have not been peer reviewed by an academic journal (i.e., grey literature), in order to restrict reviewed studies to those of a minimum standard of quality.
- Research articles which evaluated the association between job satisfaction and occupational burnout amongst participants whose professional discipline could not be categorized as healthcare (e.g., teachers, police etc).
- Research studies which are qualitative.
- Research studies which record outcomes relating to job satisfaction and occupational burnout using measures that are not validated or reliable (i.e., outcomes not recorded using any validated measure as defined above).

Articles which do not meet the eligibility criteria will be excluded. The number of excluded studies will be recorded at each stage of the screening and assessment of eligibility process.

* **Condition or domain being studied.**
Occupational Burnout

* **Participants/population.**
Adults whose professional discipline falls under that of healthcare professional and therefore work in healthcare, including mental and physical health.

* **Intervention(s), exposure(s).**
Impact of working in healthcare (mental healthcare or physical healthcare).

* **Comparator(s)/control.**
N/a

* **Types of study to be included.**
Quantitative Observational Studies which evaluate the association between Job Satisfaction and Occupational Burnout amongst Healthcare Professionals.

Quantitative Experimental Studies which evaluate the association between Job Satisfaction and Occupational Burnout amongst Healthcare Professionals. For experimental studies that specifically target occupational burnout and job satisfaction, data will only be extracted that is available prior to exposure to the experimental intervention.

* **Main outcome(s).**
Job Satisfaction, as measured quantitatively using validated and reliable outcome measures. Occupational Burnout, as measured quantitatively using validated and reliable outcome measures.

* **Data extraction (selection and coding).**
This systematic review will follow the PRISMA 2020 guidelines (Page et al., 2021).

Screening stage 1: Titles, abstracts and key words of research articles identified through the afore mentioned search strategies will be screened in accordance with the eligibility criteria. Research papers which do not meet the inclusion/exclusion criteria based on screening titles, abstracts and key words will be excluded.

Screening stage 2: The full texts of research papers which were assessed as eligible during screening stage 1 will be read and reviewed for further eligibility in accordance with the inclusion/exclusion criteria. Full texts which are found ineligible for inclusion at screening stage 2 will be excluded.

Data Extraction: For the remaining eligible research papers which will be included in this systematic review, a standardized extraction form will be used to gather data. This will be used for the purposes of assessing the quality of included papers and for the synthesis of results/outcomes pertaining to associations between job satisfaction and occupational burnout. Using the Cochrane Collaboration Data Collection Form for RCTs and Non-RCTs developed by Higgins and Green (2011), data will be extracted from included studies such as:

- Author
- Year of publication
- Study Setting
- Study Design

- Participants
- Sample size
- Types of Intervention
- Types of Comparison
- Types of Outcome Measures
- Methodology
- Data analysis/analytic method
- Information relevant to risk of bias assessments

*** Risk of bias (quality) assessment.**

Risk of Bias will be assessed using a Critical Appraisal Skills Program (CASP). Depending on the study design, the CASP Randomised Controlled Trials Checklist, CASP Cohort Study Checklist, or CASP Case Control Study Checklist will be used.

In order to ascertain reliability of quality ratings, risk of bias assessments will be conducted independently by two researchers on a subsample of eligible papers. Any disagreements will be resolved through discussions during consensus meetings, which may include a third reviewer should they be required to resolve any disagreements.

*** Strategy for data synthesis.**

If sufficient quantitative data is available, statistical results will be synthesised using random effects meta-analysis (i.e., pooled correlation coefficient). This will include the examination of heterogeneity (I^2 , Q-test) and publication bias (Fail-safe N calculation, Funnel plot using the trim-and-fill method, a statistical test of asymmetry such as Kendall's tau)).

Alternatively, given the expected diversity of study designs (e.g., intervention, observation), the results of each study, and hence the research evidence, will be summarized using narrative synthesis. Therefore, the following will be commented on:

- Study Design
- Number and Characteristics of Participants (including, healthcare setting, occupation)
- Description of intervention (including (but not limited to), intervention protocol, length of intervention, integrity of intervention, definition of 'control' groups etc.) and/or outcome measures (including (but not limited to), reliability, validity, timing of implementation of measures, adverse outcomes, method of aggregation etc.).
- Results
- Strengths/Limitations of research
- Potential Bias
- Study Quality
- Heterogeneity/Homogeneity of studies
- Descriptions of patterns/trends in the data, given the different study characteristics.

*** Analysis of subgroups or subsets.**

If sufficient data are available, categorical moderator analyses will be conducted to examine potential sources of heterogeneity. To examine the influence on the pooled effect size and indices of heterogeneity in the event of insufficient data (<20), this will be limited to sensitivity analysis where systematically different studies/samples will be removed from the meta-analysis.

Potential sources of heterogeneity that will be examined will be related to study design (e.g., RCT vs. Observational designs), risk of bias/quality appraisals, participant

characteristics (e.g., occupational discipline, different work environments (e.g., inpatient or outpatient settings)), the different types of outcome measures completed for occupational burnout and job satisfaction and when these were administered, allocation of groups, interventions etc.

* **Country.**

United Kingdom

Keywords.

Occupational Burnout, Job Satisfaction, Healthcare Professionals

Appendix B – PRISMA 2020 Abstracts Checklist



PRISMA 2020 for Abstracts Checklist

Section and Topic	Item #	Checklist item	Reported (Yes/No)
TITLE			
Title	1	Identify the report as a systematic review.	Yes
BACKGROUND			
Objectives	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	Yes
METHODS			
Eligibility criteria	3	Specify the inclusion and exclusion criteria for the review.	Yes
Information sources	4	Specify the information sources (e.g. databases, registers) used to identify studies and the date when each was last searched.	Yes
Risk of bias	5	Specify the methods used to assess risk of bias in the included studies.	Yes
Synthesis of results	6	Specify the methods used to present and synthesise results.	Yes
RESULTS			
Included studies	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	Yes
Synthesis of results	8	Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured).	Yes
DISCUSSION			
Limitations of evidence	9	Provide a brief summary of the limitations of the evidence included in the review (e.g. study risk of bias, inconsistency and imprecision).	Yes
Interpretation	10	Provide a general interpretation of the results and important implications.	Yes
OTHER			
Funding	11	Specify the primary source of funding for the review.	N/a
Registration	12	Provide the register name and registration number.	Yes

Appendix C –PRISMA 2020 Checklist for Systematic Reviews/Meta-analyses



PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Pg. 1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Appendix B
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Pg. 4-8
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Pg. 8
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Pg. 9
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Pg. 8-9 Pg. 13-14
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Pg. 8-9 Appendix D
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Pg. 9-10
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Pg. 9-10
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Pg. 9-10 Pg. 11-12
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Pg. 13
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Pg. 11
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Pg. 9-10
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Pg. 9-10 Pg. 11-12
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Pg. 9-10
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Pg. 10
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Pg. 11-13
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Pg. 13
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Pg. 12-13
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Pg. 13



PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Pg. 11-12
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Pg. 13-15
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Pg. 13-15 Appendix F Appendix G
Study characteristics	17	Cite each included study and present its characteristics.	Pg. 18-46
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Pg. 47-50
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect <u>estimate</u> and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Pg. 18-46 Pg. 53
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Pg. 47-50
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (<u>e.g.</u> confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Pg. 51-53
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Pg. 56-58
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Pg. 56-58
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Pg. 54-55
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Pg. 52-58
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Pg. 59-60
	23b	Discuss any limitations of the evidence included in the review.	Pg. 60-61
	23c	Discuss any limitations of the review processes used.	Pg. 61-63
	23d	Discuss implications of the results for practice, policy, and future research.	Pg. 63-64
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Pg. 8
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Pg. 8 Appendix A.
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/a
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	N/a
Competing interests	26	Declare any competing interests of review authors.	N/a



PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: (a) template data collection forms; (b) data extracted from included studies; (c) data used for all analyses; (d) analytic code; (e) any other materials used in the review.	(a) available online (b) and (c) available upon request. request.

Appendix D – Search Terms

APA PsychINFO

("occupational burnout" OR burnout* OR burn-out OR "compassion fatigue" OR "burnout syndrome" OR "professional burnout" OR "emotional exhaustion" OR "occupational stress" OR "work-related stress" OR depersonali*ation OR "organi*ational burnout") AND ("job satisfaction" OR "employee satisfaction" OR "job dissatisfaction") AND ("healthcare professional" OR "healthcare practitioner" OR "mental health professional" OR "mental health practitioner" OR "medical practitioner" OR "medical professional" OR "frontline professional" OR "frontline staff" OR consultant OR therapist OR "wellbeing practitioner" OR PWP OR doctor OR "general practitioner" OR GP OR nurse OR counsellor OR counselor OR midwife OR clinician OR psychiatrist OR psychologist OR "psychodynamic psychotherapist" OR physician OR registrar OR physiotherapist OR "occupational therapist" OR "healthcare assistant" OR "healthcare worker" OR "healthcare staff" OR "support worker" OR paramedic OR "speech language therapist" OR speech-language OR chiropodist OR podiatrist).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]
LIMIT TO (english language AND ("0100 journal" OR "0110 peer-reviewed journal") AND journal article)

SCOPUS

((TITLE-ABS-KEY ({occupational burnout} OR burnout* OR burn-out OR {compassion fatigue} OR {burnout syndrome} OR {professional burnout} OR {emotional exhaustion} OR {occupational stress} OR {work-related stress} OR depersonali*ation OR {organi*ational burnout}) AND ({job satisfaction} OR {employee satisfaction} OR {job dissatisfaction}) AND ({healthcare professional} OR {healthcare practitioner} OR {mental health professional} OR {mental health practitioner} OR {medical practitioner} OR {medical professional} OR {frontline professional} OR {frontline staff} OR consultant OR therapist OR {wellbeing practitioner} OR PWP OR doctor OR {general practitioner} OR GP OR nurse OR counsellor OR counselor OR midwife OR clinician OR psychiatrist OR psychologist OR {psychodynamic psychotherapist} OR physician OR registrar OR physiotherapist OR {occupational therapist} OR {healthcare assistant} OR {healthcare worker} OR {healthcare staff} OR {support worker} OR paramedic OR {speech language therapist} OR speech-language OR chiropodist OR podiatrist)) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (EXCLUDE (SRCTYPE, "p")))

Web Of Science

("occupational burnout" OR "burnout*" OR "burn-out" OR "compassion fatigue" OR "burnout syndrome" OR "professional burnout" OR "emotional exhaustion" OR "occupational stress" OR "work-related stress" OR "depersonalization" OR "organizational burnout" (Topic)) AND ("job satisfaction" OR "employee satisfaction" OR "job dissatisfaction" (Topic)) AND ("healthcare professional" OR "healthcare practitioner" OR "mental health professional" OR "mental health practitioner" OR "medical practitioner" OR "medical professional" OR "frontline professional" OR "frontline staff" OR "consultant" OR "therapist" OR "wellbeing practitioner" OR "PWP" OR "doctor" OR "general practitioner" OR "GP" OR "nurse" OR "counsellor" OR "counselor" OR "midwife" OR "clinician" OR "psychiatrist" OR "psychologist" OR "psychodynamic psychotherapist" OR "physician" OR "registrar" OR "physiotherapist" OR "occupational therapist" OR "healthcare assistant" OR "healthcare worker" OR "healthcare staff" OR "support worker" OR "paramedic" OR "speech language therapist" OR "speech-language" OR "chiropodist" OR "podiatrist" (Topic)) AND English (Languages) AND Articles (Document Types)

Appendix E – CASP Cohort Checklist



CASP Checklist: 12 questions to help you make sense of a **Cohort Study**

How to use this appraisal tool: Three broad issues need to be considered when appraising a cohort study:

- ▶ Are the results of the study valid? (Section A)
- ▶ What are the results? (Section B)
- ▶ Will the results help locally? (Section C)

The 12 questions on the following pages are designed to help you think about these issues systematically. The first two questions are screening questions and can be answered quickly. If the answer to both is “yes”, it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a “yes”, “no” or “can’t tell” to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA ‘Users’ guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

Referencing: we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Cohort Study) Checklist. [online] Available at: URL. Accessed: Date Accessed.*

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Paper for appraisal and reference:.....

Section A: Are the results of the study valid?

1. Did the study address a clearly focused issue?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

HINT: A question can be 'focused' in terms of

- the population studied
- the risk factors studied

• is it clear whether the study tried to detect a beneficial or harmful effect

- the outcomes considered

Comments:

2. Was the cohort recruited in an acceptable way?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

HINT: Look for selection bias which might compromise the generalisability of the findings:

- was the cohort representative of a defined population
- was there something special about the cohort
- was everybody included who should have been

Comments:

Is it worth continuing?

3. Was the exposure accurately measured to minimise bias?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

HINT: Look for measurement or classification bias:

- did they use subjective or objective measurements
- do the measurements truly reflect what you want them to (have they been validated)
- were all the subjects classified into exposure groups using the same procedure

Comments:

4. Was the outcome accurately measured to minimise bias?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

HINT: Look for measurement or classification bias:

- did they use subjective or objective measurements
- do the measurements truly reflect what you want them to (have they been validated)
 - has a reliable system been established for detecting all the cases (for measuring disease occurrence)
 - were the measurement methods similar in the different groups
 - were the subjects and/or the outcome assessor blinded to exposure (does this matter)

Comments:

5. (a) Have the authors identified all important confounding factors?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

HINT:
• list the ones you think might be important, and ones the author missed

Comments:

5. (b) Have they taken account of the confounding factors in the design and/or analysis?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

HINT:
• look for restriction in design, and techniques e.g. modelling, stratified-, regression-, or sensitivity analysis to correct, control or adjust for confounding factors

Comments:

6. (a) Was the follow up of subjects complete enough?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

HINT: Consider

- the good or bad effects should have had long enough to reveal themselves
- the persons that are lost to follow-up may have different outcomes than those available for assessment
- in an open or dynamic cohort, was there anything special about the outcome of the people leaving, or the exposure of the people entering the cohort

6. (b) Was the follow up of subjects long enough?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

Comments:

Section B: What are the results?

7. What are the results of this study?

HINT: Consider

- what are the bottom line results
- have they reported the rate or the proportion between the exposed/unexposed, the ratio/rate difference
- how strong is the association between exposure and outcome (RR)
- what is the absolute risk reduction (ARR)

Comments:

8. How precise are the results?

HINT:

- look for the range of the confidence intervals, if given

Comments:

9. Do you believe the results?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

- HINT: Consider
- big effect is hard to ignore
 - can it be due to bias, chance or confounding
 - are the design and methods of this study sufficiently flawed to make the results unreliable
 - Bradford Hills criteria (e.g. time sequence, dose-response gradient, biological plausibility, consistency)

Comments:

Section C: Will the results help locally?

10. Can the results be applied to the local population?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

- HINT: Consider whether
- a cohort study was the appropriate method to answer this question
 - the subjects covered in this study could be sufficiently different from your population to cause concern
 - your local setting is likely to differ much from that of the study
 - you can quantify the local benefits and harms

Comments:

11. Do the results of this study fit with other available evidence?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

Comments:

12. What are the implications of this study for practice?

Yes	<input type="checkbox"/>
Can't Tell	<input type="checkbox"/>
No	<input type="checkbox"/>

- HINT: Consider
- one observational study rarely provides sufficiently robust evidence to recommend changes to clinical practice or within health policy decision making
 - for certain questions, observational studies provide the only evidence
 - recommendations from observational studies are always stronger when supported by other evidence

Comments:

Appendix F – Table of Exclusions Following Database Search and Associated Reasons

Authors (year)	DOI and/or Web Link	Reasons for Exclusion
Adarkwah & Hirsch (2020)	DOI: 10.3390/ijerph17082964 https://www.mdpi.com/1660-4601/17/8/2964	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Adarkwah et al. (2018)	DOI: 10.2147/PRBM.S179503 https://www.dovepress.com/burnout-and-work-satisfaction-in-general-practitioners-practicing-in-r-peer-reviewed-fulltext-article-PRBM	No indices of association between Burnout and Job Satisfaction
Al Sabei et al. (2020)	DOI: 10.1111/jnu.12528 https://sigmapubs.onlinelibrary.wiley.com/doi/10.1111/jnu.12528	No indices of association between Burnout and Job Satisfaction
Bennett et al. (2005)	DOI: 10.1136/adc.2003.048462 https://adc.bmj.com/content/90/11/1112	Not all Healthcare Professionals
Besse et al. (2021)	DOI: 10.1080/09638237.2021.1922635 https://www.tandfonline.com/doi/full/10.1080/09638237.2021.1922635	Not all Healthcare Professionals
Burston & Stichler (2010)	DOI: 10.1111/j.1365-2648.2010.05336.x https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2648.2010.05336.x	No indices of association between Burnout and Job Satisfaction
Chichra et al. (2019)	DOI: 10.4103/jpgm.JPGM_489_18 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6813678/	Not Healthcare Setting
Chiron et al. (2010)	DOI: 10.1177%2F1359105309360072 https://journals.sagepub.com/doi/10.1177/1359105309360072?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%20pubmed	No indices of association between Burnout and Job Satisfaction
Danaci & Koç (2019)	DOI: 10.1177/0969733019836151 https://journals.sagepub.com/doi/10.1177/0969733019836151	No indices of association between Burnout and Job Satisfaction
Deckard et al. (1994)	DOI: 10.1097/00005650-199407000-00007 https://journals.lww.com/lww-medicalcare/Abstract/1994/07000/Physician_Burnout__An_Examination_of_Personal_.7.aspx	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Dorigan & Guirardello (2018)	DOI: 10.1590/1518-8345.2633.3056 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6206827/	No indices of association between Burnout and Job Satisfaction

Authors (year)	DOI and/or Web Link	Reasons for Exclusion
Dupree & Day (2008)	DOI: 10.1300/J294v14n02_11 https://www.tandfonline.com/doi/abs/10.1300/J294v14n02_11	Unable to Access Full Text Requested 15/10/2021 – Research Gate
Dutra et al. (2019)	DOI: 10.1891/1061-3749.27.1.E17 https://connect.springerpub.com/content/sgrjnm/27/1/e17	Unable to Access Full Text Requested 15/10/2021 – Research Gate
Faller et al. (2011)	DOI: 10.1097/NNA.0b013e3182059492 https://journals.lww.com/jonajournal/Abstract/2011/02000/Work_Related_Burnout,_Job_Satisfaction,_Intent_to.6.aspx	Unable to Access Full Text Requested 15/10/2021 – Research Gate
Fiabane et al. (2021)	DOI: 10.1111/jocn.12084 https://onlinelibrary.wiley.com/doi/10.1111/jocn.12084	No indices of association between Burnout and Job Satisfaction
Flynn & Ironside (2018)	DOI: 10.3928/01484834-20180102-06 https://journals.healio.com/doi/10.3928/01484834-20180102-06	Unable to Access Full Text Requested (15/10/2021) - Emailed corresponding author: lflynn@sn.rutgers.edu
Galeazzi et al. (2004)	DOI: 10.1017/s1121189x00003456 https://www.cambridge.org/core/journals/epidemiology-and-psychiatric-sciences/article/abs/morale-of-mental-health-professionals-in-community-mental-health-services-of-a-northern-italian-province/6047E205B980BFEE78A03CE3AF61F341	No indices of association between Burnout and Job Satisfaction
Ghanayem, et al. (2020)	DOI: 10.1111/jonm.12973 https://onlinelibrary.wiley.com/doi/10.1111/jonm.12973	Insufficient Information regarding Validity and/or Reliability of the Burnout Measure
Gunnarsdóttir et al. (2009)	DOI: 10.1016/j.ijnurstu.2006.11.007 https://www.sciencedirect.com/science/article/pii/S0020748906003154?via%3Dihub	Job Satisfaction measured using Single Item Construct
Happell & Koehn (2010)	DOI: 10.1111/j.1365-2648.2010.05570.x https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2648.2010.05570.x	No indices of association between Burnout and Job Satisfaction
Hayes et al. (2015)	DOI: 10.1186/s12912-015-0110-x https://bmcnurs.biomedcentral.com/articles/10.1186/s12912-015-0110-x	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Hayes et al. (2014)	DOI: 10.1111/jan.12452 https://onlinelibrary.wiley.com/doi/10.1111/jan.12452	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure

Authors (year)	DOI and/or Web Link	Reasons for Exclusion
Hirsch & Adarkwah (2018)	DOI: 10.3390/ijerph15102190 https://www.mdpi.com/1660-4601/15/10/2190/htm	No indices of association between Burnout and Job Satisfaction
Hricova et al. (2020)	DOI: 10.5708/EJMH.15.2020.1.1 https://semmelweis.hu/ejmh/2020/06/15/perceived-stress-and-burnout/	Not all Healthcare Professionals
Jansen et al. (1996)	DOI: 10.1016/0020-7489(95)00060-7 https://www.sciencedirect.com/science/article/pii/S0020748995000607?via%3Dihub	Insufficient Information regarding Validity and/or Reliability of the Burnout Measure
Janssen et al. (2004)	DOI: 10.1016/j.jvb.2003.09.004 https://www.sciencedirect.com/science/article/pii/S0001879103001465?via%3Dihub	Job Satisfaction measured using Single Item Construct
Kaiser et al. (2020)	DOI: 10.1177%2F2158244020947436 https://journals.sagepub.com/doi/10.1177/2158244020947436	Not all Healthcare Professionals
La & Yun (2019)	DOI: 10.1016/j.anr.2019.09.002 https://www.asian-nursingresearch.com/article/S1976-1317(19)30506-7/fulltext	No indices of association between Burnout and Job Satisfaction
Labrague et al. (2017)	DOI: 10.1111/inr.12347 https://onlinelibrary.wiley.com/doi/10.1111/inr.12347	No indices of association between Burnout and Job Satisfaction
Labrague et al. (2019)	DOI: 10.1111/ijn.12711 https://onlinelibrary.wiley.com/doi/10.1111/ijn.12711	No indices of association between Burnout and Job Satisfaction
Lal et al. (2020)	DOI: 10.1016/j.revmed.2019.12.005 https://www.sciencedirect.com/science/article/pii/S0248866319311816?via%3Dihub	Not Healthcare Setting
Laschinger et al. (2011)	DOI: 10.1097/NNR.0b013e318209782e https://journals.lww.com/nursingresearchonline/Abstract/2011/03000/Situational_and_Dispositional_Influences_on.7.aspx	Unable to Access Full Text Requested 15/10/2021 – Research Gate.
Levin et al. (2017)	DOI: https://doi.org/10.1212/WNL.0000000000003640 https://n.neurology.org/content/88/8/797	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Li et al. (2014)	DOI: 10.1016/j.profnurs.2013.04.004 https://www.sciencedirect.com/science/article/pii/S8755722313000550?via%3Dihub	No indices of association between Burnout and Job Satisfaction

Authors (year)	DOI and/or Web Link	Reasons for Exclusion
Liu et al. (2012)	DOI: 10.1111/j.1365-2702.2011.03991.x https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2702.2011.03991.x	Job Satisfaction measured using Single Item Construct
Liu et al. (2019)	DOI: 10.1016/j.outlook.2019.04.006 https://www.nursingoutlook.org/article/S0029-6554(18)30652-3/fulltext	Job Satisfaction measured using Single Item Construct
McNearney et al. (2008)	DOI: 10.1097/RHU.0b013e318177274d https://journals.lww.com/jclinrheum/Abstract/2008/06000/What_Factors_Relate_to_Job_Satisfaction_Among.2.aspx	Job Satisfaction measured using Single Item Construct
McPhillips et al. (2007)	DOI: 10.1016/j.jpeds.2007.03.016 https://www.jpeds.com/article/S0022-3476(07)00254-5/fulltext	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Messmer et al. (2011)	DOI: 10.3928/00220124-20110324-05 https://journals.healio.com/doi/10.3928/00220124-20110324-05	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Meyer et al. (2015)	DOI: 10.1016/j.pedn.2013.12.008 https://www.pediatricnursing.org/article/S0882-5963(13)00373-4/fulltext	Longitudinal Correlation between Job Satisfaction and Burnout – Not Comparable to Cross-sectional Data from Other Studies
Palazoğlu & Koç (2019)	DOI: 10.1177/0969733017720846 https://journals.sagepub.com/doi/10.1177/0969733017720846	Unable to Access Full Text Requested (15/10/2021) Emailed Corresponding Author: Zelihaceren@hotmail.com
Perzynski et al. (2019)	DOI: 10.1177/2374373518777742 https://journals.sagepub.com/doi/10.1177/2374373518777742	No indices of association between Burnout and Job Satisfaction
Phuekphan et al. (2021)	https://he02.tci-thaijo.org/index.php/PRIJNR/article/view/248823	No indices of association between Job Satisfaction and Burnout
Probst et al. (2012)	DOI: 10.1259/bjr/16840236 https://www.birpublications.org/doi/10.1259/bjr/16840236	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Roney & Acri (2018)	DOI: 10.1016/j.pedn.2018.01.016 https://www.pediatricnursing.org/article/S0882-5963(17)30447-5/fulltext	Insufficient data relating to non-significant association between burnout and job satisfaction. Requested on 8/11/2021 – ResearchGate
Rouleau et al. (2012)	DOI: 10.1186/1478-4491-10-9 https://human-resources-health.biomedcentral.com/articles/10.1186/1478-4491-10-9	No indices of association between Job Satisfaction and Burnout

Authors (year)	DOI and/or Web Link	Reasons for Exclusion
Rouxel et al. (2016)	DOI: 10.1016/j.ijnurstu.2016.07.010 https://www.sciencedirect.com/science/article/abs/pii/S0020748916300943?via%3Dihub	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Sarmiento et al. (2003)	DOI: 10.1111/j.1365-2648.2003.02973.x https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1365-2648.2003.02973.x	Not Healthcare Setting
Shahid et al. (2018)	https://odad.org/article/organizational-resource-personal-resource-influencing-job-satisfaction-a-mediating-role-of-burnout	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Shanafelt et al. (2016)	DOI: 10.1016/j.mayocp.2016.02.001 https://pubmed.ncbi.nlm.nih.gov/27046522/	Job Satisfaction measured using Single Item Construct
Surgenor et al. (2009)	http://www.nzma.org.nz/journal/122-1300/3737/	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Takayesu et al. (2014)	DOI: 10.1111/acem.12464 https://onlinelibrary.wiley.com/doi/10.1111/acem.12464	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Talasaz et al. (2017)	DOI: 10.17795/jhealthscope-35507 https://sites.kowsarpub.com/healthscope/articles/20174.html	Insufficient Information regarding Validity and/or Reliability of the Burnout Measure
Willemse et al. (2012)	DOI: 10.1016/j.ijnurstu.2012.02.003 https://www.sciencedirect.com/science/article/pii/S002074891200048X?via%3Dihub	Not Healthcare Setting

Appendix G – Table of Exclusions Following Forwards and Backwards Citation Searching and Associated Reasons

Authors (year)	DOI and/or Web Link	Reasons for Exclusion
Adwan (2014)	DOI: 10.1016/j.pedn.2014.01.011 https://linkinghub.elsevier.com/retrieve/pii/S0882596314000426	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Alameddine et al. (2017)	DOI: 10.1111/hsc.12454 https://onlinelibrary.wiley.com/doi/10.1111/hsc.12454	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Buis et al. (2017)	DOI: 10.1212/WNL.0000000000003640 https://n.neurology.org/content/88/8/797	Job Satisfaction measured using two questions/items
Chen et al. (2016)	DOI: 10.21203/rs.3.rs-136344/v1 https://www.researchsquare.com/article/rs-136344/v1	Insufficient Information regarding Validity and/or Reliability of the Burnout Measure
Jasperse et al. (2014)	DOI: 10.1111/ecc.12098 https://onlinelibrary.wiley.com/doi/10.1111/ecc.12098	Job Satisfaction measured using single item construct
Kader et al. (2021)	DOI: 10.1016/j.ajp.2021.102619 https://www.sciencedirect.com/science/article/pii/S1876201821000757?via%3Dihub	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Kallaith & Morris (2002)	DOI: 10.1097/00005110-200212000-00010 https://journals.lww.com/jonajournal/Abstract/2002/12000/Job_Satisfaction_Among_Nurses__A_Predictor_of.10.aspx	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Kanai-Pak et al. (2008)	DOI: 10.1111/j.1365-2702.2008.02639.x https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2702.2008.02639.x	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Kozak et al. (2013)	DOI: 10.1016/j.ridd.2012.07.021 https://www.sciencedirect.com/science/article/pii/S0891422212001886?via%3Dihub	Not all Healthcare Professionals
Kumar et al. (2012)	DOI: 10.1177/0020764012440675 https://journals.sagepub.com/doi/10.1177/0020764012440675	Longitudinal Correlation between Job Satisfaction and Burnout – Not Comparable to Cross-sectional Data from Other Studies
Lanham et al. (2012)	DOI: 10.17744/mehc.34.4.w35q80w11kqpqn26 https://meridian.allenpress.com/jmhc/article-abstract/34/4/341/83211/How-Gratitude-Relates-to-Burnout-and-Job?redirectedFrom=fulltext	Not all Healthcare Professionals
Munnangi & Dupiton (2018)	DOI: 10.1097/JTN.0000000000000335	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure

Authors (year)	DOI and/or Web Link	Reasons for Exclusion
Ogresta et al. (2008)	https://journals.lww.com/journaloftraumanursing/Fulltext/2018/01000/Burnout,_Perceived_Stress,_and_Job_Satisfaction.2.aspx DOI: 10.3325%2Fcmj.2008.3.364	Not all Healthcare Professionals
Payne et al. (2020)	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2443621/ DOI: 10.4102/sajpsychoiatry.v26i0.1454	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Pekçetin (2018)	https://sajp.org.za/index.php/sajp/article/view/1454 DOI: 10.31086/tjgeri.2018137963	Not Healthcare Setting
Saedi et al. (2020)	http://geriatri.dergisi.org/uploads/pdf/pdf_TJG_1017.pdf DOI: 10.22038/ijn.2019.39744.1634	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Song et al. (2020)	DOI: 10.1097/JOM.0000000000002040	Unable to Access Full Text Requested 22/11/2021 – Emailed Corresponding Author
Tremolada et al. (2015)	https://journals.lww.com/joem/Abstract/2020/12000/Relationship_Between_Job_Satisfaction_and_Burnout.25.aspx DOI: 10.1002/jca.21379	Chuanhua Yu (Yuchua@whu.edu.cn) Insufficient Information regarding Validity and/or Reliability of the Burnout Measure
Visser et al. (2003)	https://onlinelibrary.wiley.com/doi/10.1002/jca.21379 https://www.cmaj.ca/content/cmaj/168/3/271.full.pdf	Insufficient Information regarding Validity and/or Reliability of Job Satisfaction Measure
Wu et al. (2021)	DOI: 10.1080/13548506.2020.1778750 https://www.tandfonline.com/doi/full/10.1080/13548506.2020.1778750	Not all Healthcare Professionals

Appendix H – Results from the Standardization of Statistical Data for Inclusion in the Meta-analysis

Fifty-four studies ($N = 27,667$) provided sufficient data for inclusion in the meta-analysis examining associations between job satisfaction and burnout amongst healthcare professionals. Of these, studies reported Pearson's r ($n = 31$), Spearman's ρ ($n = 5$) or an unspecified correlational analysis r ($n = 11$). Seven studies conducted regression analyses only; five of which reported standardized β -coefficients whilst two reported odds ratios. Where possible, the results from these studies were included in the meta-analysis once converted into r -coefficients (Peterson et al., 2005). Twelve studies conducted correlation and regression analyses; reporting r -coefficients and β -coefficients. Of these, r -coefficients and β -coefficients were very similar ($n = 2$), or r -coefficients were greater than β -coefficients ($n = 10$). Fourteen studies included in the meta-analysis were rated as 'high' in methodological quality, 36 were rated as 'moderate' and four were rated as 'low'.

Four studies conducted Structural Equation Modelling (SEM) only. One of these studies reported a β -value that was included in the meta-analysis (Samad et al., 2021). The remaining three studies (Chen et al., 2019; Oliveira et al., 2018; Tokuda et al., 2009) were not included in the meta-analysis due to standardized and unstandardized path coefficients not being appropriate for accurate conversion into r -coefficients to allow for comparison across studies.

Thirty-three studies computed multiple r -coefficients to represent the association between the different dimensions of burnout and different dimensions of job satisfaction, different dimensions of burnout and overall job satisfaction or different dimensions of job satisfaction and overall burnout. In this case, individual r -coefficients were combined to compute a pooled r -coefficient, by running a random-effects model meta-analysis of the individual r -coefficients. Of the five studies which conducted regression analyses only (reporting standardized β -coefficients), two studies computed multiple β -coefficients. These

were first converted into r -coefficients before being combined into a pooled r -coefficients, in accordance with the method above. One study conducted three logistic regression models, reporting odds ratios to denote the relationship between job satisfaction and burnout amongst nursing professionals working in general hospitals (Dutra et al., 2018). For this study, the odds ratios were first converted into r -coefficients and these r -coefficients were combined using the above method to derive a pooled r -value that was used in the meta-analysis. Three studies reported sub-samples of participants. For two of these studies (Garcia et al., 2021; Wang et al., 2020), the sub-sample r -coefficients were combined, and the pooled r -coefficients was inputted into the meta-analysis. Ge et al. (2011) reported r -coefficients for the subsample of healthcare workers working in urban community healthcare centres across Shenyang and Benxi provinces of China, as well as the total r -coefficients across all participants. For this study, the total participants r -coefficients were pooled.

Opoku et al. (2014) reported β -coefficients for the relationship between the three subscales of burnout (i.e., emotional exhaustion, depersonalisation, and low personal accomplishment) and overall job satisfaction. However, these β -coefficients could not be included in the meta-analysis because they were outside of the range between -0.5 and 0.5 (Cohen, 1988, 1992). Therefore, the β -coefficients for the relationships between each of the burnout subscales and each of the subscales the Physician Work Life Survey (Linzer et al., 2001; i.e., satisfaction with: relationships with colleagues, nursing support, resource adequacy, compensation, work-life balance, and general job satisfaction) were included in the meta-analysis with the exception of the β -coefficient of the relationship between low personal accomplishment and general job satisfaction ($\beta = -0.705, p < .001$). Those β -coefficients that could not be imputed into the meta-analysis were included in the narrative synthesis.

Section 2 – Research Thesis

Title: Personalised Treatment Selection for Occupational Burnout in Healthcare Professionals

Abstract

Objectives: This secondary analysis of a randomised controlled trial (UpLift) aimed to investigate whether Cognitive Behaviour Therapy (CBT) or Job Crafting (JC) interventions for occupational burnout could be prescribed in a personalised way, based on participant baseline characteristics and treatment responses.

Methods: A supervised machine learning analysis (elastic net regularisation) was applied in independent training samples from CBT (n = 100) and JC (n = 100) UpLift participants. For external cross-validation, each prediction model was applied to an independent validation sample (N = 97; CBT n = 42, JC n = 55) and personalised advantage index scores were calculated. To evaluate the prediction models, the model-predicted post-intervention burnout scores were compared to the observed burnout scores across training and validation samples for each intervention.

Results: The prediction models for CBT and JC shared five prognostic variables. These included: burnout subdomains disengagement and exhaustion, stress, satisfaction with the nature of the work, and satisfaction with the job role. Baseline turnover intentions predicted post-intervention burnout in the JC intervention. Baseline mental wellbeing and social support predicted post-intervention burnout in the CBT intervention. The optimal model-indicated intervention was CBT across all participants in the validation sample. There was no evidence that some cases with specific features would respond better to JC.

Conclusion: CBT appears most beneficial at targeting occupational burnout in healthcare professionals. There was little evidence for the need to develop a targeted prescription model to differentially recommend CBT or JC in a personalised way.

Keywords: Occupational Burnout; Cognitive Behavioural Therapy; CBT; Job Crafting; Healthcare Professionals; Precision Medicine; Machine Learning; Targeted Prescription; Personalized Treatment Selection

Practitioner Points:

- Occupational burnout is a prevalent and costly problem in healthcare.
- A machine learning analysis was applied to develop a targeted prescription algorithm to match healthcare professionals to one of two interventions for occupational burnout (i.e., CBT or JC) in a personalised way; using knowledge of baseline participant characteristics and treatment responses.
- Contrary to expectation, the results indicated that CBT would work better than JC for all participants, and there was little evidence that some participants would be better suited to JC.
- Overall, CBT seemed to be the most effective treatment option for occupational burnout in healthcare professionals.

Introduction

Occupational Burnout

Occupational Burnout (hereafter referred to as ‘burnout’), termed the ‘*cost of caring*’ (Maslach, 1982), is a psychological syndrome of mental and physical exhaustion emerging in response to chronic occupational stressors (Freudenberger, 1974). The most widely cited three-factor model characterises burnout as a profile of (1) *emotional exhaustion* (EE), (2) *depersonalisation* (DP) and (3) *a diminished sense of personal accomplishment* (PA; Maslach, 1982; Maslach & Jackson, 1981). According to Maslach et al. (2001), EE refers to the *individual stress* dimension of burnout and represents feeling emotionally overwhelmed, overextended, or emotionally/physically depleted by others and/or the job role, DP refers to the *interpersonal context* dimension and represents the development of negative, callous, or excessively detached attitudes towards people who receive one’s service and/or aspects of the job, and diminished PA refers to the *self-evaluation* dimension and represents a decline in feelings of competence, successful achievement, and productivity at work. Traditionally, burnout can be characterised by a profile of high EE and DP but low PA (Maslach et al., 1996).

Alternatively, Demerouti et al. (2001) theorized a two-factor model of burnout, with dimensions ranging from (1) *vigour* to *exhaustion* and (2) *dedication* to *disengagement*. Within this model, diminished PA develops as an independent by-product, rather than a discrete dimension, of burnout (Leiter, 1993). Accordingly, Demerouti et al. (2001) developed the Job-Demands Resource (JD-R) model, which posits that burnout manifests due to the simultaneous presence of high job demands yet low job resources (Bakker et al., 2005). In support of this model, Lee and Ashforth (1996) found that reduced resources and increased job demands (i.e., role ambiguity and conflict, work-related stress and increased work pressure) strongly correlated with EE and depersonalisation/disengagement. Alternative models have been proposed, including the Effort-Reward Imbalance model (Siegrist, 1996), which suggests that burnout manifests when effort expenditure at work outweighs rewards received, and the Job Demand-Control-Support model (Karasek, 1997; Karasek

& Theorell, 1990), which posits that the additive experience of high demands, low control (i.e., skill discretion and decision authority), and low support at work results in burnout (Pisanti et al., 2016).

The prevalence estimates of burnout vary across country and healthcare occupation (Adriaenssens et al., 2015; Rotenstein et al., 2018; Simionato & Simpson, 2018; Escudero-Escudero et al., 2020; Ghahramani et al., 2021). The lowest prevalence rate of burnout was reported by Woo et al. (2020) at 11.23% amongst nurses globally, whilst the highest rate of burnout was reported by Low et al. (2019) at 77.10% amongst healthcare professional working in radiology across Asia, Europe, and North America. Research also reports high levels of burnout amongst healthcare professionals during the COVID-19 pandemic (Hu et al., 2020; Prasad et al., 2021; Pappa et al., 2021; Jalili et al., 2021; Lasalvia et al., 2021). Amongst mental health professionals, 40%, 22%, and 19% are estimated to experience EE, DP, and diminished PA, respectively (O'Connor et al., 2018). This is not surprising given the increased exposure to intense emotional suffering, suicidal ideation, and narratives of traumatic life events in the context of increasing financial strain, threats to job stability, and reduced staffing levels (Sjølie et al., 2017; Robertson et al., 2017; Sørgaard et al., 2007).

Factors Associated with Burnout

The Big Five personality dimensions (i.e., neuroticism, agreeableness, extraversion, conscientiousness, and openness; Costa & McCrae, 1992) have been associated with burnout amongst psychotherapists (Simionato et al., 2018). Positive associations have also been reported between burnout and other personality-related factors, including self-esteem, self-efficacy, and locus of control, and inverse associations have been reported between burnout and negative affectivity (Alarcon et al., 2009). Therefore, Brunborg (2008) argued that perhaps personality factors predispose individuals to perceive their work environments favourably or unfavourably, regardless of the objective nature of the work.

Burnout has been associated with increased anxiety, depression, helplessness, hopelessness, powerlessness, and substance use (Ahola et al., 2005; Bianchi et al., 2014; Hakanen & Schaufeli,

2012; Schaufeli & Buunk, 2004; Peterson et al., 2008; Beschoner et al., 2019). Physiologically, burnout has been associated with sleep disturbance, fatigue, and elevated cortisol (Grossi et al., 2003; Melamed et al., 1999; Söderström et al., 2004; Peterson et al., 2008), and cardiovascular disease, hypothalamic-pituitary-adrenal axis dysregulation, suppressed immunity, headaches, and musculoskeletal problems (Ahola et al., 2010; Melamed et al., 2006; Acker, 2010). Significantly, higher levels of burnout have predicted increased rates of physical health deterioration (Kim et al., 2011). Burnout also significantly impacts relationships with colleagues, friends, and family (Maslach et al., 2001; Bakker et al., 2005).

Burnout amongst healthcare professionals risks poorer patient outcomes (Delgadillo et al., 2018), more negative attitudes towards patients (Holmqvist & Jeanneau, 2006), and poorer patient satisfaction (Garman et al., 2002). For healthcare organisations, burnout increases staff turnover, absenteeism, job withdrawal, and job dissatisfaction, and reduces commitment to the job/organisation and job performance (Leiter & Maslach, 2009; Schouteten, 2016; Schaufeli et al., 2009; Borritz et al., 2006; Taris, 2006; Maslach & Leiter, 2016; Bakker & Heuven, 2006). Given the costly expense of recruiting and training new healthcare professional, it is not surprising that burnout is considered “*economically wasteful*” (Gilbody et al., 2006).

Interventions for Burnout

Given the aforementioned consequences, there are individual, organisational, and moral/ethical obligations to invest resources into effective burnout interventions for healthcare professionals, particularly if healthcare organisations like the National Health Service (NHS) are to be sustained. There is currently no consensus about how interventions should target burnout (Ahola et al., 2017) or the specific burnout-alleviating techniques that offer the most benefit (Maricutoiu et al., 2016). *Individual-focussed* burnout interventions include mindfulness (Goodman & Schorling, 2012; Xie et al., 2020), acceptance and commitment therapy techniques (Hayes et al., 2004; Puolakanahoa et al., 2020), psychosocial interventions targeting coping skills and attitudes (Ewers et al.,

2002), cognitive behavioural therapy (van Dierendonck et al., 1998; Salyers et al., 2011; Lee et al., 2016), and job crafting (Tims & Bakker, 2010; Lichtenthaler & Fischbach, 2019). *Organisational-focussed* burnout interventions involve communication and social skills training for supervisors (van Dierendonck et al., 1998), task planning, leadership style and staff support training for managers (Scarnera et al., 2009), and the restriction of working hours (Goitein et al., 2005; Barrack et al., 2006). Some systematic reviews and meta-analyses have demonstrated the efficacy of *organisational-focussed* burnout interventions (West et al., 2016; Busireddy et al., 2017; Panagioti et al., 2017), whilst others have demonstrated the efficacy of *individual emotion-focussed* burnout interventions for reducing EE and DP and *individual problem-focussed* interventions for increasing PA (Shin et al., 2014, Lee et al., 2016; Dreison et al., 2018). However, research has only demonstrated small-to-medium effect size averages across burnout interventions (Dreison et al., 2018).

As evidenced, burnout interventions are numerous. The results are mixed and insubstantial, and the focus, content, theoretical underpinnings, and underlying mechanisms of change through which reductions in burnout are achieved remain unclear (Ahola et al., 2017). Nevertheless, *individual-focussed* interventions have been most widely studied and implemented in healthcare, of which the two most common are cognitive behavioural interventions and job crafting.

What Works for Whom?

Precision medicine can be defined as an individual receiving:

“preventative and treatment interventions that are optimally matched to their characteristics and needs...across diagnostic categories, and across the lifespan” (National Institute of Mental Health, 2021).

Rather than relying on clinical diagnoses or therapists’ intuition or subjective judgements to determine intervention suitability, mental health research has started focusing on data-driven models to match individuals to interventions predicted to be most effective for them (Cohen & DeRubeis, 2018; Kessler & Luedtke, 2021). This is particularly important because one intervention may

prove highly effective for one individual but not for another and better outcomes are evidenced when individuals receive their optimal intervention (Cohen et al., 2018; DeRubeis et al., 2014; Delgado & Gonzalez Salas Duhne, 2020a).

Machine learning (ML) refers to a data mining process that enables the discovery of patterns in data, which a computer (i.e., *machine*) can learn and then apply to solve problems related to prediction and classification (Hastie et al., 2009). A particular type of ML – supervised ML – can identify patterns of features (i.e., demographic/clinical/personality characteristics) that are associated with response to interventions. In the field of mental health, ML has matched patients to specific interventions in this personalised way (e.g., Cohen et al., 2020; van Bronswijk et al., 2021; Delgado et al., 2020a; Webb et al., 2020; Keefe et al., 2020). Applying ML algorithms to guide clinical decision-making has been shown to improve the effectiveness of psychotherapy by matching patients to the right treatment (Delgado et al., 2022) or by selecting treatment techniques that could help resolve problems for patients who are not responding well to treatment (Lutz et al., 2022). However, precision medicine and ML methods have not yet been applied in the field of occupational health.

UpLift Trial Overview

The UpLift Trial was a randomised control trial (RCT) comparing the effectiveness of Cognitive Behavioural Therapy (CBT) targeting burnout and a novel Job Crafting (JC) intervention targeting burnout risk factors. Its focus was reducing burnout, as subjectively reported participating NHS healthcare professionals, or offer a preventative intervention. Further details of the UpLift trial are in the methods section.

Rationale

Burnout is widespread amongst healthcare professionals and has far-reaching consequences. There are multiple risk factors, suggesting that different people are at risk of burnout for different reasons and through different mechanisms. Current burnout interventions work reasonably well.

Potentially, these interventions could work better if the right treatment is offered to the right person, based on knowledge about burnout risk factors and treatment response. The field of precision mental health demonstrates that personalised treatment matching using ML algorithms can improve the efficiency and effectiveness of psychological interventions (Chekroud et al., 2021; Delgadillo & Lutz, 2020). The proposal for the current research is to apply precision medicine principles to develop personalised ways of matching healthcare professionals to burnout interventions, using outcome measure data from the UpLift Trial.

Aim and objectives

This research aimed to optimally match healthcare professionals to UpLift interventions for burnout using ML algorithms. The specific objectives are:

1. To identify participant baseline characteristics that are statistically, and significantly, associated with response to two burnout interventions: CBT or Job Crafting.
2. To develop treatment-specific prediction models using identified predictors, and a personalised advantage index combining information from these prediction models, to match individuals to their optimal intervention.
3. To test the predictive accuracy of the models in a statistically independent validation sample.

Methods

Design

This was a secondary analysis of anonymised quantitative data collected during the UpLift Trial [<https://doi.org/10.1186/ISRCTN18197153>]; a multi-site RCT investigating the comparative effectiveness of two interventions for burnout (CBT vs. JC) in a large sample of healthcare professionals employed by the NHS in England.

Ethical Considerations and Governance

Ethical approval for the UpLift Trial and secondary analyses of UpLift datasets was granted by the NHS Health Research Authority and Health and Care Research Wales, 26/10/2020, REC reference: 20/EM/0236 (see Appendix A). All participants provided informed consent for their data to be used for research purposes.

Ethical approval for this secondary analysis was provided by the University of Sheffield Research Ethics Committee (see Appendix B). The University of Sheffield provided scientific approval (see Appendix C) and confirmation of research governance sponsorship (see Appendix D). The proposed method for aggregating and analysing anonymised data was congruent with the NHS information governance policy and good practice guidelines.

The UpLift Trial

Funding

The UpLift Trial was jointly funded by MindLife UK and Rotherham Doncaster and South Humber (RDaSH) NHS Foundation Trust.

Inclusion/Exclusion Criteria

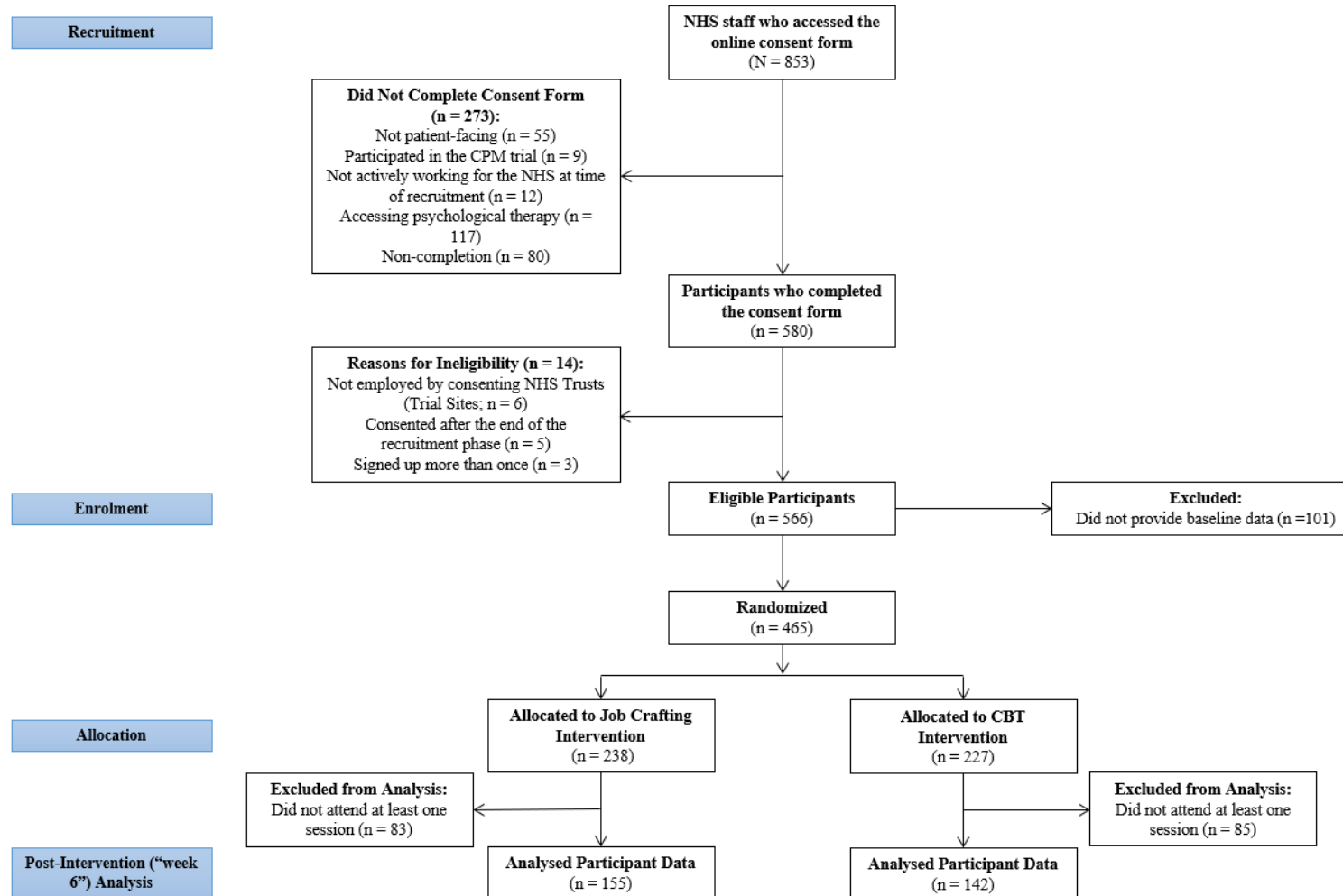
Eligible participants were full-time or part-time healthcare professionals working in participating NHS Foundation Trusts (see Appendix E for the full list of all 20 participating NHS Foundation Trusts). This included clinical and administrative staff with patient-facing roles. The exclusion criteria comprised of staff in non-patient-facing roles, not in active service at the time of recruitment (e.g., sickness absence, maternity leave, or suspension), employed on temporary contracts (e.g., bank/agency staff), not employed by participating NHS Foundation Trusts, accessing psychological therapy, and participating in other interventional studies focusing on burnout at the time of recruitment.

Recruitment, Procedure and Data Collection

UpLift participants were recruited via email promotion (through their NHS mailing list) and using electronic participant information sheets (see Appendix F) and consent forms (see Appendix G). Figure 1 shows the flow of participants in the UpLift Trial, whose data was used for the purpose of this secondary analysis. All study data were collected using electronic survey (Qualtrics software). Eligible and consenting participants were emailed web-links and reminders prompting them to complete baseline (“week 0”), mid-intervention (“week 3”), post-intervention (“week 6”), and follow-up (week “30”) outcome measures relating to participant characteristics, burnout risk factors and burnout profiles. Data collection occurred between December 2020 and August 2021. A maximum of five email reminders were sent to participants.

Figure 1

Consort Flow Diagram demonstrating the Flow of Participants through the UpLift Trial up until Post-intervention (“week 6”)



Interventions

UpLift Trial participants were randomly allocated to either (1) CBT or (2) JC. Each intervention was based on different underpinning theories, principles, and evidence base. Both interventions were expected to induce changes in burnout and wellbeing. However, they were hypothesised to do so via different mechanisms, which is consistent with literature that points to multiple interrelated risk factors (Davis, 2020). Interventions were delivered using a blended care approach involving six “live” online webinars delivered by a facilitator for one-hour each week for six weeks and access to self-help information via the UpLift Trial website (<https://upliftrial.com/>). The UpLift Trial website included interactive media such as videos, animations, and practical exercises that guided participants to apply and practice coping skills related to burnout covered by each of the six sessions from their respective intervention.

The CBT intervention targeting burnout integrated concepts from CBT (Beck, 2011), the social-cognitive theory of stress (Lazarus & Folkman, 1984), and the flow state concept from positive psychology (Nakamura & Csikszentmihalyi, 2009). It was designed to help participants implement coping skills to manage unhelpful thoughts, feelings, and behaviours arising from high levels of stress and burnout. The weekly CBT sessions covered specific coping skills featured in previous controlled trials that have empirical support (Lee et al., 2016). These coping skills included individual formulation using the five areas model, controlled breathing, mindfulness and attention training, cognitive restructuring, problem solving, and the identification and modification of counter-productive behaviours and ineffective coping strategies.

The JC intervention targeting burnout risk factors integrated concepts from the job demands-resources model (Demerouti et al., 2001), effort-reward imbalance model (Siegrist, 1996), and job crafting model (Tims et al., 2010). These theories have been used as conceptual frameworks to develop coping skills that specifically target empirically supported burnout risk factors in mental health professionals (Davis, 2020). These coping skills were designed to mitigate organisational

stressors such as (1) an imbalance of rewards-effort and demands-resources, (2) relational stressors arising from professional, client, and family relationships, and (3) psychological stressors such as over-commitment.

Secondary Data from the UpLift Trial

Demographic Data

Demographic information was collected at baseline (week “0”) before the interventions began. Data collected included: age; gender; ethnicity; occupation; years in service; occupational department (e.g., adult services, children’s services, mental health etc.); working hours (e.g., full-time, part-time); and number of days of sickness absence in the three months prior to the interventions (see Appendix H). Information relating to sickness absence was also collected at set intervals during the UpLift Trial and follow-up period.

Measures and Procedure

Outcome measures completed by participants at baseline were informed by the previous research (Davis, 2020). Twelve baseline measures were completed altogether. The primary outcome measure of burnout (described below) was completed post-intervention (week “6”) and at follow-up (“week 30”). Table 1 illustrates the outcome measures completed by participants at the given time-points with corresponding scoring, interpretations, and Cronbach- α values. This research focussed solely on identifying baseline predictors (“week 0” data) of post-intervention burnout (week “6” data). The analysis of follow-up data was outside of the scope of this research.

Primary outcome measure. The Oldenburg Burnout Inventory (OLBI; Demerouti et al., 2003) was used to assess whether interventions reduced burnout in participating healthcare professionals. The OLBI consists of 16 statements, split equally into two subscales measuring the two dimensions of burnout: (1) *vigour to exhaustion* and (2) *dedication to disengagement* (see Appendix I). Psychometric validation of the OLBI in 2599 adults across professional disciplines demonstrated robust convergent and discriminant validity (Halbesleben & Demerouti, 2005).

Baseline measures examined as potential outcome predictors.

Job Satisfaction. The Jobs Satisfaction Survey (JSS; Spector, 1985; 1997) is a 36-item self-report measure with nine facet scales to assess aspects of the job itself and attitudes towards the job. To reduce participant burden in the UpLift Trial, only the four '*nature of the work*' items relating to the job tasks were used to measure participant intrinsic job satisfaction (see Appendix J). Other aspects of job satisfaction were captured elsewhere. The JSS has been validated across healthcare professionals (Batura et al., 2016). It has evidenced "*good*" convergent (.61 to .80) and discriminant (.19 to .59) validity in comparison to the Job Descriptive Index (JDI; Smith et al., 1969) and subscales (Spector, 1985; van Saane et al., 2003). The Job Discrepancy and Satisfaction Scale (JDSS; Nagy, 2002) has been validated in comparison to the JDI (Smith et al., 1969). It consists of eight questions capturing how satisfied individuals are with their role, including salary, promotion, and supervision (see Appendix K).

Stress and Mental Wellbeing. The Mental Health Professionals Stress Scale (MHPSS; Cushway et al., 1996) is a 42-item self-report measure originally grouped into seven subscales. In accordance with Davis (2020), only 30 items were administered from five subscales relating to '*workload*', '*client-related difficulties*', '*organisation structure and processes*', '*relationships and conflicts with other professionals*' and '*lack of resources*' were used for this research (see Appendix L). Research supports the concurrent validity and discriminant validity of the MHPSS (Cushway et al., 1996). The Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; Tennant et al., 2007) is a 16-item self-report measure designed to assess mental wellbeing across the previous two weeks (see Appendix M). Psychometric evaluation of the WEMWBS has demonstrated validity, reliability and robustness as a measure of wellbeing in adults, with "*good*" test-retest reliability (.81; Tennant et al., 2007).

Turnover Intentions. Turnover intentions are defined as the probability that an employee will leave their job (Simon et al., 2010). One statement from the Job Diagnostic Survey (JDS;

Hackman & Oldham, 1975) was used to assess turnover intentions (see Appendix N); “*I frequently think about quitting my job*”. The JDS demonstrates “*low-to-moderate*” test-retest reliability and “*moderate-to-good*” discriminant validity (Taber & Taylor, 1990).

Job Autonomy. The Job Diagnostic Survey: Autonomy Subscale (JDSAS; Hackman & Oldham, 1974) consists of four statements pertaining to subjective levels of job autonomy (see Appendix O). This subscale has been validated by Adebayo and Ezeanya (2011); demonstrating that lower levels of autonomy are related to increased burnout amongst psychiatrists.

Self-efficacy. General Self-Efficacy Scale (GSES; Schwarzer & Jerusalem, 1995) is a 10-item self-report measure used to identify an individual’s subjective levels of self-efficacy and beliefs about their ability to cope with challenges (see Appendix P). Psychometric evaluation has demonstrated “*good*” convergent and discriminant validity of the GSES (Schwarzer et al., 1997).

Work-family Conflict. The Work-Family Conflict Scale (WFCS; Netemeyer et al., 1996) is a five-item self-report measure designed to capture conflict between work roles and familial responsibilities (see Appendix Q). Construct and predictive validity of this measure has been supported through psychometric validation (Boyar et al., 2006).

Overcommitment. The Overcommitment Subscale (OCI; Siegrist et al., 2014) of the Effort-Reward Imbalance (ERI) questionnaire has six-items that capture the ability to separate professional roles from personal life (see Appendix R). Studies have supported the factorial validity (Rantanen et al., 2013), test-retest reliability (Shimazu & de Jonge, 2009), and discriminant validity (Leineweber et al., 2010) of the ERI questionnaire.

Social Support. The Social Support Scale (SSS; House et al., 1978) is a six-item self-report questionnaire designed to capture the level of work-related social support received by an individual from colleagues, supervisors, spouses/partners, and friends/family (see Appendix S). For this research, only the ‘*supervisor*’ and ‘*other people at work*’ items were administered (Davis, 2020).

Higher scores indicate higher levels of perceived social support. Psychometric evaluation demonstrates discriminant validity and reliability of the SSS (Deeter-Schmelz & Ramsey, 1977; Jenkins & Elliot, 2004)

Personality. The Big Five Inventory-10 (BFI-10; Rammstedt et al., 2007) consists of 10 statements, derived from the 44-item measure of personality, capturing: (1) extraversion, (2) agreeableness, (3) conscientiousness, (4) neuroticism, and (5) openness (see Appendix T). This measure has been deemed suitable where time is a significant limiting factor and investigations of personality are not the main focus of the study (Rammstedt et al., 2007). The BFI-10 demonstrates “*satisfactory*” test-retest reliability, convergent validity, and discriminant validity (Rammstedt et al., 2007).

Table 1

Measures Completed at Baseline (“week 0”) and Post-intervention (“week 6”) with Corresponding Scoring, Interpretations, and Cronbach- α values

Measure	Subscales	Item Scoring Range	Min	Max	Scoring Interpretation	Cronbach- α
OLBI						
	Disengagement	1-4	8	32	higher scores = greater disengagement	.80†
	Exhaustion	1-4	8	32	higher scores = greater exhaustion	.76†
WEMWBS¶		1-5	14	70	higher scores = greater positive mental wellbeing	0.89 - 0.91‡
JDS		1-7	1	7	higher scores = greater intention to quit	-.16 - .91
BFI-10¶						
	Extraversion	1-5	2	10	higher scores = greater extraversion	.64†
	Agreeableness	1-5	3	15	higher scores = greater agreeableness	.41†
	Conscientiousness	1-5	2	10	higher scores = greater conscientiousness	.42†
	Neuroticism	1-5	2	10	higher scores = greater neuroticism	.55†
	Openness	1-5	2	10	higher scores = greater openness	.23†
MHPSS						
	Workload	0-3	0	18	higher scores = greater workload pressure	.83†
	Client-related Difficulties	0-3	0	18	higher scores = greater client-related difficulties	.73†
	Organisational Structures/Processes	0-3	0	18	higher scores = greater pressures with organisation structures and processes	.84†
	Relationships/Conflicts with Other Professionals	0-3	0	18	higher scores = greater pressures with relationships and conflicts with other professionals	.79†
	Lack of Resources	0-3	0	18	higher scores = greater pressures with lack of resources	.68†
GSES		1-4	10	40	higher scores = greater perceived general self-efficacy	.89†
WFCS		1-7	5	35	higher scores = greater levels of conflict	.93†
JDSAS		1-7	4	28	higher scores = greater perceived level of job autonomy	.78†
JDSS¶		1-4	8	32	higher scores = greater satisfaction with role	.77†
JSS		1-6	4	24	higher scores = greater job satisfaction	.68 - .77§
OCI		1-4	6	24	higher scores = greater overcommitment to work	.85†
SSS		0-3	0	18	higher scores = greater social support	.89†

Note. Oldenburg Burnout Inventory (OLBI; Demerouti et al., 2003); Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; Tennant et al., 2007); Job Diagnostic Survey (JDS; Hackman et al., 1975); Big Five (Personality) Inventory-10 (BFI; Rammstedt & John, 2007); Mental Health Professionals Stress Scale (MHPSS; Cushway et al., 1996); General Self-Efficacy Scale (GSES; Schwarzer et al., 1995); Work-Family Conflict Scale (WFCS;

Netemeyer et al., 1996); Job Diagnostic Survey: Autonomy Subscale (JDSAS; Hackman et al., 1974); Job Discrepancy and Satisfaction Scale (JDSS; Nagy, 2002); Job Satisfaction Survey (JSS; Spector, 1985; 1997); Over-commitment Subscale (OCI; Siegrist & Montano, 2014); Social Support Scale (SSS; House & Wells, 1978).

† Cronbach- α taken from Davis (2020); ‡ Cronbach- α taken from Tennant et al., (2007); § Cronbach- α taken from Spector (1997) and Fields (2002); - No Cronbach- α for the single JDS item, however the Cronbach- α for the full JDS is given underneath in brackets (taken from Taber et al., 1990; Jansen et al., 1996; Adebayo & Ezeanya, 2010; Cai et al., 2011; Charalambous et al., 2013); ¶ Administered at Baseline only

Data Pre-processing

Sample Size Estimation

A previous study collecting the same measures as the UpLift Trial recruited 287 mental health professionals (Davis, 2020). Davis (2020) demonstrated that baseline participant characteristics predicted burnout severity with an R^2 of $\geq .38$, which is equivalent to a large effect size of $f^2 = .61$. As observed by Davis (2020), not all baseline parameters retain prognostic/prescriptive value. Therefore, although 12 baseline measures were included in the UpLift Trial, it was not expected that all 12 would be retained in each prediction model following initial variable selection. Entering the parameters from Davis (2020) and expecting that approximately two-thirds of predictors would be retained in each prediction model (i.e., nine predictors), a sample size calculation equation for the development of two multivariable prediction models using ML was followed (Riley et al., 2019). This used internal cross-validation loops and allowed for up to 10% prediction shrinkage, which is highly conservative (Riley et al., 2019). The results yielded a minimum sample size estimate of 118 participants with available baseline and outcomes data would be required per intervention group (i.e., Total training sample $N = 236$; CBT $n = 118$; JC $n = 118$) to accomplish the objectives of this secondary analysis.

Research in the field of ML recommends that the accuracy of prediction models be tested in an independent validation sample, that has not been used to train the prediction models. Such a validation design would require an additional 118 participants (i.e., Total $N = 352$; training sample $n = 236$; validation sample $n = 118$).

Sample Selection Process and Sample Characteristics

Data were only eligible for inclusion from participants who attended at least one intervention session and who completed all baseline measures. In accordance with Fig 1, data from 297 UpLift participants were available for this secondary analysis (i.e., JC $n = 155$; CBT $n = 142$). Table 2

summarises sample characteristics and the results of baseline outcome measures for the total sample and for each respective intervention.

Table 2*Sample Characteristics and Baseline Measures in the Total Sample and Each Intervention Groups*

Characteristics	Total Sample (N = 297)	CBT (n = 142)	JC (n = 155)
Age†	41.20 (10.74)	40.82 (10.65)	41.54 (10.83)
Gender			
Female‡	269 (90.57%)	127 (89.44%)	142 (91.61%)
Male‡	27 (9.09%)	15 (10.56%)	12 (7.74%)
Prefer not to Say‡	1 (0.34%)	-	1 (0.65%)
Ethnicity			
White British‡	247 (83.16%)	119 (83.80%)	128 (82.58%)
White European‡	11 (3.70%)	6 (4.23%)	5 (3.23%)
Asian/British Asian – South Asia‡	9 (3.03%)	5 (3.52%)	4 (2.58%)
White Other‡	9 (3.03%)	3 (2.11%)	6 (3.87%)
Asian/Asian British – East African, Punjabi, Tamil, Other‡	4 (1.35%)	2 (1.41%)	2 (1.29%)
Mixed – Other‡	4 (1.35%)	2 (1.41%)	2 (1.29%)
Black/Black British African‡	3 (1.01%)	1 (0.70%)	2 (1.29%)
Black/Black British – Caribbean‡	2 (0.67%)	1 (0.70%)	1 (0.65%)
Mixed – White/Asian‡	2 (0.67%)	1 (0.70%)	1 (0.65%)
Black British‡	1 (0.34%)	1 (0.70%)	-
Black/Black British – Other‡	1 (0.34%)	-	1 (0.65%)
Chinese‡	1 (0.34%)	1 (0.70%)	-
Vietnamese‡	1 (0.34%)	-	1 (0.65%)
Did Not Specify‡	2 (0.67%)	-	2 (1.29%)
Occupation			
Nurse‡	57 (19.19%)	25 (17.61%)	32 (20.65%)
Psychologist, Psychotherapist or Other Psychological Therapist‡	53 (17.85%)	28 (19.72%)	25 (16.13%)
Occupational Therapist/Assistant‡	26 (8.75%)	10 (7.04%)	16 (10.32%)
Team/Clinical Lead or Team/Ward Manager‡	17 (5.72%)	5 (3.52%)	12 (7.74%)
Other Medical Professional‡	15 (5.05%)	10 (7.04%)	5 (3.23%)
Mental Health Practitioner‡	15 (5.05%)	10 (7.04%)	5 (3.23%)
Community Psychiatric Nurse‡	14 (4.71%)	8 (5.63%)	6 (3.87%)
Physiotherapist‡	13 (4.38%)	8 (5.63%)	5 (3.23%)
Speech & Language Therapist/Assistant‡	11 (3.70%)	6 (4.23%)	5 (3.23%)
Assistant Psychologist‡	8 (2.69%)	4 (2.82%)	4 (2.58%)
Consultant Psychiatrist‡	8 (2.69%)	1 (0.70%)	7 (4.52%)
Nursing/Healthcare Assistant or Support Worker‡	7 (2.36%)	3 (2.11%)	4 (2.58%)
Care Co-ordinator‡	6 (2.02%)	3 (2.11%)	3 (1.94%)

Paramedic‡	5 (1.68%)	2 (1.14%)	3 (1.94%)
Social Worker‡	5 (1.68%)	4 (2.82%)	1 (0.65%)
Health Advisor‡	4 (1.35%)	1 (0.70%)	3 (1.94%)
Pharmacy Technician‡	4 (1.35%)	3 (2.11%)	1 (0.65%)
Psychological Therapies Trainee‡	4 (1.35%)	1 (0.70%)	3 (1.94%)
Administrator‡	3 (1.01%)	1 (0.70%)	2 (1.29%)
Doctor or Physician‡	2 (0.67%)	2 (1.14%)	-
Education/Employment Professional‡	2 (0.67%)	1 (0.70%)	1 (0.65%)
Not Stated‡	18 (6.06%)	6 (4.23%)	12 (7.74%)
OLBI			
Total OLBI†	37.89 (6.30)	37.51 (6.68)	38.25 (5.94)
Disengagement†	20.78 (3.69)	20.67 (3.88)	20.88 (3.52)
Exhaustion†	17.11 (3.53)	16.84 (3.65)	17.36 (3.41)
WEMWBS†	43.10 (7.53)	42.92 (7.88)	43.26 (7.22)
JDS†	3.91 (2.04)	3.94 (2.16)	3.88 (1.94)
BFI-10			
Extraversion†	6.43 (2.12)	6.21 (2.02)	6.63 (2.20)
Agreeableness†	7.39 (1.70)	7.38 (1.78)	7.40 (1.62)
Conscientiousness†	8.49 (1.62)	8.42 (1.66)	8.56 (1.58)
Neuroticism†	6.37 (2.02)	6.63 (2.02)	6.13 (2.00)
Openness†	6.97 (1.87)	7.01 (1.93)	6.94 (1.81)
MHPSS†	43.79 (15.10)	43.44 (16.09)	44.11 (14.18)
GSES†	27.93 (4.52)	27.48 (4.40)	28.34 (4.60)
WFCS†	21.30 (7.55)	21.03 (7.55)	21.55 (7.55)
JDSAS†	20.30 (4.83)	20.27 (5.01)	20.32 (4.68)
JDSS†	19.75 (4.49)	19.56 (4.45)	19.92 (4.53)
JSS†	18.69 (3.86)	18.32 (4.07)	19.03 (3.63)
OCI†	16.21 (3.49)	16.49 (3.68)	15.96 (3.30)
SSS†	12.36 (3.91)	12.16 (4.05)	12.54 (3.79)

Note. Cognitive Behaviour Therapy (CBT); Job Crafting (JC); Oldenburg Burnout Inventory (OLBI; Demerouti et al., 2003); Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; Tennant et al., 2007); Job Diagnostic Survey (JDS; Hackman et al., 1975); Big Five (Personality) Inventory-10 (BFI; Rammstedt et al., 2007); Mental Health Professionals Stress Scale (MHPSS; Cushway et al., 1996); General Self-Efficacy Scale (GSES; Schwarzer et al., 1995); Work-Family Conflict Scale (WFCS; Netemeyer et al., 1996); Job Diagnostic Survey: Autonomy Subscale (JDSAS; Hackman et al., 1974); Job Discrepancy and Satisfaction Scale (JDSS; Nagy, 2002); Job Satisfaction Survey (JSS; Spector, 1985; 1997); Overcommitment Subscale (OCI; Siegrist et al., 2014); Social Support Scale (SSS; House et al., 1978).

† Mean and Standard Deviation; ‡ Number and Percentage

Partitioning of Data into Training and Validation Samples

Using an online random number generator, the dataset ($N = 297$) was partitioned into two independent samples – a training sample and a validation sample. The training sample contained data from 200 participants (i.e., JC $n = 100$ (64.52%); CBT $n = 100$ (70.42%)). The validation sample contained data from 97 participants (i.e., JC $n = 55$ (35.48%); CBT $n = 42$ (29.58%)).

Missing Data

Multiple imputation (Rubin, 2004; Schunk, 2008) was conducted separately across the training and validation samples to account for missing data in predictor variables (i.e., baseline data) and dependent variable (i.e., post-intervention OLBI scores).

Data Analysis Methodology

Developing the Machine Learning Models

Prediction models were independently developed for CBT and JC cases in the training sample. Elastic Net Regularization (ENR) is a supervised ML approach that performs variable selection (i.e., identifying participant characteristics that are reliably associated with the outcome of interest) and weight setting (i.e., adding more or less “*weight*” to variables that have stronger or weaker predictive value, respectively), to develop one prediction model per intervention. ENR was applied to identify prognostic and prescriptive variables for each intervention, with post-intervention OLBI scores as the dependent variable. Prognostic variables refer to variables that generally predict outcomes in both treatments. Prescriptive variables are treatment-specific (i.e., they predict outcomes for one intervention but not the other). The ENR analysis is a form of penalized regression, combining the Ridge regression penalization (also termed L2 regularization), which penalizes regression coefficients without excluding predictors, and the Least Absolute Shrinkage and Selection Operator (LASSO) penalisation (also termed L1 regularization), which selects the most parsimonious model of predictors by shrinking coefficients that have no predictive value to zero. Together, Ridge and

LASSO constrain coefficients among collinear variables in order to minimize model overfitting and enhance the prediction accuracy and generalizability of the model (Zou & Hastie, 2005).

The predictors entered into these models were all available baseline measures. To select an optimal set of predictor variables using ENR, several candidate models were tested using 10-fold cross-validation (Rodriguez et al., 2009). The selected models were within one standard deviation of the best fitting model (one standard error rule), in order to choose models that would be most likely to generalize to new samples and which include a parsimonious set of predictors. This internal (i.e., within the training sample) cross-validation procedure enables the selection of predictors in a way that is not overly influenced by extreme outliers, therefore improving model generalizability (Breckler, 1990; MacCallum et al., 1992). Separate ENR models were developed in the training sample for each intervention group. An independent validation sample, comprising of cases from both interventions, was used as an external cross-validation sample (as per objective 3). The methodology followed the exact methodology used by Delgadillo et al. (2020a), for reference.

Developing a Personalised Advantage Index

Using the intervention-specific ENR equations developed in the training sample, a personalized advantage index (PAI; DeRubeis et al., 2014) was computed. This computes the difference between ENR model-predicted OLBI scores from each intervention (i.e., predicted score for CBT - predicted score for JC) for each participant. A positive PAI score indicated that participants were more likely to benefit from JC, whilst a negative PAI score indicated that participants were more likely to benefit from CBT. For example, a PAI of -0.82 suggests that if a participant's model-predicted post-intervention OLBI score for the JC intervention was 40.47, the model-predicted post-intervention OLBI score for the CBT intervention would be 0.82 less, resulting in a score of 39.65 (with lower scores indicating less burnout).

During the next stage of the analysis, it was assumed that participants could then be classified into subgroups according to the PAI cut-off scores of one standard deviation above/below the

mean PAI. These subgroups were expected to be (1) participants for whom an “*optimal*” treatment was not strongly indicated (i.e., a PAI score close to the mean – indicating that the participant would respond equally to either intervention), or (2) participants for whom one of the two interventions (i.e., CBT or JC) was indicated as the “*optimal*” treatment (i.e., a PAI score further from the mean – indicated the intervention that is mostly likely to lead to lower burnout for that individual). This PAI classification method was expected to help match healthcare professionals to their optimal treatment option.

External Cross-validation in the Validation Sample

The performance and clinical utility of the ENR models and targeted prescription algorithm were evaluated in two steps. Firstly, each intervention-specific ENR model was applied in the external validation sample (N = 97) to produce a model-predicted post-intervention OLBI score. The predictive accuracy of each ENR model was evaluated by examining the absolute agreement between the predicted and the observed post-intervention OLBI scores, using the R-square as a performance metric. Secondly, the targeted prescription algorithm (which combined information from both ENR models) was applied to all cases in the external validation sample. This meant that, based on each participant’s baseline characteristics, the algorithm could make a prediction about their optimal intervention. The distribution of PAI scores was examined using a histogram, to understand if and how participants would be expected to benefit more from CBT or JC.

Results

General Effectiveness of Interventions for Burnout

An independent samples t-test revealed that post-intervention burnout (OLBI) scores were not significantly different between JC (M = 41.05, SD = 4.81) and CBT (M = 41.06, SD = 4.82, $t(274) = -0.02, p = .998$). Further details and statistical analyses for the primary outcome are found

in the main report for the UpLift Trial (Delgadillo et al., currently in preparation) and are outside of the scope of this secondary analysis.

Development and Performance of ENR Models in the Training Sample

Table 3 presents the variables and regularized coefficients selected into the most parsimonious prediction models for JC and CBT, in the training sample. Beta-coefficients (β -coefficients) shrunk to exactly .000 indicated variables that did not have predictive value. Five common prognostic variables featured in both ENR models. These were baseline OLBI disengagement, OLBI exhaustion, MHPSS, JDSS, and JSS scores. Baseline JDS was a better predictor of post-intervention OLBI scores in the JC intervention. Baseline WEMWBS and SSS scores were better predictors of post-intervention OLBI scores in the CBT intervention. The relative magnitude of regularized β -coefficients indicated the importance of each baseline variable for prediction accuracy. Baseline JSS was the most important predictor for the JC intervention, whilst baseline OLBI exhaustion was the most important predictor for the CBT intervention. Overall, both ENR models showed good prediction accuracy within the training sample, explaining approximately 61% of variability ($R^2 = .61$) in post-intervention burnout (OLBI).

Table 3*Elastic Net Regularization (ENR) Prediction Models for Post-Intervention Burnout (Total OLBI)**Scores according to Intervention (CBT vs. JC)*

Independent Variables at Baseline	JC Training Sample (N = 100) R ² = .61		CBT Training Sample (N = 100) R ² = .61	
	Beta (β)	Standard Error (SE)	Beta (β)	Standard Error (SE)
Age	.000	.000	.000	.005
Working Hours	.000	.000	.000	.004
OLBI Disengagement †	.183	.063	.142	.059
OLBI Exhaustion †	.050	.060	.165	.066
WEMWBS	.000	.010	.030	.047
JDS‡	-.019	.049	.000	.033
BFI Extraversion	.000	.001	.000	.003
BFI Agreeableness	.000	.003	.000	.003
BFI Conscientiousness	.000	.001	.000	.001
BFI Neuroticism	.000	.000	.000	.001
BFI Openness	.000	.001	.000	.011
MHPSS †	-.167	.074	-.126	.067
GSES	.000	.005	.000	.000
WFCS	.000	.000	.000	.005
JDSAS	.000	.032	.000	.030
JDSS †	.118	.064	.106	.068
JSS †	.213	.063	.142	.067
OCI	.000	.003	.000	.009
SSS§	.000	.029	.092	.050
Gender	.000	.001	.000	.006

Note. Oldenburg Burnout Inventory (OLBI; Demerouti et al., 2003); Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; Tennant et al., 2007); Job Diagnostic Survey (JDS; Hackman et al., 1975); Big Five (Personality) Inventory-10 (BFI; Rammstedt et al., 2007); Mental Health Professionals Stress Scale (MHPSS; Cushway et al., 1996); General Self-Efficacy Scale (GSES; Schwarzer et al., 1995); Work-Family Conflict Scale (WFCS; Netemeyer et al., 1996); Job Diagnostic Survey: Autonomy Subscale (JDSAS; Hackman et al., 1974); Job Discrepancy and Satisfaction Scale (JDSS; Nagy, 2002); Job Satisfaction Survey (JSS; Spector, 1985; 1997); Overcommitment Subscale (OCI; Siegrist et al., 2014); Social Support Scale (SSS; House et al., 1978).

† Prognostic variables common to JC and CBT; ‡ Prescriptive variables for JC only; § Prescriptive variables for CBT only

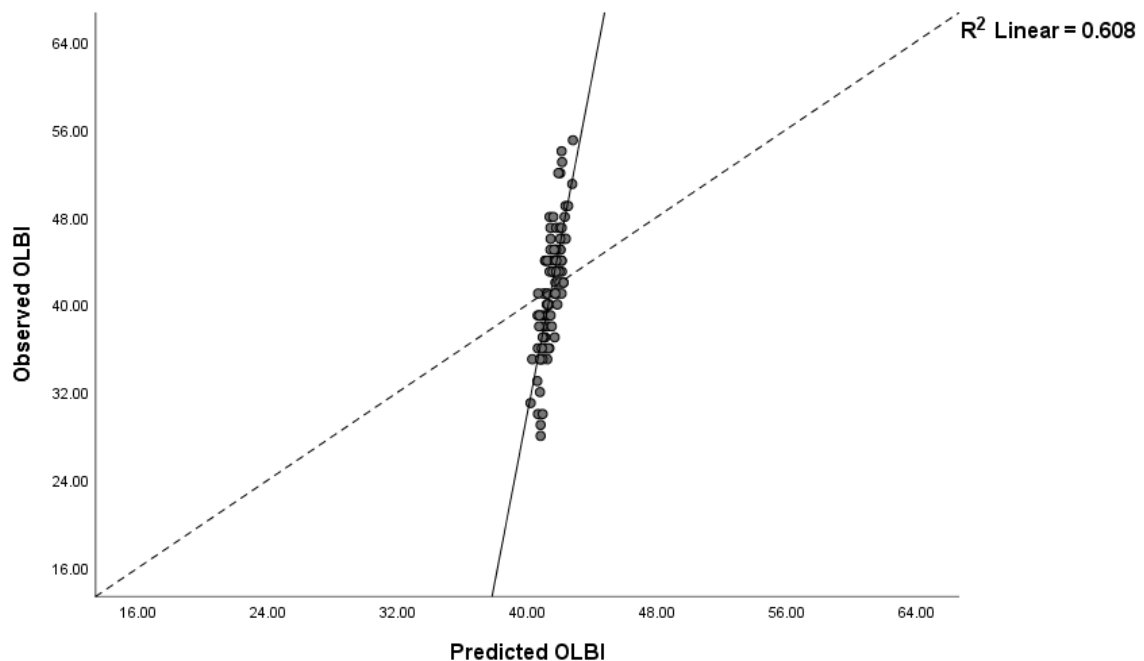
Evaluation of ENR Models and Personalized Advantage Index

Evaluation of ENR Models

Job Crafting. Figure 2 and Figure 3 demonstrate the calibration of the ENR model-predicted post-intervention OLBI scores compared to the observed post-intervention OLBI scores for the JC intervention. Figure 2 examines the performance of the JC ENR model in the training sample, whilst Figure 3 examines the performance of the JC ENR model in the validation sample. These plots show that prediction accuracy was high in both the training ($R^2 = .61$) and validation ($R^2 = .61$) samples, respectively.

Figure 2

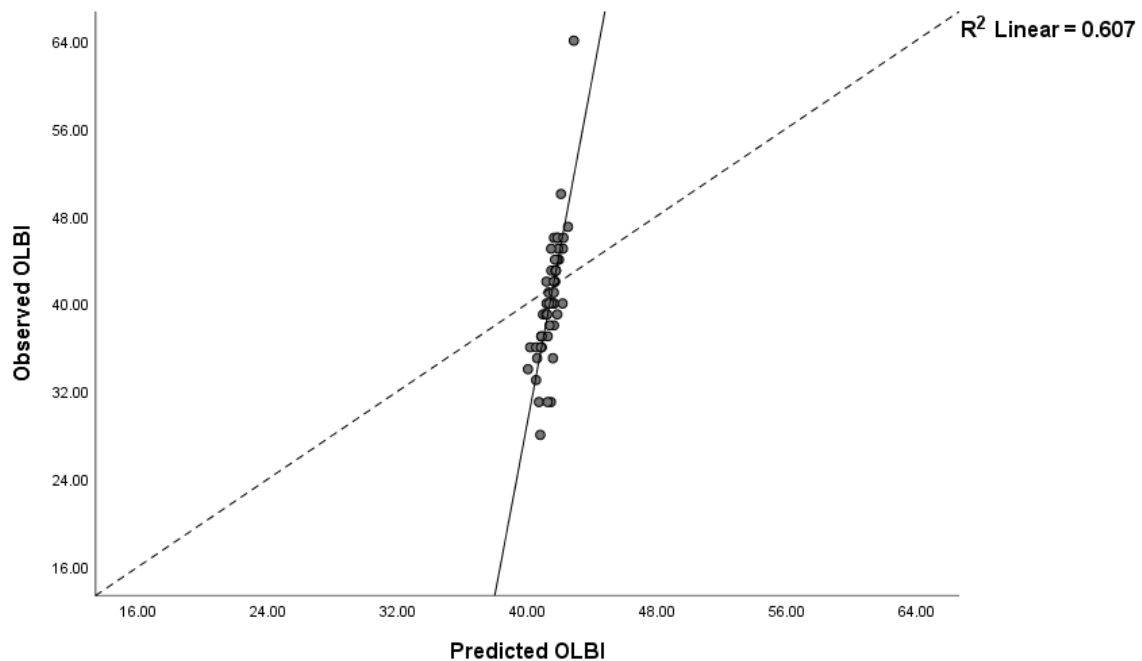
Scatter Plot demonstrating the Calibration of the ENR Model for the Job Crafting Intervention, in the Training Sample.



Note. (–) Solid diagonal line represents the inclination of the slope for the ENR model-predicted post-intervention OLBI scores; (--) Dotted diagonal line represents the inclination of the slope for what would indicate “perfect” predictive accuracy in which predicted and observed post-intervention OLBI scores would be equal (e.g., $R^2 = 1.00$); the R^2 demonstrates the predictive accuracy of the JC ENR model in the training sample (i.e., the calibration between predicted and observed post-intervention OLBI scores).

Figure 3

Scatter Plot demonstrating the Calibration of the ENR Model for the Job Crafting Intervention, in the Validation Sample.

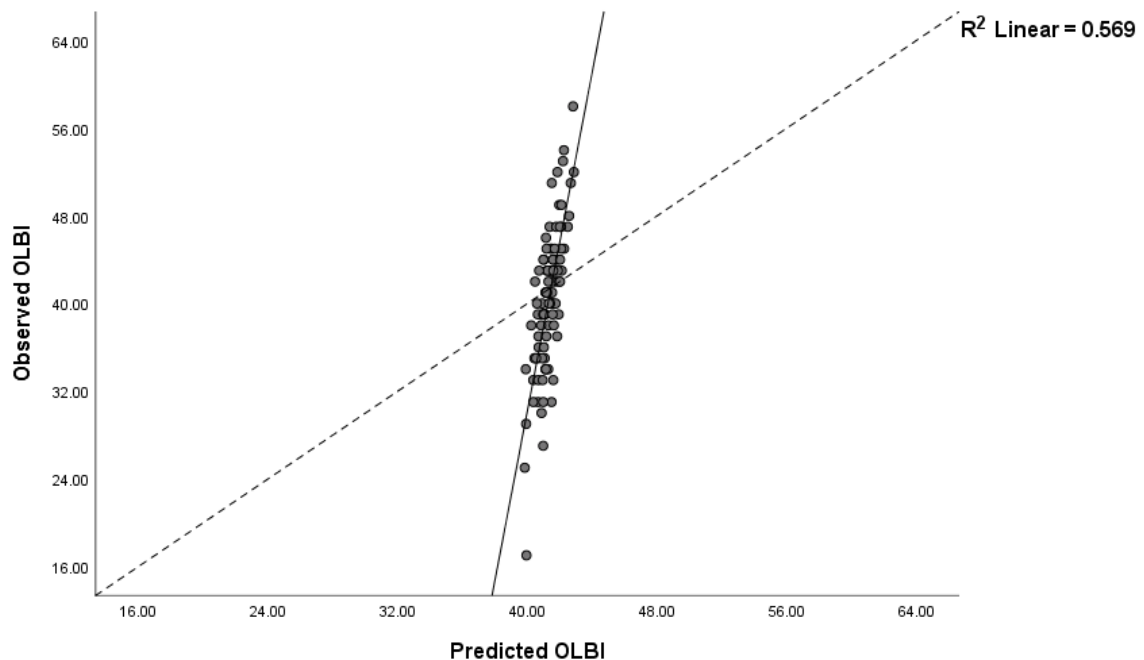


Note. (–) Solid diagonal line represents the inclination of the slope for the ENR model-predicted post-intervention OLBI scores; (–) Dotted diagonal line represents the inclination of the slope for what would indicate “perfect” predictive accuracy in which predicted and observed post-intervention OLBI scores would be equal (e.g., $R^2 = 1.00$); the R^2 demonstrates the predictive accuracy of the JC ENR model in the validation sample (i.e., the calibration between predicted and observed post-intervention OLBI scores).

CBT. Figure 4 and Figure 5 demonstrate the calibration of the ENR model-predicted post-intervention OLBI scores compared to the observed post-intervention OLBI scores for the CBT intervention. Figure 4 examines the performance of the CBT ENR model in the training sample, whilst Figure 5 examines the performance of the CBT ENR model in the validation sample. These plots show that prediction accuracy was high in the training sample ($R^2 = .57$) but lower (i.e., less accurate) in the validation sample ($R^2 = .43$).

Figure 4

Scatter Plot demonstrating the Calibration of the ENR Model for the Cognitive Behaviour Therapy Intervention, in the Training Sample.

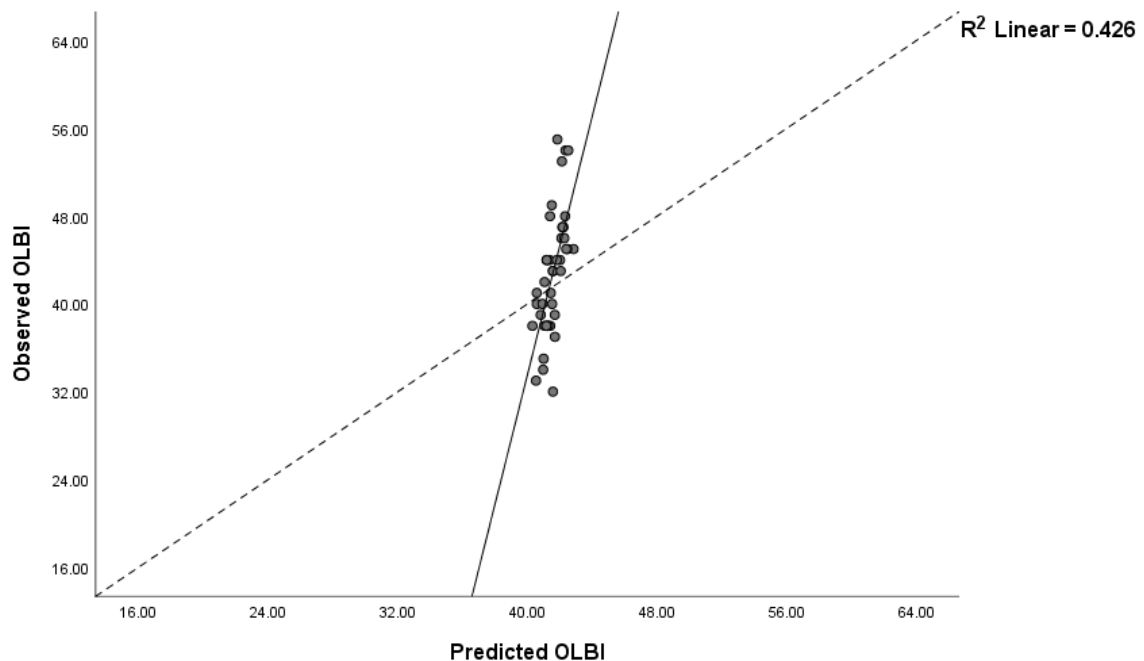


Note. (–) Solid diagonal line represents the inclination of the slope for the ENR model-predicted post-intervention OLBI scores; (--) Dotted diagonal line represents the inclination of the slope for what would indicate “perfect” predictive accuracy in which predicted and observed post-intervention OLBI scores would be equal (e.g., $R^2 = 1.00$); the R^2 demonstrates the predictive accuracy of the CBT ENR model in the training sample (i.e., the calibration between predicted and observed post-intervention OLBI scores).

The inclination of the slope (solid diagonal line) for the predicted OLBI scores across all calibration plots do not perfectly align with the dotted diagonal reference line (which would indicate a perfect correlation), but it follows a similar trend. Visually, this shows that predicted scores are correlated with observed (actual) scores, but they are not perfectly matched.

Figure 5

Scatter Plot demonstrating the Calibration of the ENR Model for the Cognitive Behaviour Therapy Intervention, in the Validation Sample.



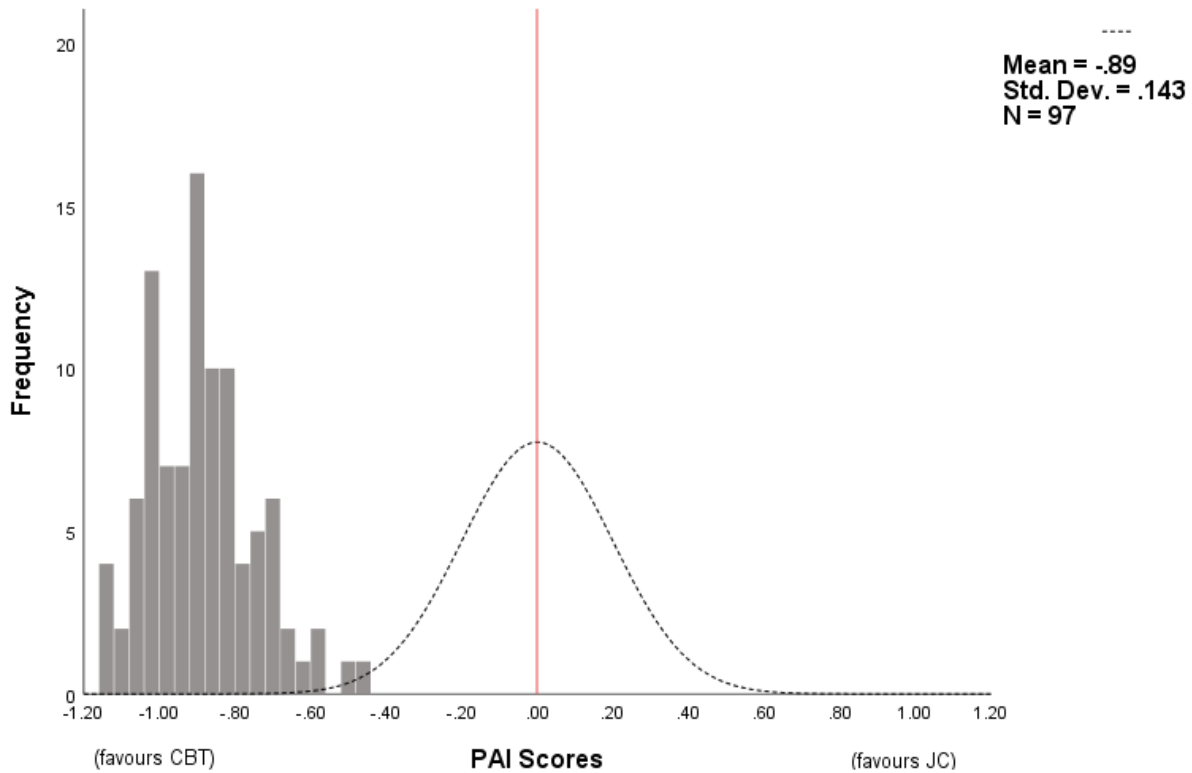
Note. (–) Solid diagonal line represents the inclination of the slope for the ENR model-predicted post-intervention OLBI scores; (–) Dotted diagonal line represents the inclination of the slope for what would indicate “perfect” predictive accuracy in which predicted and observed post-intervention OLBI scores would be equal (e.g., $R^2 = 1.00$); the R^2 demonstrates the predictive accuracy of the CBT ENR model in the validation sample (i.e., the calibration between predicted and observed post-intervention OLBI scores).

Evaluation of PAI Model

The PAI scores ranged from -0.45 to -1.22 ($M = -0.87$, $SD = 0.14$). PAI scores demonstrated that all participants in the validation sample were predicted to benefit more from CBT (see Figure 6). Figure 6 clearly indicates that there is no evidence that some participants might benefit more from JC, while others might benefit more from CBT (i.e., treatment response heterogeneity). Instead, the PAI model indicates that CBT is the preferred intervention for all participants in the validation sample.

Figure 6

Histogram demonstrating the Distribution of Personalized Advantage Index (PAI) scores in the Validation Sample according to the Expected Prognosis.



Note. Cognitive Behaviour Therapy (CBT); Job Crafting (JC); (—) Solid red horizontal reference line represents the centre of a normal distribution (i.e., the mean of 0.00); (---) Dotted bell-shaped curve represents a normal distribution centred around the mean (i.e., 0.00) and demonstrates the expected “hypothetical” distribution of PAI scores where some participants would benefit more from CBT to the left of the red reference line (i.e., the mean of 0.00) and some participants would benefit more from JC to the right of the red reference line (i.e., the mean of 0.00).

Post Hoc Sample Size Estimation

Only seven predictors were retained in the ENR prediction models, instead of the estimated nine predictors. Therefore, a post hoc sample size calculation was computed using the calculation from Riley et al. (2019) and parameters from Davis (2020; see Table 4).

Table 4*Comparison of A Priori and Post Hoc Sample Size Calculations*

Parameter	A Priori Value	Post Hoc Value
N†	287	287
Predictor Parameters†	12	12
R-squared†	0.38	0.38
Adjusted R-squared	0.35	0.35
Number of Retained Parameters	9‡	7§
Required Sample Size Per Group	118	92
Required Total Sample Size	354	276

Note. † Parameter estimates from Davis (2020); ‡ Number of estimated parameters retained a priori; § Number of observed parameters retained.

Discussion**Main Findings**

This secondary analysis of the UpLift Trial aimed to investigate whether healthcare professionals show treatment response heterogeneity in the context of two interventions for burnout; CBT or JC. Preliminary analyses indicated no significant mean differences between post-intervention burnout scores comparing CBT vs. JC. Such a result using comparison of group means could be argued to “mask” treatment response heterogeneity. A ML analysis, on the other hand, could help to identify subgroups of patients who might benefit more from one intervention over another (Cohen et al., 2018; Kessler et al., 2021). Using ENR, two treatment-specific prediction models were developed using pre-intervention participant characteristics and post-intervention burnout scores. According to these models, the direction of the effects for the CBT intervention was as follows: experiencing elevated exhaustion and disengagement, less stress, greater satisfaction with the nature of the work and satisfaction with the job role, greater levels of mental wellbeing, and greater levels of social support predicted lower post-intervention burnout. For the JC intervention, the direction of effects was as follows: experiencing elevated exhaustion and disengagement, less stress, greater satisfaction with the nature of the work and satisfaction with the job role, and lower turnover interventions predicted lower post-intervention burnout. The strongest predictor of post-intervention burnout for CBT was baseline exhaustion, whilst the strongest predictor of post-intervention burnout for

JC was baseline satisfaction with the nature of the work. As expected, both ENR models performed well in the training sample, and they generalized well to an external validation sample. However, there was some modest loss of predictive accuracy in the CBT model; indicating that predicting CBT outcomes may be more difficult to achieve with these variables.

The external cross-validation of the PAI model combining predictors from both ENR models demonstrated that, although variability in participants predicted post-intervention burnout (OLBI) scores existed, CBT was predicted to be the “optimal” intervention for all participants despite some participants having received the JC intervention. This pattern of results supports CBT as the preferred intervention for burnout amongst healthcare professionals, regardless of baseline burnout profile and risk characteristics.

Clinical and Theoretical Implications

These results are important given the prevalence, and the individual, ethical/moral, and organisational ramifications of burnout in healthcare (De Hert, 2020). Economically, delivering CBT for burnout would be highly cost-effective for healthcare organisations because resources would not be wasted on delivering suboptimal interventions predicted to be less effective at reducing burnout (i.e., JC). Online interventions offer increased accessibility and adaptability to meet the needs of healthcare professionals (Hedman et al., 2011; Barret & Stewart, 2021; Pospos et al., 2018), which is particularly important for healthcare professionals who are ward-based and who work shifts. Given the online nature of the UpLift interventions, fewer resources would be required to deliver CBT for burnout to a potentially large-scale audience. These may be key drivers in an already under-resourced and under-staffed NHS (The King’s Fund, 2022; Health and Social Care Committee, 2021).

Given that the UpLift Trial was delivered during the COVID-19 pandemic, the results of this secondary analysis should be considered in the context of COVID-19. The strongest predictor in the CBT ENR model was elevated baseline exhaustion, the second strongest predictor in the CBT

and JC ENR models was elevated baseline disengagement. These results could be unique to experiences of burnout during a global pandemic, in which frontline healthcare professionals experienced unprecedented challenges; including rapid changes in work patterns and job roles, insufficient resources, exposure to infection and isolation from family/friends, resulting in increased anxiety, depression and burnout (Wilson, 2020). Therefore, these results may continue to have clinical utility, whilst COVID-19 remains prevalent and for future pandemics. However, in the absence of the additional pressures resulting from the impact of COVID-19, it is not inconceivable that a different pattern of results may have emerged.

Overall, the results of this research do not support the use of personalised treatment matching in the field of precision mental health, specifically when applied to interventions for burnout. Much rather, these results contradict the evidence-base which has thus far demonstrated a pattern of treatment response heterogeneity (i.e., different interventions are predicted to be “optimal” or “suboptimal”) depending on participant baseline characteristics (Cohen et al., 2020; Delgadillo et al., 2020a; Webb et al., 2020; Keefe et al., 2020; Schwartz et al., 2020). This means that, as of yet, there remains a reliance on intuition-based subjective judgements to determine intervention suitability in occupational health.

Perhaps, this discrepancy in research findings regarding the utility of personalised treatment matching are consequential to the type of interventions compared (e.g., previous research has compared two manualised evidence-based interventions), the target of intervention (e.g., previous research has focused on symptoms of mental health diagnoses), the outcome measures used (e.g., occupational health- vs. mental health-related outcome measures), and the length of intervention (Cohen et al., 2020; Delgadillo et al., 2020a; Webb et al., 2020; Keefe et al., 2020; Schwartz et al., 2020). More research may be warranted to cultivate an evidence base evaluating the utility of personalised treatment selection for occupational health interventions in light of these differences.

Nevertheless, these results add to an expanding evidence-base supporting the efficacy of *individual-focused* interventions targeting burnout amongst healthcare professionals (Ewers et al., 2002; Salyers et al., 2011; Goodman et al., 2012; Ahola et al., 2017; Xie et al., 2020; Dreison et al., 2018); particularly CBT-based interventions (Yasmin et al., 2022; Barrett et al., 2021; Pospos et al., 2018).

Given these results, it may be of clinical and theoretical importance to understand why CBT was predicted to be the “optimal” intervention for all participants. The CBT intervention integrated concepts from CBT (Beck, 2011), social-cognitive theory of stress (Lazarus et al., 1984) and positive psychology (Nakamura et al., 2009). In comparison to the novel JC intervention, CBT is already manualised. It also has the largest evidence-base and empirical support of any psychotherapeutic intervention, particularly from studies using robust methodological designs (David et al., 2018). The underlying mechanisms of change for CBT involve identifying and restructuring maladaptive cognitions and modifying behaviours and physiological/emotional responses (Webb et al., 2012). Despite knowing the theoretical underpinnings of the JC intervention, little is known about the underlying mechanisms of change. Therefore, in addition to attending to outcomes (Barret et al., 2021), focusing on the precise mechanisms through which greater post-intervention reductions in burnout were predicted in the CBT intervention for all participants could have application in enhancing the efficacy of the CBT intervention for burnout but also to the ways in which novel burnout interventions are manualised from theory into practice. Perhaps, then, a different pattern of PAI distributions than evidenced in this research would emerge and demonstrate treatment response heterogeneity.

Strengths, Limitations, and Directions for Future Research

This research involved the secondary analysis of data from an RCT; arguably the ‘*gold standard*’ of empirical research design. The outcome measure data included in the UpLift Trial were numerous and gathered using validated outcome measures. This meant that multiple predictors

relating to pre-intervention burnout profiles, individual/job characteristics, and multiple risk-factors associated with burnout were captured to strengthen the accuracy of prediction models.

The data analysis methodologies used in this research were highly sophisticated. These methodologies supported the differential identification of prescriptive and prognostic variables, the development of two independent ENR prediction models, the development of a targeted prescription algorithm, and the evaluation of the targeted prescription algorithm on an independent validation sample. This research provided data-driven models and a targeted prescription algorithm that suggested the predicted benefit of one intervention (i.e., CBT) over another (i.e., JC; Cohen et al., 2018; Kessler et al., 2021). Therefore, this research supports the removal of a “suboptimal” intervention for burnout.

Pooling together training and validation samples contributes to model overfitting, overconfidence, inflated relationships, and the over-optimistic inclusion of considerably more parameters estimates (Fiedler, 2011; Vabalas et al., 2019). Therefore, a particular strength of this research was the use of an independent validation sample to improve the accuracy of the prediction models and provide proof of concept. This supports the accuracy of prediction models, and hence the targeted prescription algorithm, despite the results not supporting the use of personalised treatment matching in the field of precision mental health.

However, some limitations are noteworthy. The a priori sample size calculation yielded a minimum sample size estimation of 352 participants split equally across the two training samples and the external validation sample. However, a sample size of 297 was attained. Therefore, analyses were not suitably powered. The post-hoc sample size calculation based on the reduced number of predictors entered into the model demonstrated that the sample size attained (i.e., above 92 participants in each group) was appropriately powered to ensure that the prediction model developed was reliable when applied to new individuals in the target population (Riley et al., 2020). Nevertheless,

it has been argued that the use of post-hoc power calculations do not represent 'true power' or provide 'sensible results' (Zhang et al., 2019). Thus, the results must be interpreted with caution.

According to NHS Digital (2019a; 2019b), in the absence of data regarding non-binary gender identity, 43.60% and 56.40% of NHS staff who have stated their gender identity identify as female or male, respectively. Additionally, 75.92% of NHS staff have reported their ethnicity as White, in comparison to 12.68% from Black, Asian, and Minority Ethnic (BAME) communities. Although the current research included healthcare professionals from diverse professional backgrounds across 20 NHS Foundation Trusts, the majority of participants were female (90.75%) and either White British, White European or White Other (89.89%). Therefore, the prediction models and targeted prescription algorithm may not be generalisable to individuals who identify as male or non-binary, or to individuals from BAME communities who work in the NHS. Future research should seek to validate and replicate this research or combine datasets to revise the ENR models and targeted prescription algorithm using data from more diverse samples of healthcare professionals. This would ensure that prediction models are developed in, and generalisable to, a more accurate representation of the current NHS workforce.

According to DeRubeis et al. (2014), other factors such as patient preference and treatment cost are more likely to influence decisions regarding intervention selection when the PAI is small. The mean PAI (i.e., -0.87) in this research represented a predicted difference between ENR model-predicted post-intervention burnout scores of less than one. Therefore, preference judgements may remain in the context of the findings of this research. Although these results suggest that an evidence-based *individual-focused* intervention (i.e., CBT) was predicted to be more beneficial than a novel *individual-focused* intervention (i.e., JC) for burnout amongst healthcare professionals, the results do not suggest that the CBT intervention would out-perform other *individual-focused* evidence-based interventions. Therefore, future research should seek to compare the UpLift CBT intervention to other *individual-focused* evidence-based interventions to ascertain whether there is, in

fact, utility of targeted prescription in the field of precision mental health (i.e., whether PAI scores change to demonstrate treatment response heterogeneity when comparing two *individual-focused* evidence-based interventions) or the same pattern results emerge.

Further still, there continues to be a lack of consensus in the research literature regarding whether *individual-* or *organisational-focused* interventions for burnout are more, or less, beneficial (Ahola et al., 2017). Shanafelt and Noseworthy (2017), argued that long-lasting and meaningful reductions in burnout would only be achieved via *organisational-focused* interventions implemented systemically and primarily targeted at the level of leadership. Therefore, future research should also seek to ascertain whether there is utility for targeted prescription for organisational-focused interventions for burnout. This would ensure that the NHS is able to deliver “*optimal*” interventions for burnout, whether focused at the individual and/or organisation as a whole.

The results of this research are based on quantitative data purely reliant upon accurate self-report. Noteworthy, the credibility of self-report methods is questioned throughout the evidence-based literature, particularly in relation to social desirability and response bias and in the context of internet-based questionnaires (Gosling et al., 2004; Paulhus & Vazire, 2007; Chan, 2009). Future research should seek to incorporate different methods of reporting to provide more accurate predictions than those generated from purely quantitative self-report methods alone (DeRubeis et al., 2014).

Evaluation of the ENR models demonstrated that, although model-predicted post-intervention burnout scores correlated with observed post-intervention burnout scores in the training and validation samples, neither ENR model provided an accurate fit to the data. Furthermore, all ENR predicted post-intervention burnout scores were narrowly distributed around the mean post-intervention OLBI score for each intervention. Taken together, these findings suggest that other baseline variables and participant characteristics not measured in the UpLift Trial could contribute to the increased accuracy of the prediction models, particularly the CBT model. Research has doc-

umented the importance of therapist effects and the therapeutic relationship for client/patient outcomes in psychotherapy (Saxon & Barkham, 2012; Del Re et al., 2012; Webb et al., 2011). Research has also documented the association between burnout experienced by healthcare professionals and quality of life, emotional intelligence, and income (Galaiya et al., 2020), enthusiasm to choose their profession (Dinibutun, 2020), and levels of self-compassion and empathy (Duarte et al., 2016), to name a few. Future research should seek to incorporate such variables to improve the accuracy of the prediction models.

Research evaluating the efficacy of burnout interventions is lacking in follow-up data (Klein et al., 2020). For some studies that have included follow-up data, improvements in post-interventions burnout are only evident at follow-up (Klein et al., 2020). The current research developed a targeted prescription algorithm using baseline burnout profiles and risk characteristics (“week 0”) and post-intervention burnout (OLBI) scores (“week 6”). Future research should seek to establish whether the same *prescriptive* and *prognostic* variables are retained when using long-term follow-up data (i.e., “week 30” data) and hence produce different prediction models, a different targeted prescription algorithm, and a different PAI model.

Conclusion

Occupational burnout is prevalent and problematic for healthcare professionals, patients, and organisations. Two interventions for burnout were compared in the UpLift Trial. Using baseline burnout profiles and risk characteristics, ML analysis ENR was used to develop two prediction models, one for CBT targeting burnout and one for JC targeting burnout risk factors. A subsequent targeted prescription algorithm was developed which was expected to demonstrate treatment response heterogeneity (i.e., JC would work better for some participants, whilst CBT would work better for others). However, CBT was predicted to produce greater reductions in post-intervention burnout for all participants, in comparison to JC. Therefore, the most effective intervention for burnout amongst healthcare professionals is indicated to be CBT.

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Appendices

Appendix A – Health Research Authority and Health and Care Research Wales Ethical Approval for the UpLift Trial



Ymchwil Iechyd
a Gofal Cymru
Health and Care
Research Wales



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University of Sheffield
Clinical Psychology Unit, University of Sheffield
Cathedral Court, Floor F
1 Vicar Lane, Sheffield
S1 1HD

Email: approvals@hra.nhs.uk
HCRW.approvals@wales.nhs.uk

26 October 2020

Dear Dr Delgadillo

**HRA and Health and Care
Research Wales (HCRW)
Approval Letter**

Study title:	UpLift: A randomised controlled trial to improve NHS staff wellbeing
IRAS project ID:	288024
REC reference:	20/EM/0236
Sponsor	Rotherham Doncaster and South Humber NHS Foundation Trust

I am pleased to confirm that [HRA and Health and Care Research Wales \(HCRW\) Approval](#) has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

Please now work with participating NHS organisations to confirm capacity and capability, in line with the instructions provided in the "Information to support study set up" section towards the end of this letter.

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?

HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) have been sent to the coordinating centre of each participating nation. The relevant national coordinating function/s will contact you as appropriate.

Please see [IRAS Help](#) for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations?

HRA and HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to [obtain local agreement](#) in accordance with their procedures.

What are my notification responsibilities during the study?

The standard conditions document "[After Ethical Review – guidance for sponsors and investigators](#)", issued with your REC favourable opinion, gives detailed guidance on reporting expectations for studies, including:

- Registration of research
- Notifying amendments
- Notifying the end of the study

The [HRA website](#) also provides guidance on these topics, and is updated in the light of changes in reporting expectations or procedures.

Who should I contact for further information?

Please do not hesitate to contact me for assistance with this application. My contact details are below.

Your IRAS project ID is **288024**. Please quote this on all correspondence.

Yours sincerely,

Helen Poole

Approvals Specialist

Email: approvals@hra.nhs.uk

Copy to: *Miss Jeannie McKie, RDASH NHS Foundation Trust*

Appendix B – Ethical approval for this Secondary Analysis/Research Thesis provided by the University of Sheffield Research Ethics Committee



Downloaded: 25/01/2021
Approved: 21/01/2021

Nicole King
Registration number: 190217998
Psychology
Programme: Doctorate of Clinical Psychology

Dear Nicole

PROJECT TITLE: Personalised Treatment Selection for Occupational Burnout in Healthcare Professionals
APPLICATION: Reference Number 038002

This letter confirms that you have signed a University Research Ethics Committee-approved self-declaration to confirm that your research will involve only existing research, clinical or other data that has been robustly anonymised. You have judged it to be unlikely that this project would cause offence to those who originally provided the data, should they become aware of it.

As such, on behalf of the University Research Ethics Committee, I can confirm that your project can go ahead on the basis of this self-declaration.

If during the course of the project you need to [deviate significantly from the above-approved documentation](#) please inform me since full ethical review may be required.

Yours sincerely

Department Of Psychology Research Ethics Committee
Departmental Ethics Administrator

Appendix C – University of Sheffield Scientific Approval Letter



Clinical Psychology Unit
Department of Psychology
University of Sheffield
Cathedral Court
Sheffield
S1 2LT
UK

Department Of Psychology. Clinical Psychology Unit.

Doctor of Clinical Psychology (DClin Psy) Programme
Clinical supervision training and NHS research training
& consultancy.

Dr J. A. Delgado Clinical Training Research Director
Please address any correspondence to Amrit Sinha
Research Support Officer
Telephone: 0114 2226650
Fax: 0114 2226610
Email: a.sinha@sheffield.ac.uk

14th January 2021

To: Research Governance Office

Dear Sir/Madam,

RE: Confirmation of Scientific Approval and indemnity of enclosed Research Project

Project title: Personalised Treatment Selection for Occupational Burnout in Healthcare Professionals

Investigators: Nicole King (DClin Psy Trainee, University of Sheffield); Jaime Delgado (Academic Supervisor, University of Sheffield).

I write to confirm that the enclosed proposal forms part of the educational requirements for the Doctoral Clinical Psychology Qualification (DClin Psy) run by the Clinical Psychology Unit, University of Sheffield.

Three independent scientific reviewers usually drawn from academic staff within the Psychology Department have reviewed the proposal. Review includes appraisal of the proposed statistical analysis conducted by a statistical expert based in the School of Health and Related Research (ScHARR). Where appropriate an expert in qualitative methods is also appointed to review proposals.

I can confirm that approval of a proposal is dependent upon all necessary amendments having been made to the satisfaction of the reviewers and I can confirm that in this case the reviewers are content that the above study is of sound scientific quality. Consequently, the University will if necessary indemnify the study and act as sponsor.

Please ensure you save the attached letter, this email, and all other documentation going forward into a site file. The site file monitoring document is available on MOLE (for further information and guidance please see: <https://www.sheffield.ac.uk/rs/ethicsandintegrity/governance/rg-forms>)

Given the above, I would remind you that the Department already has an agreement with your office to exempt this proposal from further scientific review. However, if you require any further information, please do not hesitate to contact me.

Yours sincerely,



Dr. Jaime Delgadillo
Director of Research Training

Cc.: [Nicole King](#); Jaime Delgadillo

Appendix D – University of Sheffield Research Governance Sponsor Confirmation Letter



Department Of Psychology. Clinical Psychology Unit.

Doctor of Clinical Psychology (DClin Psy) Programme
Clinical supervision training and NHS research
training & consultancy.

Clinical Psychology Unit
Department of Psychology
University of Sheffield
Cathedral Court
Sheffield
S1 2LT
UK



Address: Nicole King
Clinical Psychologist
Department of Psychology
Cathedral Court

Clinical Psychology Unit
Department of Psychology
Cathedral Court
Sheffield

Date: 18.02.21

Telephone: 0114 22 26650

Email: a.sinha@sheffield.ac.uk

Project title: Personalised Treatment Selection for Occupational Burnout in Health Care Professionals

URMS number: **170697**

Dear Nicole,

The University has reviewed the following documents:

1. A University approved URMS costing record;
2. Confirmation of independent scientific approval;
3. Confirmation of independent ethics approval.

All the above documents are in place. Therefore, the University now **confirms** that it is the project's research governance sponsor and, as research governance sponsor, **authorises** the project to commence any non-NHS research activities. Please note that NHS R&D/HRA approval will be required before the commencement of any activities which do involve the NHS.

You are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Good Research & Innovation Practices Policy: www.shef.ac.uk/ris/other/gov-ethics/grippolicy, Ethics Policy: www.sheffield.ac.uk/ris/other/gov-ethics/ethicspolicy and Data Protection Policies: www.shef.ac.uk/cics/records

Your Supervisor, with your support and input, is responsible for providing up-to-date study documentation to all relevant sites, and for monitoring the project on an ongoing basis. Your Head of Department is responsible for independently monitoring the project as appropriate. The project may be audited during or after its lifetime by the University. The monitoring responsibilities are listed in **Annex 1**.

Yours sincerely

Jaime Delgadillo



Dr Jaime Delgadillo

Director of Research Training, Clinical Psychology Unit

cc. Academic Supervisor/s Jaime Delgadillo

Head of Department/School: Elizabeth Milne

To access the University's research governance [website](http://www.sheffield.ac.uk/ris/other/gov-ethics/governance) go to:
www.sheffield.ac.uk/ris/other/gov-ethics/governance

Monitoring responsibilities of the Supervisor:

The primary responsibility for project monitoring lies with the Supervisor. You agree to:

1. Establish a **site file** before the start of the project and ensure it remains up to date over the project's entire lifetime:
www.sheffield.ac.uk/ris/other/gov-ethics/governance/rg-forms
 2. Provide **progress reports/written updates** to the Head of Department at reasonable points over the project's lifetime, for example at:
 - a. three months after the project has started; and
 - b. on an annual basis (only if the project lasts for over 18 months); and
 - c. at the end of the project.
 See: www.sheffield.ac.uk/ris/other/gov-ethics/governance/rg-forms
 3. Report **adverse events**, should they occur, to the Head of Department:
www.sheffield.ac.uk/ris/other/gov-ethics/governance/rg-forms
 4. Provide progress reports to the research funder (if externally-funded).
 5. Establish appropriate arrangements for recording, reporting and reviewing significant developments as the research proceeds – i.e. developments that have a significant impact in relation to one or more of the following:
 - the safety or physical or mental integrity of the participants in the [project](#);
 - the [project's scientific](#) direction;
 - the conduct or management of the project.
 The Head of Department should be alerted to significant developments in advance wherever possible.
 6. Establish appropriate arrangements to record, handle and, as appropriate, store all information collected for or as part of the research project in such a way that it can be accurately reported, interpreted and verified without compromising the confidentiality of individual care users.
-

Monitoring responsibilities of the Head of Department

You agree to:

1. Review the **standard monitoring progress reports**, submitted by the Supervisor, and follow up any issues or concerns that the reports raise with the Supervisor.
2. Verify that **adverse events**, should they occur, have been reported properly and that actions have been taken to address the impact of the adverse event(s) and/or to limit the risk of similar adverse event(s) reoccurring.
3. Verify that a project is complying with any **ethics conditions** (e.g. that the information sheet and consent form approved by ethics reviewers is being used; e.g. that informed consent has been obtained from participants).
4. Introduce a form of **correspondence** (e.g. regular email, annual meeting) with a project's Supervisor, that is **proportionate to the project's potential level of risk**, in order to verify that a project is complying with the approved protocol and/or with any research funder conditions. Whatever correspondence is chosen the Head of Department should, as a minimum, ensure that s/he is informed sufficiently in advance about significant developments wherever possible.

Appendix E – List of the 20 NHS Foundation Trusts that Consented to Participate in the UpLift Trial

1. Alder Hey Children’s NHS Foundation Trust;
2. Bradford District Care NHS Foundation Trust;
3. Camden and Islington NHS Foundation Trust;
4. Cumberland, Northumbria, Tyne and Wear NHS Foundation Trust;
5. Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust;
6. East Cheshire NHS Trust;
7. Harrogate and District NHS Foundation Trust;
8. Humber Teaching NHS Foundation Trust;
9. Kent Community Health NHS Foundation Trust;
10. Leeds Community Healthcare NHS Trust;
11. Lincolnshire Partnership NHS Trust;
12. Mersey Care NHS Foundation Trust;
13. Mid and South Essex NHS Foundation Trust;
14. North East London NHS Foundation Trust;
15. Rotherham, Doncaster and South Humber NHS Foundation Trust;
16. Sheffield Health and Social Care NHS Foundation Trust;
17. Somerset Partnership NHS Foundation Trust;
18. South West Yorkshire Partnership NHS Foundation Trust;
19. Tees, Esk and Wear Valleys NHS Foundation Trust; and
20. Yorkshire Ambulance Service.

RDaSH Centre for Psychological Research



Participant Information
Leaflet

Participant information sheet

Purpose

Occupational burnout is known to affect many NHS staff, adversely impacting their job satisfaction, job performance, relationships at work, general health and wellbeing. The COVID-19 pandemic has led to a major increase in stressful conditions and pressures that exacerbate occupational burnout. This trial will provide NHS workers with easy access to interventions designed to reduce occupational burnout and improve their wellbeing.

Interventions

NHS workers will participate in six video-based group workshops delivered via Microsoft Teams, and they will have access to a dedicated App which includes online resources such as videos, worksheets and self-help tools. There are two interventions developed by our team to improve NHS staff wellbeing and reduce occupational burnout. One intervention has a well-established evidence base; the second intervention is novel and has no prior empirical support, but it is well informed by the latest science and evidence bases in the fields of psychology and occupational health. Both interventions will be delivered online, as described above. Participants will be randomly allocated to one of these interventions, so that we can compare their effectiveness.

Do I have to take part?

Participation is voluntary. If you decide to take part after reading this information sheet, please complete and sign the electronic consent form by clicking on the web-link provided at the end of this information sheet. You can withdraw from the study at any time without any negative consequences, and you do not have to give a reason. If you wish to withdraw from the research, please use the contact details at the end of this form.

What will happen if I take part? What do I have to do?

You will be asked via email to complete a brief electronic questionnaire in relation to their occupational and personal wellbeing, at the start of the study and at three further time-points (3 weeks, 6 weeks, and 6 months later). This will include basic demographics (age, gender, ethnicity) and self-reported sickness days. After you complete the initial questionnaire, you will receive instructions via email to access your allocated intervention, at a fixed day and time each week (for 1 hour), via Microsoft Teams, for a total of six weeks. If you wish to complete the workshops during your working hours, agreement from your line management will be necessary. However, if you feel you are not able to approach your line manager about your attendance, we have provided flexibility in times and days that the sessions are run (there will be four sessions a week, you only need to attend one), so the session could be attended outside of your working hours. The video sessions will be conducted in a way that participants' identity is anonymous (e.g., no need to show your video or to reveal your full name to other participants). After the end of each of these video sessions, you will practice the skills you have learned using a dedicated App, and you will login into it via the trial website www.uplifttrial.com.

Potentially you will work with someone who has been randomized to a different intervention groups. We ask that you do not share or discuss materials from the interventions with people in different groups. This is to strengthen to the design of the study and allow a clearer result, and therefore we can be sure that any effects that occur from the trial are due to the individual interventions. This will be explained in more detail during the first session.

What are the advantages to taking part?

You will learn how to recognise key signs of occupational burnout. You will have the opportunity to acquire multiple coping skills to improve your wellbeing and to reduce the risk of burnout. You will have access to an App that will guide you to practice these skills. This is likely to lead to reductions in occupational burnout and improvements in wellbeing. However, we cannot guarantee a reduction, the reason for the study is to test the interventions ability to reduce burnout and improve wellbeing.

What are the disadvantages to taking part?

We appreciate that participants are giving up time to complete this study, and this may be seen as a burden. However, we do not expect that taking part in the study would have any disadvantages or risks, given that the tasks and materials are all designed to help NHS staff to cope with stress. Nevertheless, if you feel uncomfortable or upset by any aspects of your participation in this study, you can contact the research team who can offer support and advice. The research team can also link participants in with locally available emotional support services if necessary.

Will information collected in the study be kept confidential?

All the information collected from participants will be entirely anonymised. To complete the consent questionnaire we will ask for your work email address. This is to ensure we are able to contact you throughout the study period (e.g., sending email reminders). Once you have completed the consent form we will email you a unique participant pseudonym, which cannot personally identify any of the study participants. A pseudonym is a name/code that can be used to identify you without using any personal identifiable data. You will then use this pseudonym to identify yourself throughout the rest of the study (i.e., to log in to the UpLift App, as your identifier when you complete the rest of the measures throughout the study), so that your data is completely anonymous when using the UpLift App. Anonymous means that you cannot be identified. The Research team will keep a record of your email address and associated pseudonym, so if you forget you can contact us to confirm your code. Your work email address will be used to invite you to the online sessions as it is required for RDaSH IT to set up breakout groups, they will not be able to access any other information about your participation in the trial. Your email address will then be deleted when the study has completed.

Information will be kept strictly confidential and will only be accessible to members of the research team at the University of Sheffield. This gives participants the assurance that no sensitive information (e.g., how they feel about their job) will be available to their employers or team manager. In certain circumstances (e.g., disclosure of suicidal thoughts, or risk to self and/or others) confidentiality will have to be broken, but we will do all we can to discuss this with you before disclosing the information to the appropriate authorities.

The final study dataset will be stored in a secure University network drive, only accessible to members of the research team, which is located behind The University of Sheffield Firewall. This will ensure the security and adequate storage of research data, consistent with NHS and academic codes of information governance and data protection. All analyses will be carried out at a University site, and data will be held in a restricted-access drive. The study dataset will be archived at the University for possible use in the future.

What will happen to the results of this study?

After the conclusion of data analysis, we plan to disseminate findings about this study using a variety of forms of communication, including:

- Scientific journal publications
- Newsletter in lay terminology
- NHS Trust communications newsletter and email
- NHS Trust conferences, strategic meetings
- Mental health conferences in the UK and abroad

Project organisation and funding

This study is led by cooperation between Rotherham Doncaster and South Humber NHS Foundation Trust, the University of Sheffield, and MindLife UK. The study has been jointly funded by industry and NHS funding sources.

Monetary incentives for participation

Participants will be eligible to be included in two prize draws for Amazon shopping vouchers. The first prize draw (£100 Amazon voucher) will take place at the end of the 6-week intervention phase. To be eligible for inclusion in this prize draw, you should have attended at least four intervention sessions and have completed all three online surveys up to that point. The second prize draw (£200 Amazon voucher) will take place at the end of the 6-month follow-up phase. To be eligible for inclusion in the second prize draw, you should have attended at least four intervention sessions and have completed all four online surveys up to that point. In accordance with the University of Sheffield's policy for the ethical use of incentives in research, the prize winners will receive their electronic voucher code via email and they will be asked to return a signed receipt via email, which includes their name and

work address, which is essential for auditing purposes and for legal reasons. The prize winners names and email addresses will be stored in a secure University network drive, only accessible to members of the research team. This will ensure the security and adequate storage of research data, consistent with NHS and academic codes of information governance and data protection. The contact details will be held at the University for 12 months after the conclusion of the study, this is for audit purposes.

Does the study have ethical approval?

This study has received ethical approval by The Review Ethics Committee was: East Midlands - Leicester South Research Ethics Committee and was approved by the NHS Health Research Authority.

What if something goes wrong and I wish to complain about the research?

If you wish to discuss the study or make a complaint you can contact the grounded research team, or you may contact the Chief Investigator directly. Alternatively, if you want to talk with someone independent about the research, you can contact PALs telephone on 0800 015 and email: rdash.pals@nhs.net.

Legal statement under the General Data Protection Regulation (GDPR). How will we use information about you?

RDaSH will need to use information from you for this research project. This information will include your name and email. The research team will use this information strictly for the purpose of contacting you via email during the study period. The information that is collected as part of your participation in the study will be fully anonymised, and linked to a participant ID number instead of your name or email. RDaSH will keep all information about you safe and secure in a password protected network drive, which is only accessible to a restricted number of research team members who are in charge of data collection. Once the team has finished the study, we will keep fully anonymous data so we can work out the results. We will write our reports in a way that nobody will know that you took part in the study. The anonymous data you provide will possibly be used in future studies too, and by other authorised researchers.

What are your choices about how your information is used?

- You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have.
- We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.
- The anonymised dataset from this study will possibly be used in future studies too, and by other authorised researchers. It will not be possible for researchers using the dataset to identify you and any future research will have appropriate approvals in place.

Where can you find out more about how your information is used?

You can find out more about how we use your information

- by asking one of the research team
- by sending an email to rdash.groundedresearch@nhs.net
- by sending an email to the RDaSH Trust Data Protection Officer at rdash.dpo@nhs.net
- by going to the RDaSH Information Governance webpage at [IG Compliance](#)
- by going to the HRA website; www.hra.nhs.uk/information-about-patients/

Contact details for enquiries

Phone: 01302798456

Email: rdash.groundedresearch@nhs.net

Chief investigator: Dr Jaime Delgadillo (jaime.delgadillo@nhs.net)

Grounded Research Team, Almond Tree Court, Tickhill Road Hospital, Balby, Doncaster, DN4 8QP

Website: www.uplifttrial.com

To participate please complete the electronic consent form using the following link:

[[web-link](#)]

Thank you for taking time to consider participating in this study.

Appendix G – Electronic Participant Consent Form

<i>Please write your initials next to each of the below statements to confirm your agreement</i>	Initials
Taking Part in the Study	
I have read and understood the study information sheet Version 2 dated 10/08/2020 or the study has been fully explained to me.	
I have been given the opportunity to ask questions about the study.	
I understand that my taking part is voluntary and that I can withdraw from the study at any time; I do not have to give any reasons for why I no longer want to take part and there will be no adverse consequences if I choose to withdraw.	
How my information will be used during and after the study	
I understand that personal details such as name and email address will be collected and stored by researchers strictly to get in touch with me to involve me in this study. I understand that these identifiable details will be permanently deleted from the study records after the end of the study.	
I understand that the only exception where the study team will keep and securely store a confidential receipt including my name and organisation, is if I win and accept receipt of a shopping voucher, as part of a prize draw. This receipt will be retained by the University for audit and legal purposes.	
I understand and agree that fully anonymised information that I provide will be used to produce research outputs such as reports and presentation slides. I understand that I will not be named in these outputs.	
I understand and agree that other authorised researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	
I understand and agree that other authorised researchers may produce publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.	
I give permission for data that I provide to be deposited in an archive at The University of Sheffield so it can be used for future research and learning	
So that the information you provide can be used legally by the researchers	
I agree to assign the copyright I hold in any materials generated as part of this project to RDASH NHS Foundation Trust and the University of Sheffield.	
I understand that the research team needs to store my email address to communicate with me during the time of the study. I understand that this consent form, which includes my initials and email address, will be permanently deleted <u>at the end of the study</u> in accordance with the general data protection regulation (GDPR). This will ensure that no personal details will be stored with the study data after the end of the study.	

Appendix H – Demographic Information Collected during the UpLift Trial

Dear participant,

As part of the trial, we are required to collect some anonymous demographic information, if you could please fill out the information below it would be much appreciated.

If you have any queries, please ask a member of the Grounded Research Team at rdash.groundedresearch@nhs.net.

What is your age (in years).

1. What is your gender (please tick one):

Male	Female	
Other	Do not disclose	

2. What is your current role:

.....

3. How long have you been in this role (in years and months, please specify):

.....

4. What department do you currently work in (please tick all that apply):

Adult Services	Mental Health	
Children's Services	Physical Health	
Community Services	Inpatient Services	
Outpatient Services		

5. Do you work (please tick all that apply):

Full-time	Bank	
Part-time		

6. This question is not compulsory so if you do not wish to answer this is not a problem.
In the last month, how many days of sickness leave have you taken?

7. **What is your ethnicity (please tick one)?**

White – British	Mixed – Black & White	
White – Irish	Mixed – Chinese & White	
White – Any other White background	Mixed – Asian & Chinese	
White – Northern Irish	Mixed – Other/Unspecified	
White – Unspecified	Asian or Asian British – Indian	
White – English	Asian or Asian British – Pakistani	
White – Scottish	Asian or Asian British – Bangladeshi	
White – Welsh	Asian or Asian British – any other Asian background	
White – Cornish	Asian Mixed	
White – Cypriot (<u>non specific</u>)	Asian – Punjabi	
White – Greek	Asian – Kashmiri	
White – Greek Cypriot	Asian – East African	
White – <u>Turkish</u>	Asian – Sri Lankan	
White – Turkish Cypriot	Asian – Tamil	
White – Italian	Asian – Sinhalese	
White – Irish Traveller	Asian – British	
White – Traveller	Asian – Caribbean	
White – Gypsy/Romany	Asian – Unspecified	
White – Polish	Black or Black British – Caribbean	
White – ex USSR	Black or Black British – African	
White – Kosovan	Black or Black British –Any other Black background	
White – Albanian	Black – Somali	
White – Bosnian	Black – Mixed	

White – Croatian		Black – Nigerian	
White – Serbian		Black – British	
White – Other ex-Yugoslav		Black – Unspecified	
White – Mixed		Chinese	
White – Other European		Any Other Ethnic Group	
Mixed – Mixed White & Black Caribbean		Vietnamese	
Mixed – White & Black African		Japanese	
Mixed – White & Asian		Filipino	
Mixed – Any other mixed background		Malaysian	
Mixed – Black & Asian		Other Specified (below)	
Mixed – Black & Chinese			



Other.....

Appendix I – Oldenburg Burnout Inventory (Demerouti et al., 2003)

Instructions: The following statements refer to your feelings and attitudes during work. Please indicate to what extent you agree with each of the following statements by selecting the number that corresponds with the statement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. I always find new and interesting aspects in my work	1	2	3	4
2. There are days when I feel tired before I arrive at work	1	2	3	4
3. It happens more and more often that I talk about my work in a negative way	1	2	3	4
4. After work, I tend to need more time than in the past in order to relax and feel better	1	2	3	4
5. I can tolerate the pressure of my work very well	1	2	3	4
6. Lately, I tend to think less at work and do my job almost mechanically	1	2	3	4
7. I find my work to be a positive challenge	1	2	3	4
8. During my work, I often feel emotionally drained	1	2	3	4
9. Over time, one can become disconnected from this type of work	1	2	3	4
10. After working, I have enough energy for my leisure activities	1	2	3	4
11. Sometimes I feel sickened by my work tasks	1	2	3	4
12. After my work, I usually feel worn out and weary	1	2	3	4
13. This is the only type of work that I can imagine myself doing.	1	2	3	4
14. Usually, I can manage the amount of my work well	1	2	3	4
15. I feel more and more engaged in my work	1	2	3	4
16. When I work, I usually feel energized	1	2	3	4

Appendix J – Job Satisfaction Survey (Spector, 1985; 1997)

<p align="center">JOB SATISFACTION SURVEY</p> <p align="center">Paul E. Spector Department of Psychology University of South Florida</p> <p align="center">Copyright Paul E. Spector 1994, All rights reserved.</p>						
<p align="center">PLEASE CIRCLE THE ONE NUMBER FOR EACH QUESTION THAT COMES CLOSEST TO REFLECTING YOUR OPINION ABOUT IT.</p>		Disagree very much	Disagree moderately	Disagree slightly	Agree slightly	
8	I sometimes feel my job is meaningless. (R)	1	2	3	4	5
		6				
17	I like doing the things I do at work.	1	2	3	4	5
		6				
27	I feel a sense of pride in doing my job.	1	2	3	4	5
		6				
35	My job is enjoyable.	1	2	3	4	5
		6				

Appendix K – Job Discrepancy and Satisfaction Scale (Nagy, 2002)

Instructions: Please rate how much you agree with each of the following statements. Choose a score from 1 to 4 in reference to the scale below:

1 – Not at all satisfying; 2 – Somewhat satisfying; 3 – Moderately satisfying; 4 – Very satisfying

- 1 _____ How does the type of work that you currently do compare to what you think it should be?
- 2 _____ How does the amount of pay that you currently receive compare to what you think it should be?
- 3 _____ How do the number of opportunities for promotion that you currently have compare to what you think they should be?
- 4 _____ How does the quality of supervision that you currently receive compare to what you think it should be?
- 5 _____ How does the quality of colleagues and people you currently work with compare to what you think it should be?
- 6 _____ How do the working conditions in your job compare to what you think they should be?
- 7 _____ How does the amount of autonomy or personal freedom that you have compare to what you think it should be?
- 8 _____ How does your overall satisfaction with your current job compare to what you think it should be?

Appendix L – Mental Health Professionals Stress Scale (Cushway et al., 1996)

[REDACTED DUE TO COPYRIGHT]

Appendix M – Warwick-Edinburgh Mental Wellbeing Scale (Tennant et al., 2007)

Below are some statements about feelings and thoughts.

Please tick the box that best describes your experience of each over the last 2 weeks

	None of the time	Rarely	Some of the time	often	All of the time
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been feeling interested in other people	1	2	3	4	5
I've had energy to spare	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling good about myself	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been feeling confident	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5
I've been feeling loved	1	2	3	4	5
I've been interested in new things	1	2	3	4	5
I've been feeling cheerful	1	2	3	4	5

Please note, some questions have been removed (6, 7, 13, 14, 20, 21, 27, 28, 34, 35, 41, 42) due to other scales capturing the data more accurately

Appendix N – Job Diagnostic Survey (Hackman et al., 1975)

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Appendix O – The Job Diagnostic Survey: Autonomy Subscale (Hackman et al., 1974)

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Appendix P – General Self-efficacy Scale (Schwarzer et al., 1995)

About: This scale is a self-report measure of self-efficacy.

Items: 10

Reliability:

Internal reliability for GSE = Cronbach's alphas between .76 and .90

Validity:

The General Self-Efficacy Scale is correlated to emotion, optimism, work satisfaction. Negative coefficients were found for depression, stress, health complaints, burnout, and anxiety.

Scoring:

	Not at all true	Hardly true	Moderately true	Exactly true
All questions	1	2	3	4

The total score is calculated by finding the sum of the all items. For the GSE, the total score ranges between 10 and 40, with a higher score indicating more self-efficacy.

	Not at all true	Hardly true	Moderately true	Exactly true
1. I can always manage to solve difficult problems if I try hard enough	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. If someone opposes me, I can find the means and ways to get what I want.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. It is easy for me to stick to my aims and accomplish my goals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I am confident that I could deal efficiently with unexpected events.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I can solve most problems if I invest the necessary effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I can remain calm when facing difficulties because I can rely on my coping abilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. When I am confronted with a problem, I can usually find several solutions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. If I am in trouble, I can usually think of a solution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I can usually handle whatever comes my way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix Q – Work-family Conflict Scale (Netemeyer et al., 1996)

Below are five statements with which you may agree or disagree. Using the 1 – 7 scale below, indicate your agreement with each item by circling the appropriate number. The words “work” and “job” refer to all work-related activities that you do as part of your paid employment. The word “family” refers to the following family roles that pertain to you, including being a parent, being a spouse/partner, and overall homelife.

1 = strongly disagree; 2 = disagree; 3 = slightly disagree

4 = neither agree nor disagree; 5 = slightly agree; 6 = agree; 7 = strongly agree

1. The demands of my work interfere with my home and family life.

1 2 3 4 5 6 7

2. The amount of time my job takes up makes it difficult to fulfil my family responsibilities.

1 2 3 4 5 6 7

3. Things I want to do at home do not get done because of the demands my job puts on me.

1 2 3 4 5 6 7

4. My job produces strain that makes it difficult to fulfil family duties.

1 2 3 4 5 6 7

5. Due to work-related duties, I have to make changes to my plans for family activities.

1 2 3 4 5 6 7

Appendix R – Overcommitment Subscale (Siegrist et al., 2014)

The following items refer to your present occupation. For each of the following statements, please indicate whether you strongly agree, agree, disagree, or strongly disagree.

		<i>Strongly disagree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Strongly agree</i>
OC1	I get easily overwhelmed by time pressures at work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OC2	As soon as I get up in the morning I start thinking about work problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OC3	When I get home, I can easily relax and 'switch off' work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OC4	People close to me say I sacrifice too much for my job.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OC5	Work rarely lets me go, it is still on my mind when I go to bed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OC6	If I postpone something that I was supposed to do today I'll have trouble sleeping at night.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix S - Social Support Scale (House et al., 1978)

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Appendix T – Big Five Personality Inventory – 10 (Rammstedt et al., 2007)

Instruction: How well do the following statements describe your personality?

I see myself as someone who ...	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
... is reserved	(1)	(2)	(3)	(4)	(5)
... is generally trusting	(1)	(2)	(3)	(4)	(5)
... tends to be lazy	(1)	(2)	(3)	(4)	(5)
... is relaxed, handles stress well	(1)	(2)	(3)	(4)	(5)
... has few artistic interests	(1)	(2)	(3)	(4)	(5)
... is outgoing, sociable	(1)	(2)	(3)	(4)	(5)
... tends to find fault with others	(1)	(2)	(3)	(4)	(5)
... does a thorough job	(1)	(2)	(3)	(4)	(5)
... gets nervous easily	(1)	(2)	(3)	(4)	(5)
... has an active imagination	(1)	(2)	(3)	(4)	(5)