

Title: Resilience in railway workers: Exploring what has challenged and protected railway keyworker's mental wellbeing during the COVID-19 pandemic

Running title: COVID-19 and railway keyworkers

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Ethics approval

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Consent

All participants provided informed consent to participate in the study.

Authors' contribution statements.

All authors contributed to the study conception, design and analysis. Material preparation and data collection were performed by Nicola Cogan, Megan McGibbon and Amy Gardiner. Data analysis and write up was performed by all authors. All authors contributed to the final manuscript, which all authors read and approved.

Data availability statement

The data can be made available to reviewers upon request.

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Abstract

Railway workers are reportedly at risk of developing traumatic stress-related conditions, yet little is known about the effects of COVID-19 on the mental wellbeing of railway workers. The study consisted of a cross-sectional online survey exploring the effects of COVID-19 on the mental wellbeing of railway workers (n=906) in the UK. The aim was to explore whether protective factors (adaptive resilience, team resilience and help-seeking intentions) mediated the relationship between COVID-19 risk factors (stress, risk perception and burnout) and railway workers' mental wellbeing. Responses to psychometrically valid measures were analysed using multiple regression and parallel mediation analyses. Free text data exploring railway workers' views on the impact of COVID-19 on their mental wellbeing, were analysed using content analysis. Protective factors significantly mediated the relationship between mental wellbeing and COVID-19 risk factors. Railway workers reported that they experienced mental health decline throughout the pandemic, loss of workplace supports, increased need for psychological support, and concerns for the future. Work-based supports and access to psychological input for railway workers who need it is highlighted. Building a resilient railway workforce moving forward requires attention to staff mental wellbeing and to ensuring that support systems are robust, safe and accessible.

Keywords: Mental health, wellbeing, COVID-19, railway workers, help-seeking, support, adaptation, resilience

Practitioner points

- Our findings provide evidence that railway workers showed low levels of mental wellbeing during the third period of lockdown during the COVID-19 pandemic in the United Kingdom (December 2020–March 2021).
- The research also provides an understanding of what may help buffer or mitigate stressors associated with COVID-19 to help railway workers adapt to the

challenges faced by the railway industry associated with the COVID-19 pandemic.

- The benefits of fostering both individual and team resilience as well as encouraging help-seeking behaviour in those working within the railway industry was highlighted.
- Potential transferable insights and lessons learned relevant to other essential keyworker occupational groups were identified.

Introduction

The COVID-19 pandemic has changed how many people live and work (Al-Ghunaim, et al, 2021; Vowels et al, 2022) and has presented significant mental and physical strain across occupational groups (May et al, 2021). There is a growing awareness that occupational groups vary in their exposure to the virus and the risks associated with it (Ghoroubi et al, 2022; Lunt et al, 2022; Nguyen., et al, 2020; Topriceanu et al, 2021). Essential keyworkers have had to continue to work and carry out their daily duties during the pandemic while shouldering significant challenges such as increased workload, shortages of personal protective equipment and tensions of increased job demands and challenges (Anonymous et al, 2022; Carbajal et al, 2021;

McConnell, 2020; Yue & Cowling, 2021). Its impact has been widespread and has resulted in not only temporal changes in the status of some occupations but also introduced new ways of working (Hodder, 2020; Kramer & Kramer, 2021). As governments prioritised health and implemented measures, during the lockdown periods of the pandemic, such as the closure of non-essential businesses, schools, public areas, travel restrictions and social distancing, many workers lost their jobs, were furloughed, or started working from home (Crowley et al, 2021; Grandey et al, 2021; Koczan, 2022; Muhammad et al, 2020). Consequently, many people's working lives have drastically transformed and this period has had major implications for mobility and transportation. The railway industry, has been severely impacted, with government warnings against public commutes being one of the first actions taken against the spread of COVID-19 at the onset of the pandemic (Naweed et al, 2021; Tardivo et al, 2021; Yin et al, 2021).

Mental wellbeing and risk factors

COVID-19 has significantly affected the railway industry; while this presents opportunities as well as challenges moving forward (Tardivo et al, 2021), little is known about the impact on the mental wellbeing of railway keyworkers. Occupations beyond healthcare settings are at high risk of the virus (Brown et al, 2021; De Camargo, 2022; May et al, 2021; Shan, 2021), including railway workers, due to frequent contact with commuters (Lan et al., 2020; Shinohara et al, 2021). Perception of risk is the subjective judgment that people create regarding the characteristics, severity, and way in which risk is managed (Cerese, 2017; Cori et al, 2020). Perception of risk plays a key role in people's mental wellbeing and in their daily habits (Brown et al, 2021; Anonymous et al, 2021; Han et al, 2021). Railway workers' perceived risks are likely intensified as

working in close proximity with the public brings heightened health risks (Brown et al, 2021). Extensive research has explored the impact of COVID-19 on the mental wellbeing of keyworker populations; however, it has tended to focus on health care workers (Douglas et al., 2020), whereby negative outcomes have largely been reported (Arslan et al., 2020; Anonymous et al, 2022; Hennein et al, 2021; Kua et al, 2022; Lamb et al, 2020; McGlinchey et al, 2021; Saragih et al, 2021; Talae et al., 2020; Vanhaecht et al, 2021) including stress, anxiety, burnout and PTSD (Apaydin et al, 2021; d’Ettorre et al., 2021; Sumner & Kinsella, 2021; Yildirim et al., 2021). Some studies have identified similar levels of anxiety and depression in health-care workers compared with non-health care workers (Barzilay et al., 2020; Zhou & Kan, 2021). In contrast, Pink et al (2021) reported lower distress levels among healthcare workers and first responders compared to the general population; this was attributed to the protective function of psychological resilience and acting to help others, playing a critical role in society during a crisis. However, these findings relate to data collected early on in the pandemic; there is evidence to suggest that the mental health of keyworkers and community samples may have worsened over the course of the pandemic (Botha et al, 2022; Daly et al 2020; D’Angelo et al, 2021; Niedzwiedz et al, 2021; Peirce et al, 2020; Zacher & Rudolph, 2021) and when compared to pre-pandemic population norms (Ayling et al, 2020; Gasteiger et al, 2021; Kwong et al, 2021). A growing body of research acknowledges the role of burnout and mental health decline associated with stressors outside of the workplace, including COVID-19 burnout (Yildirim et al., 2021). It is, therefore, unclear if particular occupations have experienced increasingly adverse effects of the stressors associated with the COVID-19 pandemic on their mental wellbeing, over and above that evident across community studies. Nonetheless, the risk for poorer mental health during the COVID-19 pandemic varies within the broad category

of keyworkers generally (De Camargo & Whiley, 2021; Sharp et al, 2021; Topriceanu et al, 2021) and there is evidence to suggest that those working in utility, food chain and transport roles have been found to be especially at risk (Bu et al, 2022; Wong, 2021).

Yet, railway workers, who have continued to provide services throughout the pandemic to ensure, for example, that other keyworkers are able to get to work, have been under-explored. Railway workers have had to respond quickly to the significant challenges presented by COVID-19 with little preparation and limited resources. Transport occupations have been identified as having a twofold higher risk of being exposed to the virus (Mutambudzi et al., 2020). To date, there has been no research specifically looking at the impact of COVID-19 on the mental wellbeing of railway workers within the UK context.

Beyond the COVID-19 pandemic, railway workers are reportedly occupationally exposed, through their professional tasks, to stressful situations including accidents, assaults and traumatic incidents such as person under the train (Abbott et al., 2003; Bardon & Mishara, 2015; Doroga & Băban, 2013; Eyimaya & Tezel, 2021; Gu et al, 2017; Metzger, 2014; Naweed et al, 2017; Tranah, & Farmer, 1994; Virdee et al, 2019). Such stressors can elicit chronic stress, emotional exhaustion, burnout and post-traumatic stress (Bardon et al, 2021; da Conceição Lemos & Patrão, 2018; Farmer et al, 1992; Gasquoine, 2020; Karlehagen et al., 1993; Lemos & Patrão, 2018; Sharifi et al, 2021) and increased prevalence of mental health pathology following these stressors (Roche et al., 2016). Railway workers as an occupational group present with three risk factors associated with poor mental wellbeing as a consequence of stressors relating to COVID-19; being an essential keyworker group (Holmes et al., 2020; O'Sullivan, 2020), those with occupational risk to mental health problems and/or pre-existing mental health conditions, particularly within male dominated industries (Brooks et al.,

2020; Marshall et al, 2021) and risk of exposure to traumatic occupational incidents (Evans & Hughes, 2019; Frewin et al., 2019; Turner et al, 2010). To date, little is known of the mechanisms that may protect against poor mental wellbeing outcomes for railway workers in this context.

Protective factors

Across occupations, resilience is well-established as an important protective factor for personal well-being and professional performance (Robertson, Cooper, Sarkar, & Curran, 2015). Emerging evidence suggests that there may be protective factors that mitigate poor mental wellbeing outcomes associated with COVID-19 stressors. Arslan et al (2020) propose that resilience is one of the potential protective factors for mental wellbeing during the COVID-19 pandemic. The concept of resilience is defined as an ability to adapt and rebound from negative events (Cooke et al, 2019; Tugade & Frerickson 2014) and has repeatedly been highly correlated with higher scores on mental wellbeing in general population samples (Arslan, & Yildirim, 2021; Britt et al., 2016; Davydov et al., 2010; Oducado et al, 2021; Yildirim et al, 2021) and keyworker occupations (Arslan et al, 2021; Anonymous et al, 2021; Bozdağ & Ergün, 2020; Heath et al, 2020; Lamb & Anonymous, 2016; Schilbach et al, 2021; Pink et al, 2021; Roberts et al, 2021). Resilience is one of the core constructs of positive organisational behaviour (Hartmann et al, 2020; Hillmann & Guenther, 2021; IJntema et al, 2021). Adaptive resilience may help in mediating the relationship between stress and burnout both pre-COVID (Hao et al., 2015; Sehmi et al, 2019) and during the course of the pandemic (Santarone et al, 2020; Yildirim & Solmaz, 2020). Having a crucial societal role during crises may reiterate the importance of enhancing resilience within groups who encounter high-risk situations daily (Pink et al, 2021). High resilience has

been found to help medical workers in managing personal and system-level stressors at the peak of the COVID-19 pandemic with support from their institutions and team-working being identified as protective factors (Huffman et al, 2021). Individual resilience can be fostered in the workplace (Lamb & Anonymous, 2016) through effective team-working and supportive relationships (Kuntz et al, 2017).

In recent years, there has been an increasing interest in resilience as a collective phenomenon (Drury et al, 2021; Elcheroth & Drury, 2020; Mannarini et al, 2021; Slavich et al, 2021; Stevenson et al, 2021), which is conceptually different from individual resilience (Bowers et al, 2017; Carmeli et al., 2013; Sakurai & Chughtai, 2020). Within an organisational context, research has largely focused on resilience within teams (Aliger et al, 2015; Chapman et al, 2020). Theorising on team resilience is at an earlier stage than that of individual resilience (Gucciardi et al, 2018; Hartmann et al, 2021; Kennedy, Landon, & Maynard, 2016; Pangallo, et al, 2015), however, it has gained momentum over the last decade (Gucciardi et al, 2021; Sharma & Sharma, 2016; Stoverink et al, 2020) with its conceptual expositions encompassing a range of individual, team and system level factors (Bowers et al, 2017; Flint et al, 2014; Naweed, 2020). Studies suggest that individuals who identify with the values, norms and emotions of their team are likely to have similar attitudes and behaviours in response to an incident resulting in positive team performance (Brykman & King, 2021; Meneghal et al., 2016; Tajfel & Turner 1985; Stewart, 2010). In terms of adaptations after the beginning of the pandemic, collective, team resilience strategies have reportedly helped healthcare keyworkers prioritise tasks, encourage interprofessional collaborations, develop cooperation with networks and support peers emotionally (Barton et al, 2021; Delgado et al, 2021; Juvet et al, 2021); understanding the relationship between team resilience and the wellbeing of railway keyworkers has yet to be explored.

There is evidence that help-seeking intentions may help foster both individual (Anonymous & MacDonald, 2021; Kaye-Kauderer et al, 2021) and team resilience (Hom et al, 2020; Wilson et al, 2020) and protect mental wellbeing (Lombardi et al, 2021; Yamauchi, Suka, & Yanagisawa, 2020). Improvements in attitudes towards mental health and help-seeking among railway workers has been found to improve team cohesion and mental wellbeing (Brooks et al, 2019; Sage et al, 2016). Research has yet to explore such constructs in the context of railway workers dealing with the stressors associated with the COVID-19 pandemic. Research concerning resilience training among first responders to critical incidents has highlighted the positive role that teaching practical mental health skills and creating an organisational culture that supports staff wellbeing and help-seeking; further research is needed to understand this across diverse organisational contexts (Joyce et al, 2019; Wild et al, 2020). This is pertinent given that earlier research of male-dominated industries suggest that masculine norms predict poor mental health outcomes and help-seeking intentions (Battams et al, 2014; Mahalik et al., 2007; Ross et al, 2020; Sage et al, 2016). The findings are generally consistent with earlier systematic reviews that have identified the risk factors associated with poorer mental health outcomes amongst male dominated industries (Michie & Williams, 2003; Stansfeld & Candy, 2006) including railway workers. A range of mental health risk factors have been reported, including individual factors, team environment, work conditions and work–home interference (Battams et al, 2014; Brooks et al, 2017; Brooks & Greenberg, 2018; Folmer & Jones, 2018); further research is needed to understand both risks and protective factors for railway workers within the context of stressors associated with the COVID-19 pandemic.

COVID-19 within the UK context

This study was conducted in the context of UK wide government restrictions in response to the risks posed by the COVID-19 pandemic. At the time of data collection (December 2020-March 2021) the UK experienced its 3rd national lockdown (starting on the 1st of January 2021), with Tier 4 restrictions in place prior to this in certain areas. Tier 4 restrictions include hospitality closures, travel bans, essential shopping only, indoor leisure closures, social distancing and limitations on socialisation between households (Baker et al., 2021). The beginning of that period resulted in the collapse of demand for train travel as well as vital changes to safety protocols during lockdown. Changes in the infrastructure of the railway industry in order to adhere to lockdown rules presented new challenges as staff members changed their working practices, including working from home when feasible and complying with social distancing guidelines (Jallow et al, 2020). As restrictions have begun to lift, challenges around passengers' new expectations and requirements, capacity issues, and economic shrinkage, have altered how the rail is perceived and used. In considering how the rail industry adapts to the 'new norm' it is essential that there be a focus on staff wellbeing in order to help sustain and meet the challenges ahead (Gallagher, 2021).

The current study

To date, this study is the first to consider: (1) the impact of risk factors such as COVID-related stress, risk perception and burnout on the mental wellbeing of railway workers in the UK, and (2) protective factors that may mediate the relationship between COVID-19 risk factors and mental wellbeing. It is also unique in its consideration of a male-dominated industry that is at increased exposure to COVID-19 by nature of being keyworkers.

Method

The study adopted a mixed methods approach that involved an anonymous online survey with both closed and open-ended questions using Qualtrics (Qualtrics, 2005). A cross-sectional design was adopted.

Participants

The participants were recruited through convenience sampling. Inclusion criteria stated that participants had to be 18 years of age or over and employed within the railway industry (for at least 6 months) in the UK.

Procedure

Following ethical approval from the University Ethics Committee (Reference: UEC20/75), the online survey was published via Qualtrics. Data collection occurred during the third national lockdown in the UK. A recruitment poster for the study was circulated via social media (LinkedIn, Twitter and Facebook) and through train and intranet platforms within the railway industry. The survey was accessed by participants through an online link or advert QR code. Prior to participation, which was anonymous and voluntary, the study's purpose and aims were outlined, with the lead researcher's contact details and available support services also being provided. Participants were asked to provide informed consent prior to their participation which was captured electronically within Qualtrics. The average time that participants took to complete the survey was 16 minutes ($M = 16.53$, $S.D = 8.38$). Once the survey was completed, a debrief form was presented electronically.

The survey

Socio-demographic characteristics were collected at the beginning of the online survey. Participants were asked their age, gender, education level, location, and occupational role. Information regarding both physical and mental health conditions were collected, and any additional conditions associated with the high risk of COVID-19 morbidity. Participants were asked to provide their current and previous status relating to COVID-19 diagnosis and shielding category.

In order to measure mental wellbeing, the following psychometrically valid measure was used:

Warwick-Edinburgh Mental Well-being Scale- Short Form (WEMWBS-SF):

Stewart-Brown et al., (2009) developed an abbreviated version of the original Warwick-Edinburgh Mental wellbeing scale, with 7 items. Participants are asked to rate from 1-5 how often they have experienced the following statements over the last 2 weeks (e.g., “I’ve been feeling optimistic about the future”). The 5-point Likert scale ranges from “none of the time” (1) to “all of the time” (5). Scores from each of the items are then summed and transformed using the WEMWBS-SF conversion table. McFadden et al., (2021) found the internal consistency to be excellent (Cronbach’s alpha= .86) in a sample of UK HSCWs during COVID-19. Shah et al., (2021) compared the WEMWBS-SF to PHQ-9 and GAD-7 scores to suggest cut off points for probable depression (<17), possible depression (18-20), average mental wellbeing (21-27) and high mental wellbeing (28-35).

The following psychometrically valid measures of COVID-19 risk factors for mental wellbeing were used:

Covid-19 Stress Measure (CSM): Arslan et al., (2020) validated the CSM, which was adapted from the 14-item perceived stress scale (Cohen et al. 1983) to assess perceived stress related to COVID-19. The CSM includes eight items with scoring based on a 5-point Likert scale, ranging between 0 (“never”) and 4 (“very often”). An example item states, “In the last month due to coronavirus, how often have you felt that you were unable to control the important things in your life?”. Yildirim & Solmaz, (2020) found good internal consistency of this scale (Cronbach’s alpha= .71).

Coronavirus Perceived Risk Scale (CPRS): Yildirim & Guler (2020) developed a scale to measure the COVID-19 related perceived risk by adapting the wording of the SARS Risk Perception Scale (Brug et al., 2004). Each of the 8 items is rated on a Likert scale ranging between 1 (negligible) and 5 (very large). Higher scores indicate higher levels of perceived risk related to COVID-19. Yildirim & Guler (2020) confirmed a 2-factor structure (emotional and cognitive dimensions), the internal consistency was satisfactory for each dimension (Cronbach’s alpha is 0.84 - 0.88 and 0.70 - 0.74 for emotional and cognitive dimensions respectively).

COVID-19 Burnout (COVID-19-BS): Yildirim & Solmaz, (2020) developed the COVID-19-BS, which was adapted from the Burnout Measure-Short Version (Malach-Pines, 2005), defining burnout as a state of physical, mental and emotional exhaustion (Pines & Aronson, 1988). There are 10 items, a sample item is “When you think about COVID-19 overall, how often do you feel hopeless?” Each item is rated on a 5-point Likert scale of 1 (never) to 5 (always). A total score can be calculated by summing all 10 items, such that scores can range from 10 to 50. Higher score indicates higher levels

of burnout related with COVID-19. Yildirim & Solmaz, (2020) found excellent internal consistency of this scale (Cronbach's alpha= .92).

In order to measure protective factors for mental wellbeing, the following psychometrically valid measures were used:

Brief Resilience Coping Scale (BRCS): Sinclair & Wallston (2004) developed a 4-item scale to measure adaptive resilience, each item has a 1-5 Likert scale ranging from “does not describe me at all” (1) to “describes me very well” (5). An example item asks participants to rate how well this statement describes them, “I believe I can grow in positive ways by dealing with difficult situations”. A total score was created by summing all items, the scores range from 4-20. Sinclair & Wallston (2004) propose cut-off points to help interpret scores for low resilience (4-13), medium resilience (14-16) and high resilience (17-20). Kocalevent et al., (2017) reported BRCS to have adequate internal consistency (Cronbach's alpha=.76 and test-retest reliability of $r=.71$).

Team Resilience Scale (TRS): Meneghel et al., (2016) developed a team resilience scale comprising 7 items, based on Mallak's (1998) principles for resilience in the workplace. Participants were asked to tick all the statements that apply to them. An example statement could be “In difficult situations, my team tries to look on the positive side”. The more statements identified by the participants the higher the TRS score. Meneghel et al., (2016) reported a .87 Cronbach's alpha, representing a high level of internal consistency.

The General Help-Seeking Questionnaire (GHSQ): Wilson et al., (2005) developed and validated 10 items which measure the participants intention to seek help for a personal/emotional problem. They found the internal consistency of the items to be excellent (Cronbach's alpha = .70), with strong test re-test reliability after 3 weeks (= .86) and significant predictive/construct validity (of moderate and small magnitudes dependent of source of help). Each item comprises a potential source of help that is rated on a 7-point Likert scale ranging from 1 (extremely unlikely) to 7 (extremely likely). Item scores ranged from 1 to 7, with higher scores indicating higher intentions to seek help from a source. Sources were organised into 2 categories: informal sources (intimate partner, friend, family, other relative) and formal sources (GP, mental health professional, phone helpline, religious leader).

Analysis

The sample data (n = 906) was screened to identify missing cases and incomplete responses. Missing data analysis found that less than 5% of cases (2.3%) were missing, therefore, series mean imputation was appropriate to replace the missing values to maintain a sample size of 817 (Cockluk & Kayri, 2011; Mertler & Vannatta., 2005). A priori power analysis was conducted to estimate the necessary sample size, using G*Power software (Erdfelder et al., 2009). The alpha was set at .05, the power at .80 to detect a Cohen's (1988) f^2 small effect size .02 which indicated a sample size of 725 participants was required; the actual sample superseded the necessary power for multiple regression and mediation analysis.

Firstly, descriptive statistics (mean and standard deviations) were derived from the sample and a Pearson's correlation was used to explore the association between COVID-19 risk factors, protective factors and wellbeing. Kurtosis and skewness scores

and their cut-off values were used to examine the assumption of normality (Blanca et al, 2013). Multiple regression analysis was used to determine the association between each potential predictor and mental wellbeing. Parallel mediation analyses were achieved via PROCESS macro (Model 6) for SPSS version 27 (Hayes 2018). The bootstrapping method with 5,000 resamples to estimate the 95% confidence intervals (CI) was used for significance testing of indirect effects (IE; Hayes 2018). Significance level of $p < 0.05$ was used for all analyses.

For the qualitative, free-text question, content analysis of participants' comments was undertaken (see Krippendorff, 2018; Schreier, 2012). Initial descriptive codes were applied to participants' written responses to the open-ended question. Subsequent text was compared to previously coded text and either allocated an existing code or provided a new one, thus grouping responses by similarity (Leech & Onwuegbuzie, 2007). Category development was guided by Vaismoradi et al (2013). The first coder (MMcG) initially analysed the data, with the review being undertaken by another member of the research team (AG), enabling both category refinement and research rigour. The researchers (MMcG, AG, LM & NC) returned to the data several times during the analytical process to ensure that the results showed a strong connection to the analysed data (Kyngäs, 2020). The categories of meaning (key categories) represented the highest level of abstraction for the reporting of the results. In the final phase, coded data were treated as variables for analysis conducted using descriptive statistics (frequency counts and percentages) in Microsoft Excel.

Findings

Participants: The participants were predominantly male (79.3%). The age of the sample ranged between 19-69 (mean age = 44.94 years; SD= 9.90) which is similar to previous research on the ageing workforce in the rail industry with a mean age of 44.51 years for females and 44.6 years for males (NSAR, 2018). Table 1 outlines the demographic information of the sample including gender, country, education level, occupational role, disability, additional conditions that increases the risk of morbidity to COVID-19, COVID-19 diagnosis and shielding status. Where available, comparative information is provided from NSAR’s Diversity Report, with a sample size of 117,130 UK rail workers (NSAR, 2018). Data revealed that the participants for the current study were fairly representative of the wider population of railway workers in the UK context. The majority of participants were train drivers (64.5%) and at least one in ten participants reported having a pre-existing mental (11.6%) and/or physical health (14.0%) problem.

TABLE 1 HERE

The descriptive statistics of all variables of interest are presented in Table 2. A total mean wellbeing score of 19.48 (S.D = 3.80) was found for all railway workers, indicating ‘possible depression’. COVID-19 stress scores (M=9.37, SD=4.74) suggested medium levels of stress. Mean COVID-19 risk perception (M=25.45, SD=6.87) and burnout scores (M=29.09, SD=8.25) indicated that the sample experienced high levels of perceived risk and burnout related to COVID-19.

In terms of protective factors, the mean score (M=10.56, SD=3.44) of adaptive resilience indicated low resilient coping. Mean scores of team resilience (M=2.79, SD=1.61) and help seeking from a formal source (M= 11.12, SD=5.31) indicated that the sample experienced low levels of team resilience and intentions to seek help from a

formal source. GHSQ help seeking from an informal source mean scores ($M=15.52$, $SD=6.25$) indicated high intentions to seek help from informal sources.

In order to explore the relationship between risk and protective factors and their relationship with mental wellbeing, a correlation matrix was conducted. All correlations were significant at $p<.05$, one exception was help-seeking from a formal source and burnout, which was non-significant. All variables scored adequate to excellent internal consistency of items, as distinguished by Cortina (1993), as Cronbach's alpha scores range from .75 to .91. Note that internal consistency of team resilience cannot be assessed here as there was only 1 item in this measure. See Table 2 for Pearson correlation coefficients and Cronbach's alpha for all variables.

TABLE 2 HERE

Table 3 details the descriptive statistics of each individual GHSQ items. Within the informal sources of help category, intimate partner was most likely to be a source of help and other relative to be the least likely. Within the formal sources of help category, doctor was the most likely source of help and least likely, a religious leader. Railway workers were significantly more likely to seek informal support (mean = 3.87, sd = 1.56) for dealing with personal or emotional problems compared to formal (mean = 2.78, sd = 1.32) sources of support ($t(816) = 70.85$, $p = .001$).

TABLE 3 HERE

The outcomes from railway workers' scores on the psychometric measures used for this study were compared to data collected from earlier studies with other occupational groups (Table 4). Note that team resilience was not considered for comparison here due to differentiation in scoring and variation in measures used for this construct. Comparing participants' mean scores indicated that the current sample of

railway workers had lower resilience, lower help seeking intentions (from formal and informal sources), lower mental wellbeing, similar burnout levels, but lower COVID-19 stress and lower COVID-19 risk perception when compared with community samples and other occupational keyworkers groups during the COVID-19 pandemic (Turkish HSCWs, Yildirim et al., 2021; UK HSCWs, McFadden et al., 2021; Turkish general population, Yildirim & Solmaz 2020, Yildirim & Guler, 2020), and prior to the pandemic in various samples (Immigrant groups in Norway, Markova et al., 2020; UK general population, Fat et al., 2017; German general population, Kocalevent et al., 2017; New Zealand Defence force personnel, Hom et al., 2020). Therefore, railway workers may be more at risk in terms of their mental wellbeing when faced with adversities associated with COVID-19 when compared to other occupational groups and the community samples.

TABLE 4 HERE

COVID-19 risk factors: Multiple regression analysis showed that the predictor variables (COVID-19 stress, COVID-19 risk perception and COVID-19 burnout) together accounted for 50% ($r^2 = .50$) of the variance in mental wellbeing scores, which was statistically significant, $F(3, 813) = 271.509, p < .001$. This indicated that higher COVID-19 stress, risk perception and burnout, together, significantly predicted lower mental wellbeing scores. Individually, the standardised regression coefficients (see Table 5) indicated that COVID-19 stress and COVID-19 burnout were significant negative predictors of mental wellbeing scores ($B = -.212, p < .001$; $B = -.571, p < .001$; respectively), indicating that higher COVID-19 stress and burnout predicted lower wellbeing scores. COVID-19 risk perception was a significant positive predictor of

mental wellbeing scores ($B = .067, p < .05$), therefore, lower scores in risk perception predicted higher scores on mental wellbeing.

TABLE 5 HERE

Protective factors: Multiple regression analysis showed that the predictor variables (help-seeking informal, help-seeking formal, adaptive resilience and team resilience) together accounted for 18% ($r^2 = .18$) of the variance in mental wellbeing scores, which was statistically significant, $F(5, 811) = 35.712, p < .001$. The standardised regression coefficients (see Table 6) indicated that adaptive resilience, help-seeking (informal) and team resilience were all significant positive predictors of mental wellbeing scores ($B = .189, p < .001$; $B = .103, p < .010$; $B = .252, p < .001$; respectively). This indicated that higher adaptive resilience, higher intentions to seek help from an informal source and higher rates of team resilience significantly predicted higher mental wellbeing scores. Intentions to seek help from a formal source did not significantly predict mental wellbeing scores.

TABLE 6 HERE

Mediation models: Three mediation models were analysed, one for each COVID-19 risk factor (COVID-19 Stress, model 1; COVID-19 Risk Perception, model 2; and COVID-19 Burnout; model 3). In each model, the outcome variable (mental wellbeing) was regressed onto the independent variable with four mediator variables (help-seeking informal, help-seeking formal, adaptive resilience and team resilience).

Model 1: COVID stress. The total effect of the model was statistically significant [$F(1, 815) = 481.2363, p < .001$]; the predictors and mediators together accounted for 37% of the variance in mental wellbeing scores ($r^2 = .37$). Overall, the three mediators significantly mediated the relationship between COVID-19 stress and mental wellbeing ($IE_{\text{overall}} = -.0395, CI: LL = -.0609 \text{ to } UL = -.0194$). There was a statistically significant indirect effect of COVID-19 stress to mental wellbeing through help-seeking from an informal source ($IE = -.0066, CI: LL = -.0150 \text{ to } UL = -.0006$), brief resilience ($IE = -.0134, CI: LL = -.0268 \text{ to } UL = -.0024$) and team resilience ($IE = -.0227, CI: LL = -.0375 \text{ to } UL = -.0102$). Help-seeking from formal sources did not significantly mediate the relationship between COVID-19 stress and mental wellbeing ($IE = .0032, CI: LL = -.0007 \text{ to } UL = .0087$).

Model 2: Risk Perception. The total effect of the model was statistically significant [$F(1, 815) = 139.2643, p < .001$]; the predictors and mediators together accounted for 15% of the variance in mental wellbeing scores ($r^2 = .15$). Overall, the three mediators significantly mediated the relationship between COVID-19 risk perception and mental wellbeing ($IE_{\text{overall}} = -.0244, CI: LL = -.0411 \text{ to } UL = -.0089$). There was a statistically significant indirect effect of COVID-19 risk perception on mental wellbeing through team resilience ($IE = -.0171, CI: LL = -.0280 \text{ to } UL = -.0081$). There was a statistically non-significant indirect effect of COVID-19 risk perception to mental wellbeing through help-seeking from an informal source ($IE = -.0038, CI: LL = -.0104 \text{ to } UL = .0009$), help-seeking from a formal source ($IE = .0015, CI: LL = -.0020 \text{ to } UL = .0054$) and adaptive resilience ($IE = -.0050, CI: LL = -.0146 \text{ to } UL = .0033$). Overall, the protective factors mediated the relationship between COVID-19 risk factors and wellbeing (Figure 1).

Model 3: COVID-19 Burnout. The total effect of the model was statistically significant [$F(1, 815)=764.3375, p<.001$]; the predictors and mediators together accounted for 48% of the variance in mental wellbeing scores ($r^2=.48$). Overall, the three mediators significantly mediated the relationship between COVID-19 burnout and mental wellbeing ($IE_{\text{overall}}=-.0252, CI: LL=-.0364$ to $UL=-.0152$). There was a significant indirect effect of COVID-19 burnout to mental wellbeing through help-seeking from an informal source ($IE=-.0043, CI: LL=-.0091$ to $UL=-.0006$), through adaptive resilience ($IE=-.0092, CI: LL=-.0169$ to $UL=-.0029$) and through team resilience ($IE=-.0121, CI: LL=-.0206$ to $UL=-.0052$). Help seeking from formal sources did not significantly mediate the relationship between COVID-19 burnout and mental wellbeing ($IE=.0004, CI: LL=-.0169$ to $UL=.0025$).

FIGURE 1 HERE

Open text responses: Participants were asked to respond to an open-ended question asking them about the impact of COVID-19 on their mental wellbeing. In total, 307 (37.57%) of participants responded to the question which generated 756 coded comments. A total of 62 associated codes were then developed, resulting in seven categories of meaning (see Table 7). The majority of these categories of meaning related to ‘negative impacts’ on their mental wellbeing, however, one category identified ‘positive changes’. The categories were: 1) deterioration in mental health and wellbeing (e.g. “My mental health has worsened the longer the pandemic has gone on”); 2) Lack of work-based support (e.g. “There’s been no help for mental health at work”); 3) Loss of social support (e.g. “I feel lonely and isolated”); 4) Concerns about risks and uncertainty (e.g. “I’m worried if I get it, my family will too”); 5) Life/work imbalance

(e.g. “I struggle to separate work and home life”) and 6) Positive changes (e.g. “I feel I have more time for me and my family”). Fourteen comments were categorised as 7) miscellaneous (e.g. “Mistrust of the government”) as they were too broad or non-specific to be categorise.

TABLE 7 HERE

Discussion

This study explored the impact of COVID-19 on the mental wellbeing of railway keyworkers, as well as protective factors, during the third lockdown in the UK. A cross-sectional online survey and a multi-method approach to analysis was adopted. In order to determine potential statistical predictors of mental wellbeing, socio-demographic data were collected, along with self-rated risk factors of COVID-19 stress, risk perception and burnout. Protective factors of adaptive coping, team resilience and help-seeking (informal and formal) were also explored as potential mediators in relationship between COVID-19 risk factors and mental wellbeing. This study is novel in its consideration of a male-dominated industry faced with the challenges associated with COVID-19 as a consequence of being keyworkers who are occupationally at higher risk of being exposed to the virus as well as heightened risks of occupational stress (Bardon & Mishara, 2015; Corina & Adriana, 2013; Evans & Hughes, 2019; Fonseca et al, 2018; Ghoroubi et al, 2022; Lunt et al, 2022; Nguyen., et al, 2020; Topriceanu et al, 2021; Virdee et al, 2019). A number of key findings emerged, contributing to our understanding of not only the challenges to mental wellbeing but also protective factors which may help buffer or mitigate the impact of stressors associated with COVID-19 and help railway workers to adapt in face of adversities. The

findings were comparable to recent studies with diverse keyworker populations (Ayling et al, 2020; Bu et al, 2021; Anonymous & MacDonald, 2021, d’Ettorre et al., 2021; Mutambudzi et al., 2020; Talaei et al., 2020; Yildirim et al., 2021; Vanhaecht et al, 2021), indicating that higher scores on COVID-19 risk factors (stress, risk perception and burnout) for mental wellbeing were predictive of lower scores on mental wellbeing for railway workers. In terms of protective factors, higher levels of individual adaptive coping, team resilience and informal help seeking intentions were predictive of higher scores on mental wellbeing. This is congruent with research on both individual and team resilience and mental wellbeing (Anonymous et al, 2022; Anonymous & MacDonald, 2021; Bozdağ & Ergün, 2020; Pink et al, 2021; Santarone et al, 2020; Yıldırım & Arslan 2020) and on help-seeking intentions and mental wellbeing (Brooks et al, 2019; Hom et al., 2020; Sage et al, 2016) with other occupational groups. Crucially, the adaptive function of resilience on an individual and team level facilitates better mental wellbeing by mitigating the impact of COVID-19 stress and burnout (Bonanno 2004; Yıldırım 2019). Notably, team resilience was the only factor that significantly mitigated the impact of COVID-19 risk perception on mental wellbeing. Similar to recent research (Lee, 2021; Naweid et al, 2021), this finding suggests that teams have an important role in addressing railway workers’ perceived worries and risks associated with COVID-19.

Similarly, those who had stronger intentions to seek informal help from others were found to have a reduced negative impact of COVID-19 stress and burnout on their mental wellbeing. However, there was no significant impact for risk perception. Intentions to seek help from a formal source did not significantly reduce the impact of COVID-19 stress, burnout and risk perception on mental wellbeing. Similar to previous work (Edward & Hercelinskyj, 2007; Sánchez-Moreno et al 2014), this may suggest that stress and burnout are issues that the participants believed could be supported by

informal sources. Further, one may be able to utilise team-based resilience rather than internal resilience to bolster against the effects of risk perception. Alternatively, this may be indicative of railway workers being less likely to seek formal help for mental health, potentially due to barriers to help seeking associated with stigma surrounding mental health; this has been found to be an issue in other keyworker and/or male dominated occupations (Clement et al, 2015; Dyrbye et al, 2015; Kulesza et al, 2015; Lai et al, 2020; Lynch et al, 2018; Rasmussen et al, 2018; Watson & Andrews, 2018). Further, participants were more able to utilise team-based resilience, perhaps in the absence of internal resilience, to bolster against the effects of risk perception. This indicates the importance of workplace support and wellbeing during periods of high perceived risks.

Qualitative data from the open-test responses largely supported the above findings, while also contributing further insights. From this set of data, the majority of participants focused on the negative impact of COVID-19 on their mental wellbeing. Self-reported deterioration in mental health over the course of the pandemic was the most frequent category to emerge, followed by loss of social support, concerns about risks and uncertainty and life/work imbalance. Interestingly, one category of meaning highlighted positive changes in mental wellbeing during the pandemic. This finding is similar to earlier work reporting on protective factors for mental wellbeing during lockdown which were most likely to be reported among those who were able to spend time outdoors, exercise, go for walks and care for others (Cho et al, 2021; Corley et al, 2021; Fan & Smith, 2017; Lades et al, 2020; Maugeri et al, 2020; Williams et al, 2021).

This study contributes to the COVID-19 research priorities outlined in Holmes et al., (2020)'s position paper, utilising measures with strong psychometric properties and COVID-19 specificity. The current findings can contribute evidence to support the

development of resilience-based interventions at both individual and team levels to support mental wellbeing during a pervasively stressful time. These findings provide recommendations relevant to organisational supports to provide targeted interventions to those railway workers who present with low resilience and help-seeking intentions. This study also contributes to the growing picture of the impact of COVID-19 stressors across diverse occupational groups (Gómez-Ochoa et al, 2021; Holton et al, 2020; Koh, 2020). The self-reported mental wellbeing status of the railway keyworker population can be compared in future work to provide a dynamic picture of the occupational risks to mental wellbeing moving forward.

Limitations and future directions

Given the restrictions in place concerning social distancing during the conduct of the study, the recruitment of participants was largely determined by those who responded to the online recruitment posters circulated via social media platforms and/or through affiliations with the railway trade unions. Therefore, self-selection bias (Bethlehem 2010) may have occurred, possibly limiting access to harder-to-reach groups (e.g., ethnic minorities, LBGT+), those more impacted by digital poverty (e.g., disadvantaged groups, low-income workers) and railway workers within the industry who may not be supported by a trade union. There is a pronounced digital divide across the UK with 15% of the general population not having access to internet (Blank et al., 2019), which may exacerbate their ability to access the survey and support services during the pandemic. Use of printed surveys would help gain a more representative sample of those who may experience digital exclusion in future work (Helsper & Reisdorf, 2017).

There are also limitations associated with the survey design including the exclusive dependence on self-reported measures that may risk self-report bias. To reduce such potential biases in future studies, adopting a multi-method approach, whereby in-depth, qualitative interviews could be conducted in addition to collecting quantitative, longitudinal data (Bonevski et al, 2014) with observable outcomes (e.g., levels of sick leave attributed to stress, monitoring staff morale, perceived psychological safety within the workplace) to accompany findings. Therefore, it is recommended that future research aims to explore the long-term impact COVID-19 on mental wellbeing using multi-method approaches (O'Connor, Thayer, & Vedhara, 2020). Indeed, findings from our content analysis of free text responses revealed that deterioration in mental wellbeing over the course of the pandemic was a concern raised among participants; longitudinal work will help illuminate such causal pathways.

The study used a cross sectional design with mediation analyses which are helpful to explore relationships between constructs and measure change at one time-point (Windgassen et al. 2016). However, both are limited in their ability to determine temporal causality. For example, the findings propose that high levels of COVID-19 risk factors may predict poor mental wellbeing, although it cannot be concluded with certainty that risk factors precede and influence poor wellbeing. Although mediation analysis does not test causality directly, our findings shed light on the possible mechanism underlying COVID-19 risks and mental wellbeing by considering the roles of resilience and help-seeking (Windgassen et al. 2016; Yıldırım, Arslan, & Özaslan, 2020). Given the importance of resilience to safeguard against the negative effects from the COVID-19 pandemic on railway keyworkers mental wellbeing, it is recommended that the railway industry aims to enhance both individual and organisational resilience (Huffman et al, 2021; Kasyanova & Vinogradova, 2020; Zhang & Pan, 2020) moving

forward. This may involve implementing evidence-based resilience training interventions incorporating skills such as self-care, cognitive reframing, relaxation techniques, mindfulness-based stress reduction and expressive writing (Lamb & Anonymous, 2016; Mealer et al, 2014; Sood et al, 2011) or enhancing team resilience through frameworks such as the “Five Cs” of centering, confidence, commitment, community and compassion (Bennett et al, 2010; Bennett et al, 2018). Both research and interventions incorporating and extending contemporary understanding of individual and team resilience is needed (Huffman et al, 2021). There is evidence that co-creation positively impacts on both individual and team resilience mainly through the feeling of being a valuable member in the organisation and increasing trust and transparency (Partouche-Sebban et al, 2021; Rao, 2021). Previously, it has been shown that building trust, enthusiasm, optimism, satisfaction, comfort, compassion and relaxation, helps teams to foster team resilience and improve their performance and enhance a team’s capacity to face difficulties collectively (Andel et al, 2021; Meneghel et al., 2016; Olvera et al., 2017). Based on the available literature, there is a need for research exploring the implementation of both individual and team based interventions seeking to enhance railway keyworkers’ resilience and wellbeing. More broadly, research exploring what constitutes a resilient team within specific occupational context will help shape intervention development and contribute towards theoretical understanding of team resilience. Drawing upon the social-ecological approach to understanding resilience in the recovery phase of the COVID-19 pandemic may shed light on the interaction between individual and wider systems that shape resilience in diverse ways (Britt et al, 2021; Folke et al. 2011; Kuba & Scheibe, 2017; Leach et al. 2012). It is crucial that future research also investigates the work climate and culture in the railway industry and the norms set around staff mental health and wellbeing (Fan &

Smith, 2018); exploratory qualitative studies incorporating the perspectives and experiences of railway workers seems warranted. While cultural norms of this kind are complex and often difficult to change (Anonymous et al, 2022), it is crucial they be recognised and addressed. Further, improving the accessibility of support services alone is bound to have a limited impact on the rates of railway workers seeking formal help when needed; understanding potential barriers to formal help-seeking needs to be considered in ongoing research and intervention development. What our data, alongside various other studies (Anonymous et al 2021, Follmer, & Jones, 2018; Sage et al, 2016; Weibelzahl et al, 2021), have done is establish that there is a need to provide mental health support to railway keyworkers (Debbaut et al, 2014); the question that research must target next is why and when this need does and does not translate into uptake of formal and/or informal support. Potential transferable insights and lessons learned through the current research with railway workers bear relevance to other essential keyworker occupational groups, particularly those that tend to be male dominant industries (Roche et al, 2016). While for some, the conditions of lockdown helped bring about positive changes for some (Beaglehole et al, 2022; Williams et al, 2021), the COVID-19 pandemic will be one of many mental health crises that society will face in the impending future (Dong & Bouey, 2020; Esterwood & Saeed, 2020; Shoss, 2021); it is essential that the right ideas, readiness to help keyworker groups, organisations and society address these challenges when they occur and in preparedness for future pandemics.

Conclusion

The results of this study provide much needed insight into the impact of COVID-19 on the mental wellbeing of railway keyworkers during the 3rd UK lockdown period of the COVID-19 pandemic in the UK. Crucially this workforce's

socio-demographic characteristics, COVID-19 diagnosis and shielding status, alongside scores on psychometric measures of risk (COVID-19 risk perception, COVID-19 stress, COVID-19 burnout) and protective factors (adaptive resilience, team resilience, help-seeking) and mental wellbeing and provide baseline data for policy makers, researchers and the railway industry in developing policies and interventions to support staff wellbeing. These findings help to position the psychological impact of the pandemic on railway workers in comparison to other key worker occupational groups. Further, the findings confirm expected results that COVID-19 risk factors predict poorer mental wellbeing. It also provides unique insights into the protective factors to alleviate the relationship between COVID-19 risk factors and mental wellbeing of railway keyworkers. These findings will help to inform mental wellbeing strategies within the rail industry with a critical focus on bolstering adaptive and team resilience and improving help-seeking intentions. Transferable insights and lessons learned bear relevance to other essential keyworker occupational groups.

Table 1.

Socio-demographic information of the sample alongside comparative data from the wider population of railway workers (NSAR, 2018).

		Current study		Comparison with NSAR (2018)	
		N	Percentage %	Percentage %	Percentage change
Gender	Male	677	79.3	88	+8.7
	Female	165	19.3	12	-7.3
	Prefer not to say	11	1.3	-	-
	Prefer to self-describe	1	0.1	-	-
	<i>Total</i>	<i>854</i>			
Country	England	508	59.4	90.8	+31.4
	Scotland	308	36.0	4.5	-31.5
	Wales	39	4.6	4.6	
	Northern Ireland	0	0	0.1	+0.1
	<i>Total</i>	<i>855</i>			
Highest	University	188	22.0	-	-

Education Level	College	315	36.8	-	-
	High School	344	40.2	-	-
	Other	8	0.9	-	-
	<i>Total</i>	<i>855</i>			
Pre-existing conditions	Mental health condition	98	11.6	-	-
	Long term physical health condition	118	14.0	-	-
	Both	41	4.9	19 (both or either one)	+14.1
	None	535	63.5	81	+17.5
	Prefer not to say	31	3.6	-	-
	Other	20	2.3	-	-
	<i>Total</i>	<i>843</i>		-	-
Number of Additional conditions	None	664	77.6	-	-
	1	162	18.9	-	-
	2	25	2.9	-	-
	>3	5	0.6	-	-
	<i>Total</i>	<i>856</i>		-	-
Occupation	Train Driver	552	64.5	-	-
	Conductor	88	10.3	-	-
	Ticket Examiner	11	1.3	-	-
	Station Staff	56	6.5	-	-
	Engineering	14	1.6	-	-
	Cleaning	5	0.6	-	-
	Ground Staff	6	0.7	-	-
	Clerical	18	2.1	-	-
	Managerial	58	6.8	-	-
	Head Office	26	3.0	-	-
	Other	22	2.6	-	-
	<i>Total</i>	<i>856</i>		-	-
COVID-19 Diagnosis	Currently have	19	2.3	-	-
	Previously had, but now resolved	86	10.6	-	-
	Never	710	87.1	-	-
	<i>Total</i>	<i>815</i>		-	-
Shielding	Yes	29	3.6	-	-
	No	785	96.4	-	-
	<i>Total</i>	<i>814</i>		-	-

Table 2.

Descriptive statistics (Mean, Standard deviation and range) and Pearson correlation co-efficient indicating associations between variables.

*= $p < .05$ **= $p < .01$ ***= $p < .001$ n.s = non-significant

Variable	M	SD	Range	Cronbach's alpha	1	2.	3.	4.	5.	6.	7.	8.
1. COVID-19 Risk perception	25.45	6.87	8-45	-		-.382**	.607**	.562**	-.045(n.s)	-.059(n.s)	.085*	-.160**
2. Mental Wellbeing	19.48	3.80	7-35	.86			-.609**	-.696**	.287**	.236**	.084*	.323**
3. COVID-19 Stress	9.37	4.74	0-20	.88				.768**	-.093**	-.079*	.070*	-.231**
4. COVID-19 Burnout	29.09	8.25	10-50	.91					-.118**	-.150**	.017n.s	-.249**
5. Brief Resilience	10.56	3.44	0-20	.80						.217**	.086*	.228**
6. Help-seeking- Informal	15.52	6.25	4-28	.75							.364**	.228**
7. Help-seeking- Formal	11.12	5.31	4-28	.75								.109**
8. Team Resilience	2.79	1.61	1-7	-								

Table 3.

Descriptive statistics (Mean, Standard Deviation and Range) for each item of The General Help-Seeking Questionnaire.

Help-Seeking Category	GSHQ Item	M	SD	Range
Informal	1. Intimate partner	4.89	2.11	1-7
	2. Friend	4.21	2.03	1-7
	3. Parent	3.23	2.18	1-7
	4. Other Relative	3.19	2.05	1-7
Formal	5. Mental Health Professional	3.41	2.06	1-7
	6. Phone Helpline	2.41	1.74	1-7
	7. Doctor	3.85	1.99	1-7
	8. Religious Leader	1.52	1.21	1-7

Table 4:

Comparison of mean scores of the psychometric measures used in this study with other studies of general population (Gen Pop) or workforce samples, both during and prior to COVID-19.

Study Sample	Gender (F/M)	N	COVID-19 Stress M (SD)	COVID-19- Burnout M (SD)	COVID Risk Perception M(SD)	Brief Resilience M (SD)	Informal Help Seeking* M(SD)	Formal Help Seeking* M(SD)	Wellbeing M(SD)
Current study	-	818	9.37 (4.74)	29.09 (8.25)	25.45 (6.87)	10.56 (3.44)	3.87 (1.56)	2.78 (1.32)	19.48 (3.8)
Turkish HSCW¹	F	1,046	12.40 (3.19)	35.05 (9.07)	-	-	-	-	-
	M		11.31 (3.48)	30.51 (9.91)	-	-	-	-	-
Turkish Gen Pop²	-	402	11.28 (3.24)	28.61 (9.01)	-	19.48 (4.61)	-	-	-
UK HSCW³	-	3,425	-	-	-	-	-	-	21.35 (3.58)
German Gen Pop⁴	F	2,508	-	-	-	14.6 (3.1)	-	-	-
	M		-	-	-	14.9 (3.3)	-	-	-
New Zealand Defence Force⁵	-	2,805	-	-	-	22.29 (4.70)	-	-	-
Immigrant groups in Norway⁶	-	533	-	-	-	-	4.00 (1.1)	3.46 (1.4)	-
Turkish Gen pop⁷	-	3109	-	-	26.30(5.66)	-	-	-	-

¹Yildirim et al., 2021 ²Yildirim & Solmaz, 2020 ³McFadden et al., 2021⁴ Kocalevent et al ., 2017 ⁵ Hom et al., 2020 ⁶Markova et al., 2020 ⁷Yıldırım & Guler, 2020.

* Participant responses where averaged to each source of help.

Table 5.

The standardised beta weights of risk factors that predict mental wellbeing scores in a multiple regression analysis.

Variable	Standardised Beta weights
COVID-19 Stress	-.212***
COVID-19 Burnout	-.517***
COVID-19 Risk Perception	.067*

*=p<.05 **=p<.01 ***=p<.001 n.s = non-significant

Table 6.

The standardised beta weights of protective factors that predict mental wellbeing scores in a multiple regression analysis.

Variable	Standardised Beta weights
Adaptive Resilience	.189***
Help-seeking (Informal)	.103**
Help-seeking (Formal)	-.048(n.s)
Team Resilience	.252***

*=p<.05 **=p<.01 ***=p<.001 n.s = non-significant

Table 7.

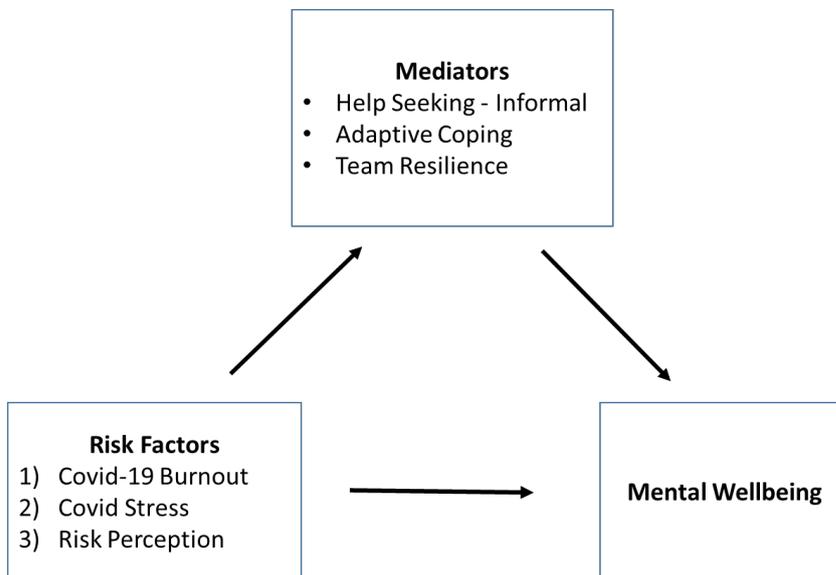
Impact on mental wellbeing: Categories of meaning (key categories) and associated codes.

Categories of meaning (N = 7 key categories)		Number (%) of comments associated with category (N = 756 coded comments)	Associated codes (N = 62 sub-codes)
1	Deterioration in mental health	183 (24.2%)	Anxiety Increasingly low mood Work stress Burnout Worries about the future Sense of hopelessness Fear Anger Less exercise Surviving not thriving Negative coping Grief of losing someone Lack of control Loss of purpose/motivation
2	Lack of work-based support	181 (23.9%)	Tensions between frontline keyworkers and management Lack of communication Struggles with managing travel restrictions Confused messages Barriers to disclosing mental health concerns No mental health support Stigma of help-seeking Lack of protection Concern about job security
3	Loss of social support	135 (17.8%)	Increased isolation Trapped Loneliness Reduced peer interactions Lack of physical touch Limited socialising Breakdown of relationships
4	Concerns about risks and uncertainty	125 (16.5%)	Concern about own health Concern about passing it on Risk of the unknown Unsafe Mortality Conspiracy Mistrust False information Scepticism
5	Life/work imbalance	90 (11.9%)	Caring concerns Less structure to day Childcare struggles Home schooling Working from home Difficulty setting boundaries
6	Positive changes	18 (2.3%)	Improvements in wellbeing Positive impact on environment Increased family time Outdoor exercise

			<p>Sense of appreciation for life Adaptive coping Connecting through technology Help seeking More reflective</p>
7	Miscellaneous	24 (3.1%)	<p>Negative impact of media Mistrust of government Frustration at lack of enforcement of restrictions Anger at other not following safety rules Forced to 'out' their hidden disabilities Restrictions on freedoms Concerns about vaccine Faith in science</p>

Figure 1.

Mediation model depicting COVID-19 risk factors, mediating protective factors and mental wellbeing



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