

Title: Understanding the mental health impacts of the COVID-19 pandemic on railway

workers: risks and protective factors

Abstract

Objective: Railway workers have provided an essential service throughout the COVID-19 pandemic. This study explored the effects of COVID-19 on the mental wellbeing of railway workers (n=906) in the UK during the third lockdown period.

Method: The online survey included measures of COVID-19 related risk factors (perceived risk, stress, burnout, trauma) and protective factors (resilience coping, team resilience, general help-seeking) associated with mental wellbeing. Responses were analysed using multiple regression and content analysis.

Results: COVID-19 related risk factors negatively predicted wellbeing. Higher scores on adaptive resilience, intentions to seek help and team resilience significantly predicted higher mental wellbeing scores. Mental health decline throughout the COVID-19 pandemic and concerns for the future were reported.

Conclusion: Building a resilient railway workforce requires attention to staff mental wellbeing and to ensuring that support systems are robust and accessible.

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

Introduction

The COVID-19 pandemic has changed how many people live and work ^(1, 2) and has presented significant mental and physical strain across occupational groups ⁽³⁾. There is a growing awareness that diverse occupations vary in their exposure to the COVID-19 virus and the risks associated with it ⁽⁴⁻⁷⁾. 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 ⁽⁸⁻¹⁰⁾. 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 ^(11,12). As governments prioritized health and implemented measures, during the lockdown periods of the COVID-19 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 ⁽¹³⁻¹⁶⁾. 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 this pandemic ⁽¹⁷⁻¹⁹⁾.

Mental wellbeing and risk factors

COVID-19 has significantly affected the railway industry; while this presents opportunities as well as challenges moving forward ⁽¹⁸⁾, little is known about the impact on the mental wellbeing of railway keyworkers. Occupations beyond healthcare settings are at high risk of the virus ^(3, 20-22), including railway workers, due to frequent contact

with commuters ^(23, 24). Perception of risk is the subjective judgment that people create regarding the characteristics, severity, and way in which risk is managed ^(25,26). Perception of risk plays a key role in people's mental wellbeing and in their daily habits ^(20, 27). Railway workers' perceived risks are likely intensified as working in close proximity with the public brings heightened health risks ⁽²⁰⁾. 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 ⁽²⁸⁾, whereby negative outcomes have largely been reported ⁽²⁹⁻³⁶⁾ including stress, anxiety, burnout and PTSD ⁽³⁷⁻⁴⁰⁾. Some studies have identified similar levels of anxiety and depression in health-care workers compared with non-health care workers ^(41, 42). In contrast, one study 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 ⁽⁴³⁾. However, these findings relate to data collected early 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 ⁽⁴⁴⁻⁴⁹⁾ and when compared to pre-pandemic population norms ⁽⁵⁰⁻⁵²⁾. 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 ⁽⁴⁰⁾. It is, therefore, unclear if particular occupations have experienced increasingly adverse effects of the stressors associated with the COVID-19 pandemic on their mental well-being, 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 ^(7, 53, 54) and there is evidence to suggest that those working in utility, food chain and transport roles have been found to be especially at risk ^(55, 56).

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 ⁽⁵⁷⁾. 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 ⁽⁵⁸⁻⁶⁶⁾. Such stressors can elicit chronic stress, emotional exhaustion, burnout and post-traumatic stress ⁽⁶⁷⁻⁷³⁾ and increased prevalence of mental health pathology ⁽⁷⁴⁾.

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 ⁽⁷⁵⁻⁷⁶⁾, occupational risk to mental health problems and/or pre-existing mental health conditions, particularly within male dominated industries ^(77,78) and risk of exposure to traumatic occupational incidents ⁽⁷⁹⁻⁸¹⁾. This is pertinent given that international studies of male-dominated industries suggest that masculine norms predict poor mental health outcomes, low help-seeking intentions and higher rates of suicide ^(74, 135, 138-140). Harmful physical and psychological working conditions (e.g., unsupportive workplace relationships, job overload and high job demands) are thought to partly explain these elevated outcomes. Masculine norms such as the importance of emotional control, dominance, self-reliance, and willingness to engage in risk-taking behaviours ⁽¹³⁹⁾ may also contribute to poorer mental health

outcomes. These findings are generally consistent with earlier systematic reviews that have identified risk factors associated with poorer mental health outcomes amongst male dominated industries ^(141,142).

Protective factors

A growing body of research has explored potential protective factors that can help prevent the adverse effects of the COVID-19 pandemic on the mental wellbeing of keyworker populations. While a broad range of mechanisms for protecting mental health and wellbeing have been studied across occupational groups, the concept of resilience has been well-established as an important protective factor for mental wellbeing during the COVID-19 pandemic ^(29, 82). The concept of resilience can be defined as an ability to adapt and rebound from negative events ^(83,84) and has repeatedly been highly correlated with higher scores on mental wellbeing in general population samples ^(40, 85-88) and keyworker occupations ^(26, 43, 89-94). Resilience is one of the core constructs of positive organizational behaviour ⁽⁹⁵⁻⁹⁷⁾ and may help in mediating the relationship between stress and burnout both pre-COVID ⁽⁹⁸⁾ and during the course of this pandemic ^(99,100). Resilience has been found to help medical workers in managing personal and system-level stressors at the peak of the COVID-19 pandemic ⁽¹⁰¹⁾. Personal resilience can be fostered in the workplace ⁽⁹²⁾ through effective team-working and supportive relationships ⁽¹⁰²⁾.

In recent years, there has been an increasing interest in resilience as a collective phenomenon ⁽¹⁰³⁻¹⁰⁷⁾, which is conceptually different from individual, personal resilience ⁽¹⁰⁸⁻¹¹⁰⁾. Within an organizational context, research has largely focused on collective resilience within teams ^(111, 112). Theorizing on team resilience is at an earlier stage than that of individual resilience ⁽¹¹³⁻¹¹⁵⁾, however, it has gained momentum over

the last decade ⁽¹¹⁶⁻¹¹⁸⁾ with its conceptual expositions encompassing a range of individual, team and system level factors ^(108, 119, 120). 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 ⁽¹²¹⁻¹²⁴⁾. In terms of adaptations during the COVID-19 pandemic, collective, team resilience strategies have reportedly helped healthcare keyworkers prioritise tasks, encourage inter-professional collaborations, develop cooperation with networks and support peers emotionally ⁽¹²⁵⁻¹²⁷⁾; understanding the relationship between team resilience and the mental wellbeing of railway keyworkers has yet to be explored.

There is evidence that help-seeking intentions may help foster both individual ^(128, 129) and team resilience ^(130,131) and protect mental wellbeing ^(132,133). Improvements in help-seeking among railway workers has been found to improve team cohesion and mental wellbeing ^(134, 135). 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 organizational culture that supports staff mental wellbeing and help-seeking; further research is needed to understand this across diverse organizational contexts ^(136,137).

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 socialization between households. 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 ⁽¹⁴⁶⁾. 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 has adapted 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 ⁽¹⁴⁷⁾.

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 buffer the impact of 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.

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, 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 intranet platforms within the railway industry. The recruitment poster was also circulated via railway unions who circulated it among their members via email. 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. Prior to consenting to taking part in the study, participants were asked to confirm that they worked within the railway industry, state their occupational role and confirm that they were aged 18 years old or over. 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 the UK people who were deemed extremely clinically vulnerable to the COVID-19 virus were contacted by the NHS. They were asked to stay at home during the acute phases of the global pandemic and to avoid face to face contact with other people. This group included, for example, people who were taking immunosuppressant therapies, women with significant heart conditions who were pregnant, and people who had undergone organ transplant. This was termed ‘shielding’.

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

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

An abbreviated version of the original Warwick-Edinburgh Mental wellbeing scale, with 7 items was used ⁽¹⁴⁸⁾. Participants are asked to rate from 1-5 how often they have experienced 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. The internal consistency of the scale has been found to be excellent (Cronbach’s alpha= .86) in a sample of UK HSCWs during COVID-

19⁽¹⁴⁹⁾. The WEMWBS-SF has been compared to the 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)⁽¹⁵⁰⁾.

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

COVID-19 Stress Measure (CSM): The CSM was adapted and validated from the 14-item perceived stress scale to assess perceived stress related to COVID-19^(29,151). 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?”. It has been found to have good internal consistency of this scale (Cronbach’s alpha= .71)⁽¹⁰⁰⁾.

Coronavirus Perceived Risk Scale (CPRS): The CPRS was developed to measure COVID-19 perceived risk by adapting the wording of the SARS Risk Perception Scale^(152, 153). 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. A 2-factor structure (emotional and cognitive dimensions) has been confirmed and the internal consistency has been found to be satisfactory for each dimension (Cronbach’s alpha is 0.84 - 0.88 and 0.70 - 0.74 for emotional and cognitive dimensions respectively)⁽¹⁵²⁾.

COVID-19 Burnout (COVID-19-BS): The COVID-19-BS⁽¹⁰⁰⁾ was adapted from the Burnout Measure-Short Version ⁽¹⁵⁴⁾, defining burnout as a state of physical, mental and emotional exhaustion ⁽¹⁵⁵⁾. 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 scores indicate higher levels of burnout related with COVID-19. It has been found to have excellent internal consistency of this scale (Cronbach’s alpha= .92) ⁽¹⁰⁰⁾.

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

Brief Resilience Coping Scale (BRCS): Developed to be 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) ⁽¹⁵⁶⁾. 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. The authors propose cut-off points to help interpret scores for low resilience (4-13), medium resilience (14-16) and high resilience (17-20) ⁽¹⁵⁶⁾. The BRCS has been found to have adequate internal consistency (Cronbach’s alpha=.76 and test-retest reliability of $r=.71$) ⁽¹⁵⁷⁾.

Team Resilience Scale (TRS): TRS was developed as a scale comprising 7 items, based on principles for resilience in the workplace ⁽¹⁵⁸⁾. Participants are 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. The authors reported a .87 Cronbach’s alpha, representing a high level of internal consistency ⁽¹²³⁾.

The General Help-Seeking Questionnaire (GHSQ): *The GHSQ* developed and validated 10 items which measure the participants’ intention to seek help for a personal/emotional problem ⁽¹⁵⁹⁾. 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 compromises a potential source of help that is rated on a 7-point Likert scale ranging from 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 organized 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 ^(160, 161). A priori power analysis was conducted to estimate the necessary sample size, using G*Power software ⁽¹⁶²⁾. The alpha was set at .05, the power at .80 to detect a small effect size .02 which indicated a sample size of 725 participants was required; the actual sample superseded the necessary power for multiple regression ⁽¹⁶³⁾.

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⁽¹⁶⁴⁾. Multiple regression analysis was used to determine the association between each potential predictor and mental wellbeing. Significance level of $p < 0.05$ was used for all analyses.

For the qualitative, free-text question, content analysis of participants' comments was undertaken^(165,166). 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⁽¹⁶⁷⁻¹⁶⁸⁾. The first coder initially analysed the data, with the review being undertaken by another member of the research team, enabling both category refinement and research rigour. The researchers returned to the data several times during the analytical process to ensure that the results showed a strong connection to the analysed data⁽¹⁶⁹⁾. 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 (79.30%). 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 44.60 years for males ⁽¹⁷⁰⁾. 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 ⁽¹⁷⁰⁾. Data revealed that the participants for the current study were fairly representative of the wider population of railway workers in the UK context when compared to NSAR data⁽¹⁷⁰⁾. The majority of participants were train drivers (64.51%) and at least one in ten participants reported having a pre-existing mental (11.60%) and/or physical health (14.01%) problem. At the time of data collection, the COVID-19 vaccine was in the early stages of being rolled out and was initially prioritized for those at highest risk from COVID-19 and also health care workers, however, the majority of participants (83.12%.) stated that they intended to be vaccinated. Only 50.00% of railway workers felt that they had been offered timely advice as to how they should have responded to the COVID-19 pandemic within their place of work. The majority of railway workers (84.21%) reported that they experienced challenges with socially distancing at their place of work. Challenges with accessing PPE was one of the challenges reported by participants, albeit this was highlighted through qualitative open-ended responses rather than numerically.

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 Cronbach's alpha scores ranged from .75 to .91⁽¹⁷¹⁾. 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

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 standardized regression coefficients (see

Table 3) 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 3 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 standardized regression coefficients (see Table 4) 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 4 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 5). 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 categorized.

TABLE 5 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 in terms of their relationship with 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 pre COVID-19 ^(4-7, 59, 66, 79, 172, 173).

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 ^(35, 36, 38, 40, 50, 57, 128, 174), 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 ^(43, 90, 99, 128, 175) and on help-seeking intentions and mental wellbeing ^(130, 134, 135) 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 ^(176, 177). Notably, team resilience was the only factor that significantly mitigated the impact of COVID-19 risk perception on mental wellbeing. Similar to recent research ^(17, 178), 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 ^(179, 180), 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 ⁽¹⁸¹⁻¹⁸⁷⁾. Further, participants were more able to utilize 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 ⁽¹⁸⁸⁻¹⁹³⁾.

This study contributes to the COVID-19 research priorities utilising measures with strong psychometric properties and COVID-19 specificity ⁽⁷⁵⁾. 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 organizational 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 ⁽¹⁹⁴⁻¹⁹⁶⁾. 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, work intranet servers and/or through affiliations with the railway trade unions. Therefore, self-selection response bias ⁽¹⁹⁷⁾ 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 ⁽¹⁹⁸⁾, 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 ⁽¹⁹⁹⁾. 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⁽²⁰⁰⁾ 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⁽²⁰¹⁾. 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 which is helpful to explore relationships between constructs and measure change at one time-point⁽²⁰²⁾. However, this is limited in its 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 regression 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^(202, 203). 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 organizational resilience^(101, 204, 205) moving forward. This may involve implementing studies exploring the effectiveness of evidence-based resilience training interventions incorporating skills such as self-care, cognitive reframing, relaxation techniques, mindfulness-based stress reduction and expressive writing^(92, 206, 207) or enhancing team resilience through frameworks such as the “Five Cs” of centering, confidence, commitment, community and compassion^(208, 209). Both research and interventions incorporating and extending contemporary understanding of

individual and team resilience is needed ⁽¹⁰¹⁾. 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 organization and increasing trust and transparency ^(210, 211). 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 ^(123, 212). 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 ⁽²¹³⁻²¹⁵⁾. 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 ⁽²¹⁶⁾; exploratory qualitative studies incorporating the perspectives and experiences of diverse and under-represented railway workers (e.g. those with protected characteristics) is warranted. Further, improving the accessibility of support services alone is likely 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 ^(135, 145, 217), have done is establish that there is a need to provide mental health support to railway keyworkers ⁽²¹⁸⁾; 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 ⁽⁷⁴⁾. While for some, the conditions of lockdown helped bring about positive changes ^(193, 219), the COVID-19 pandemic will be one of many mental health crises that society will face in the impending future ⁽²²⁰⁻²²²⁾; it is essential that the right ideas, readiness to help keyworker groups, organizations 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.

References

1. Al-Ghunaim TA; Johnson J; Biyani CS; O'Connor D, 2021, 'Psychological and occupational impact of the COVID-19 pandemic on UK surgeons: a qualitative investigation.', *BMJ Open*, vol. 11, pp. e045699, 10.1136/bmjopen-2020-045699
2. Vowels, L. M., Francois-Walcott, R. R., Carnelley, K. B., & Checksfield, E. L. (2022). Adapting to change: How has COVID-19 affected people's work and personal goals?. *Plos One*, 17(2), e0262195.
3. May, T., Aughterson, H., Fancourt, D., & Burton, A. (2021). 'Stressed, uncomfortable, vulnerable, neglected': a qualitative study of the psychological and social impact of the COVID-19 pandemic on UK frontline keyworkers. *BMJ Open*, 11(11), e050945.
4. Ghoroubi, N., Khlat, M., & Counil, E. (2022). Workplace Exposure to SARS-CoV-2 among key workers and related social inequalities: evidence from france during the first lockdown. *Safety and Health at Work*, S180-S180.
5. Lunt, J., Hemming, S., Elander, J., Baraniak, A., Burton, K., & Ellington, D. (2022). Experiences of workers with post-COVID-19 symptoms can signpost suitable workplace accommodations. *International Journal of Workplace Health Management*.
6. Nguyen, L.H., Drew, D.A., Graham, M.S., Joshi, A.D., Guo, C.-G., Ma, W., ... Zhang, F. (2020). Risk of COVID-19 among front-line health-care workers and the general community: A prospective cohort study. *Lancet Public Health*, 5, e475– e483. [https://doi.org/10.1016/S2468-2667\(20\)30164-X](https://doi.org/10.1016/S2468-2667(20)30164-X)
7. Topriceanu, C. C., Wong, A., Moon, J. C., Hughes, A. D., Chaturvedi, N., Conti, G., ... & Captur, G. (2021). Impact of lockdown on key workers: findings from the COVID-19 survey in four UK national longitudinal studies. *Journal of Epidemiology & Community Health*, 75(10), 955-962.
8. Carbajal, J., Ponder, W. N., Whitworth, J., Schuman, D. L., & Galusha, J. M. (2021). The impact of COVID-19 on first responders' resilience and attachment. *Journal of Human Behavior in the Social Environment*, 1-17.
9. McConnell, D. (2020). Balancing the duty to treat with the duty to family in the context of the COVID-19 pandemic. *Journal of Medical Ethics*, 360–363. <https://doi.org/10.1136/medethics-2020-106250>

10. Yue, W., & Cowling, M. (2021). The Covid-19 lockdown in the United Kingdom and subjective well-being: Have the self-employed suffered more due to hours and income reductions?. *International Small Business Journal*, 39(2), 93-108.
11. Hodder, A. (2020). New Technology, Work and Employment in the era of COVID-19: reflecting on legacies of research. *New Technology, Work and Employment*, 35(3), 262-275.
12. Kramer, A., & Kramer, K. Z. (2020). The potential impact of the Covid-19 pandemic on occupational status, work from home, and occupational mobility. *Journal of Vocational Behavior*, 119, 103442.
13. Crowley, F., Daly, H., Doran, J., Ryan, G., & Caulfield, B. (2021). The impact of labour market disruptions and transport choice on the environment during COVID-19. *Transport Policy*, 106, 185-195.
14. Grandey, A. A., Sayre, G. M., & French, K. A. (2021). “A blessing and a curse”: Work loss during coronavirus lockdown on short-term health changes via threat and recovery. *Journal of Occupational Health Psychology*, 26(4), 261–275. <https://doi.org/10.1037/ocp0000283>
15. Koczan, Z. (2022). Not all in this together? Early estimates of the unequal labour market effects of Covid-19. *Applied Economics*, 1-14.
16. Muhammad, S., Long, X., & Salman, M. (2020). COVID-19 pandemic and environmental pollution: A blessing in disguise? *The Science of the total environment*, 728, 138820. <https://doi.org/10.1016/j.scitotenv.2020.138820>
17. Naweed, A., Jackson, J. E., & Read, G. J. (2021). Ghost trains: Australian rail in the early stages of the global COVID-19 pandemic. *Human Factors and Ergonomics in Manufacturing & Service Industries*, 31(4), 438-444.
18. Tardivo, A., Carrillo Zanuy, A., & Sánchez Martín, C. (2021). COVID-19 Impact on Transport: A Paper from the Railways’ Systems Research Perspective. *Transportation Research Record*, 2675(5), 367–378. <https://doi.org/10.1177/0361198121990674>
19. Yin, Y., Li, D., Zhang, S., & Wu, L. (2021). How does railway respond to the spread of COVID-19? Countermeasure analysis and evaluation around the world. *Urban Rail Transit*, 7(1), 29-57.
20. Brown, R., Coventry, L., & Pepper, G. (2021). Information seeking, personal experiences, and their association with COVID-19 risk perceptions:

- demographic and occupational inequalities. *Journal of Risk Research*, 24(3-4), 506-520. De Camargo, C. (2022). 'It's tough shit, basically, that you're all gonna get it': UK virus testing and police officer anxieties of contracting COVID-19. *Policing and Society*, 32(1), 35-51.
21. De Camargo, C. (2022). 'It's tough shit, basically, that you're all gonna get it': UK virus testing and police officer anxieties of contracting COVID-19. *Policing and Society*, 32(1), 35-51.
 22. Shan, D. (2021). Occupational health and safety challenges for maritime key workers in the global COVID-19 pandemic. *International Labour Review*. <https://doi.org/10.1111/ilr.12220>
 23. Lan, F., Wei, C., Hsu, Y., Christiani, D., & Kales, S. (2020). Work-related COVID-19 transmission in six Asian countries/areas: A follow-up study. *PLOS One*, 15(5), e0233588. <https://doi.org/10.1371/journal.pone.0233588>
 24. Shinohara, N., Sakaguchi, J., Kim, H., Kagi, N., Tatsu, K., Mano, H., ... & Naito, W. (2021). Survey of air exchange rates and evaluation of airborne infection risk of COVID-19 on commuter trains. *Environment International*, 157, 106774.
 25. Cerase, A. (2017). Risk and Communication. *Theories, Models, Problems*, 1-286.
 26. Cori, L., Bianchi, F., Cadum, E., & Anthonj, C. (2020). Risk perception and COVID-19. *International Journal of Environmental Research and Public Health*, 17(9), 3114.
 27. Han, Q., Zheng, B., Agostini, M., Bélanger, J. J., Gützkow, B., Kreienkamp, J., & PsyCorona Collaboration. (2021). Associations of risk perception of COVID-19 with emotion and mental health during the pandemic. *Journal of Affective Disorders*, 284, 247-255.
 28. Douglas, M., Katikireddi, S., Taulbut, M., McKee, M., & McCartney, G. (2020). Mitigating the wider health effects of covid-19 pandemic response. *British Medical Journal*, m1557. <https://doi.org/10.1136/bmj.m1557>
 29. Arslan, G., Yıldırım, M., Tanhan, A. *et al.* (2020). Coronavirus Stress, Optimism-Pessimism, Psychological Inflexibility, and Psychological Health: Psychometric Properties of the Coronavirus Stress Measure. *International Journal Mental Health Addiction*. <https://doi.org/10.1007/s11469-020-00337-6>

30. Hennein, R., Mew, E. J., & Lowe, S. R. (2021). Socio-ecological predictors of mental health outcomes among healthcare workers during the COVID-19 pandemic in the United States. *PloS one*, 16(2), e0246602.
31. Kua, Z., Hamzah, F., Tan, P. T., Ong, L. J., Tan, B., & Huang, Z. (2022). Physical activity levels and mental health burden of healthcare workers during COVID-19 lockdown. *Stress and Health*, 38(1), 171-179.
32. Lamb, D., Greenberg, N., Stevelink, S.A., & Wessely, S. (2020). Mixed signals about the mental health of the NHS workforce. *The Lancet Psychiatry*, 7, 109–1011. [https://doi.org/10.1016/S2215-0366\(20\)30379-5](https://doi.org/10.1016/S2215-0366(20)30379-5)
33. McGlinchey, E., Hitch, C., Butter, S., McCaughey, L., Berry, E., & Armour, C. (2021). Understanding the lived experiences of healthcare professionals during the COVID-19 pandemic: an interpretative phenomenological analysis. *European Journal of Psychotraumatology*, 12(1), 1904700.
34. Saragih, I. D., Tonapa, S. I., Saragih, I. S., Advani, S., Batubara, S. O., Suarilah, I., & Lin, C. J. (2021). Global prevalence of mental health problems among healthcare workers during the Covid-19 pandemic: a systematic review and meta-analysis. *International Journal of Nursing Studies*, 121, 104002.
35. Talaee, N., Varahram, M., Jamaati, H., Salimi, A., & Attarchi, M. (2020). Stress and burnout in health care workers during COVID-19 pandemic: Validation of a questionnaire. *Journal of Public Health: From Theory to Practice*, 1–6. <https://doi.org/10.1007/s10389-020-01313-z>
36. Vanhaecht, K., Seys, D., Bruyneel, L., Cox, B., Kaesemans, G., Cloet, M., & Claes, S. (2021). COVID-19 is having a destructive impact on health-care workers' mental well-being. *International Journal for Quality in Health Care*, 33(1), mzaa158.
37. Apaydin, E. A., Rose, D. E., Yano, E. M., Shekelle, P. G., McGowan, M. G., Antonini, T. L., ... & Stockdale, S. E. (2021). Burnout among primary care healthcare workers during the COVID-19 pandemic. *Journal of Occupational and Environmental Medicine*, 63(8), 642.
38. d'Ettorre, G., Ceccarelli, G., Santinelli, L., Vassalini, P., Innocenti, G. P., Alessandri, F., Koukopoulos, A. E., Russo, A., d'Ettorre, G., & Tarsitani, L. (2021). Post-Traumatic Stress Symptoms in Healthcare Workers Dealing with the COVID-19 Pandemic: A Systematic Review. *International Journal of*

- Environmental Research and Public Health*, 18(2), 601.
<https://doi.org/10.3390/ijerph18020601>
39. Sumner, R. C., & Kinsella, E. L. (2021). “It’s Like a Kick in the Teeth”: The Emergence of Novel Predictors of Burnout in Frontline Workers During Covid-19. *Frontiers in Psychology*, 12, 1875.
 40. Yildirim, M., Arslan, G., & Wong, P. T. (2021). Meaningful living, resilience, affective balance, and psychological health problems among Turkish young adults during coronavirus pandemic. *Current Psychology*, 1-12.
 41. Barzilay, R., Moore, T.M., Greenberg, D.M., DiDomenico, G.E., Brown, L.A., White, L.K., ... Gur, R.E. (2020). Resilience, COVID-19-related stress, anxiety and depression during the pandemic in a large population enriched for health care providers. *Translational Psychiatry*, 10, 291.
<https://doi.org/10.1038/s41398-020-00982-4>
 42. Zhou, M., & Kan, M. Y. (2021). The varying impacts of COVID-19 and its related measures in the UK: A year in review. *PloS One*, 16(9), e0257286.
 43. Pink, J., Gray, N. S., O’Connor, C., Knowles, J. R., Simkiss, N. J., & Snowden, R. J. (2021). Psychological distress and resilience in first responders and health care workers during the COVID-19 pandemic. *Journal of Occupational and Organizational Psychology*, 94(4), 789-807.
 44. Botha, F., Butterworth, P., & Wilkins, R. (2022). Evaluating How Mental Health Changed in Australia through the COVID-19 Pandemic: Findings from the ‘Taking the Pulse of the Nation’(TTPN) Survey. *International Journal of Environmental Research and Public Health*, 19(1), 558.
 45. Daly, M., Sutin, A., & Robinson, E. (2020). Longitudinal changes in mental health and the COVID-19 pandemic: Evidence from the UK Household Longitudinal Study. *Psychological Medicine*, 1-10.
doi:10.1017/S0033291720004432
 46. D’Angelo, S., Syddall, H., Ntani, G., & Walker-Bone, K. (2021). O-162 Impact of the COVID-19 pandemic on key workers in England: findings from the Health and Employment After Fifty (HEAF) Study. *Occupational & Environmental Medicine*. <http://dx.doi.org/10.1136/OEM-2021-EPI.28>
 47. Niedzwiedz, C. L., Green, M. J., Benzeval, M., Campbell, D., Craig, P., Demou, E., ... & Katikireddi, S. V. (2021). Mental health and health behaviours before and during the initial phase of the COVID-19 lockdown: longitudinal analyses

- of the UK Household Longitudinal Study. *Journal of Epidemiology & Community Health*, 75(3), 224-231.
48. Pierce, M., Hope, H., Ford, T., Hatch, S., Hotopf, M., John, A., ... & Abel, K. M. (2020). Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population. *The Lancet Psychiatry*, 7(10), 883-892.
 49. Zacher, H., & Rudolph, C. W. (2021). Individual differences and changes in subjective wellbeing during the early stages of the COVID-19 pandemic. *American Psychologist*, 76(1), 50.
 50. Ayling, K., Jia, R., Chalder, T., Massey, A., Broadbent, E., Coupland, C., & Vedhara, K. (2020). Mental Health of Keyworkers in the UK during the COVID-19 Pandemic: a Cross-sectional Analysis of a Community Cohort. *MedRxiv*.
 51. Gasteiger, N., Vedhara, K., Massey, A., Jia, R., Ayling, K., Chalder, T., & Broadbent, E. (2021). Depression, anxiety and stress during the COVID-19 pandemic: results from a New Zealand cohort study on mental well-being. *British Medical Journal Open*, 11(5), e045325.
 52. Kwong, A. S., Pearson, R. M., Adams, M. J., Northstone, K., Tilling, K., Smith, D., ... & Timpson, N. J. (2021). Mental health before and during the COVID-19 pandemic in two longitudinal UK population cohorts. *The British Journal of Psychiatry*, 218(6), 334-343.
 53. De Camargo, C., & Whiley, L. A. (2021). ‘There’s always got to be a villain’: the police as ‘dirty’ key workers and the effects on occupational prestige. *Policing and Society*, 1-18.
 54. Sharp, M. L., Serfioti, D., Jones, M., Burdett, H., Pernet, D., Hull, L., ... & Fear, N. T. (2021). UK veterans’ mental health and well-being before and during the COVID-19 pandemic: a longitudinal cohort study. *British Medical Journal Open*, 11(8), e049815.
 55. Bu, F., Mak, H. W., Fancourt, D., & Paul, E. (2022). Comparing the mental health trajectories of four different types of keyworkers with non-keyworkers: 12-month follow-up observational study of 21 874 adults in England during the COVID-19 pandemic. *The British Journal of Psychiatry*, 1-8.

56. Wong, C. P. (2021). Impact of the COVID-19 pandemic on the well-being of the stranded seafarers. *Maritime Business Review*. 2397-3757 DOI 10.1108/MABR-07-2021-0049
57. Mutambudzi, M., Niedzwiedz, C., Macdonald, E., Leyland, A., Mair, F., & Anderson, J. et al. (2020). Occupation and risk of severe COVID-19: prospective cohort study of 120 075 UK Biobank participants. *Occupational & Environmental Medicine*, 78(5), 307-314. <https://doi.org/10.1136/oemed-2020-106731>
58. Abbott R, Young S, Grant G, et al. (2003). Railway Suicide: an Investigation of Individual and Organizational Consequences. A report of the SOVRN (Suicides and Open Verdicts on the Railway Network) Project. Doncaster, UK: Doncaster and South Humber Healthcare NHS Trust.
59. Bardon, C., & Mishara, B. L. (2015). Development of a comprehensive programme to prevent and reduce the negative impact of railway fatalities, injuries and close calls on railway employees. *Journal of Occupational Rehabilitation*, 25(3), 557-568.
60. Doroga, C., & Băban, A. (2013). Traumatic exposure and posttraumatic symptoms for train drivers involved in railway incidents. *Chujul Medical*, 86(2), 144.
61. Eyimaya, A. Ö., & Tezel, A. (2021). Evaluating occupational stress levels of the railway workers. *Florence Nightingale Journal of Nursing*, 29(1), 40.
62. Gu, G. Z., Yu, S. F., Zhou, W. H., Wu, H., Kang, L., & Chen, R. J. Z. Z. C. (2017). Sleep quality and occupational stress relationship analysis of 1413 train drivers in a railway bureau. *Chinese Journal of Industrial Hygiene and Occupational Diseases*, 35(7), 514-518.
63. Metzger, N. (2014). Railway spine, shellshock and psychological trauma. *Trauma and Traumatization in Individual and Collective Dimensions: Insights from Biblical Studies and Beyond*, 2, 43.
64. Naweed, A., Chapman, J., Allan, M., & Trigg, J. (2017). It comes with the job: work organizational, job design, and self-regulatory barriers to improving the health status of train drivers. *Journal of Occupational and Environmental Medicine*, 59(3), 264-273.
65. Tranah, T., & Farmer, R. D. (1994). Psychological reactions of drivers to railway suicide. *Social Science & Medicine*, 38(3), 459-469.

66. Virdee, J., Pafitanis, G., Alamouti, R., Brohi, K., & Patel, H. (2018). Mind the gap: 11 years of train-related injuries at the Royal London Hospital Major Trauma Centre. *The Annals of The Royal College of Surgeons of England*, 100(7), 520-528.
67. Bardon, C., Dargis, L., & Mishara, B. (2021). Evaluation of the implementation of a railway critical incident management and support protocol to help train drivers cope with accidents and suicides. *Journal of Occupational and Environmental Medicine*, 63(8), e495-e504.
68. da Conceição Lemos, I., & Patrão, I. (2018). Train accidents: development of post-traumatic stress disorder in train drivers. *Psychology, Community & Health*, 7(1), 44.
69. Farmer, R., Tranah, T., O'Donnell, I., & Catalan, J. (1992). Railway suicide: the psychological effects on drivers. *Psychological Medicine*, 22(2), 407-414.
70. Gasquoine, P. G. (2020). Railway spine: The advent of compensation for concussive symptoms. *Journal of the History of the Neurosciences*, 29(2), 234-245.
71. Karlehagen, S., Malt, U. F., Hoff, H., Tibell, E., Herrstromer, U., Hildingson, K., & Leymann, H. (1993). The effect of major railway accidents on the psychological health of train drivers—II. A longitudinal study of the one-year outcome after the accident. *Journal of Psychosomatic Research*, 37(8), 807-817.
72. Lemos, I. D. C., & Patrão, I. (2018). Train accidents: Is there post-traumatic stress disorder in train drivers?. *Psychology, Community & Health*, 7(1).
73. Sharifi, M., Asadi-Pooya, A. A., & Mousavi-Roknabadi, R. S. (2021). Burnout among healthcare providers of COVID-19; a systematic review of epidemiology and recommendations. *Archives of Academic Emergency Medicine*, 9(1).
74. Roche, A. M., Pidd, K., Fischer, J. A., Lee, N., Scarfe, A., & Kostadinov, V. (2016). Men, work, and mental health: A systematic review of depression in male-dominated industries and occupations. *Safety and Health at Work*, 7(4), 268–283. doi:10.1016/j.shaw.2016.04.005
75. Holmes, E. A., O'Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., Ballard, C., Christensen, H., Cohen Silver, R., Everall, I., Ford, T., John, A., Kabir, T., King, K., Madan, I., Michie, S., Przybylski, A. K., Shafran, R., Sweeney, A., Worthman, C. M., ... Bullmore, E. (2020). Multidisciplinary research priorities for the COVID-19 pandemic: a call for

- action for mental health science. *The Lancet. Psychiatry*, 7(6), 547–560.
[https://doi.org/10.1016/S2215-0366\(20\)30168-1](https://doi.org/10.1016/S2215-0366(20)30168-1)
76. O’Sullivan, E. (2020). PPE guidance for covid-19: Be honest about resource shortages. *British Medical Journal*, m1507. <https://doi.org/10.1136/bmj.m1507>
77. Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet*, 395(10227), 912–920.
78. Marshall, R. E., Milligan-Saville, J., Petrie, K., Bryant, R. A., Mitchell, P. B., & Harvey, S. B. (2021). Mental health screening amongst police officers: factors associated with under-reporting of symptoms. *BMC Psychiatry*, 21(1), 1-8.
79. Evans, A. W., & Hughes, P. (2019). Traverses, delays and fatalities at railway level crossings in Great Britain. *Accident Analysis & Prevention*, 129, 66-75.
80. Frewen, P., Zhu, J., & Lanius, R. (2019). Lifetime traumatic stressors and adverse childhood experiences uniquely predict concurrent PTSD, complex PTSD, and dissociative subtype of PTSD symptoms whereas recent adult non-traumatic stressors do not: Results from an online survey study. *European Journal of Psychotraumatology*, 10(1), 1606625.
81. Turner, N., Chmiel, N., Hershcovis, M. S., & Walls, M. (2010). Life on the line: Job demands, perceived co-worker support for safety, and hazardous work events. *Journal of Occupational Health Psychology*, 15(4), 482–493. <https://doi.org/10.1037/a0021004>
82. Robertson, I.T., Cooper, C.L., Sarkar, M., & Curran, T. (2015). Resilience training in the workplace from 2003 to 2014: A systematic review. *Journal of Occupational and Organizational Psychology*, 88, 533– 562.
<https://doi.org/10.1111/joop.12120>
83. Cooke, F. L., Cooper, B., Bartram, T., Wang, J., & Mei, H. (2019). Mapping the relationships between high-performance work systems, employee resilience and engagement: A study of the banking industry in China. *The International Journal of Human Resource Management*, 30(8), 1239-1260.
84. Tugade, M. M., & Fredrickson, B. L. (2004). Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology*, 86(2), 320–333. <https://doi.org/10.1037/0022-3514.86.2.32>

85. Arslan, G., & Yıldırım, M. (2021). A longitudinal examination of the association between meaning in life, resilience, and mental well-being in times of coronavirus pandemic. *Frontiers in Psychology, 12*.
86. Britt, T., Shen, W., Sinclair, R., Grossman, M., & Klieger, D.M. (2016). How much do we really know about employee resilience? *Industrial and Organizational Psychology, 9*, 378 - 404.
87. Davydov, D. M., Stewart, R., Ritchie, K., & Chaudieu, I. (2010). Resilience and mental health. *Clinical Psychology Review, 30*(5), 479–495.
<https://doi.org/10.1016/j.cpr.2010.03.003>
88. Oducado, R. M., Parreño-Lachica, G., & Rabacal, J. (2021). Personal resilience and its influence on COVID-19 stress, anxiety and fear among graduate students. Anxiety and Fear among Graduate Students. *Frontiers in Psychology, 12*, 648236.
<https://doi.org/10.3389/fpsyg.2021.648236>
89. Arslan, H. N., Karabekiroglu, A., Terzi, O., & Dundar, C. (2021). The effects of the COVID-19 outbreak on physicians' psychological resilience levels. *Postgraduate Medicine, 133*(2), 223-230.
90. Bozdağ, F., & Ergün, N. (2020). Psychological resilience of healthcare professionals during COVID-19 pandemic. *Psychological Reports, 123*, 0033294120965477.
91. Heath, C., Sommerfield, A., & von Ungern-Sternberg, B. S. (2020). Resilience strategies to manage psychological distress among healthcare workers during the COVID-19 pandemic: a narrative review. *Anaesthesia, 75*(10), 1364-1371.
92. Lamb, D., & Anonymous, N. (2016). Coping with work-related stressors and building resilience in mental health workers: A comparative focus group study using interpretative phenomenological analysis. *Journal of Occupational and Organizational Psychology, 89*(3), 474-492.
93. Schilbach, M., Baethge, A., & Rigotti, T. (2021). Do challenge and hindrance job demands prepare employees to demonstrate resilience? *Journal of Occupational Health Psychology, 26*(3), 155–174.
<https://doi.org/10.1037/ocp0000282>
94. Roberts, N. J., McAloney-Kocaman, K., Lippiett, K., Ray, E., Welch, L., & Kelly, C. (2021). Levels of resilience, anxiety and depression in nurses working in respiratory clinical areas during the COVID pandemic. *Respiratory Medicine, 176*, 106219.

95. Hartmann, S., Weiss, M., Newman, A., & Hoegl, M. (2020). Resilience in the workplace: A multilevel review and synthesis. *Applied Psychology*, 69(3), 913-959.
96. Hillmann, J., & Guenther, E. (2021). Organizational resilience: a valuable construct for management research?. *International Journal of Management Reviews*, 23(1), 7-44.
97. IJntema, R. C., Schaufeli, W. B., & Burger, Y. D. (2021). Resilience mechanisms at work: The psychological immunity-psychological elasticity (PI-PE) model of psychological resilience. *Current Psychology*, 1-13.
98. Sehmi, R., Maughan, B., Matthews, T., & Arseneault, L. (2019). No man is an island: social resources, stress and mental health at mid-life. *The British Journal of Psychiatry*, 217(5), 638-644. doi: 10.1192/bjp.2019.25
99. Santarone, K., McKenney, M., & Elkbuli, A. (2020). Preserving mental health and resilience in frontline healthcare workers during COVID-19. *The American Journal of Emergency Medicine*, 38(7), 1530-1531.
100. Yildirim, M. & Solmaz, F. (2020). COVID-19 Burnout, COVID-19 Stress and Resilience: Initial Psychometric Properties of COVID-19 Burnout Scale. *Death Studies*. 1-25.
101. Huffman, E. M., Athanasiadis, D. I., Anton, N. E., Haskett, L. A., Doster, D. L., Stefanidis, D., & Lee, N. K. (2021). How resilient is your team? Exploring healthcare providers' well-being during the COVID-19 pandemic. *The American Journal of Surgery*, 221(2), 277-284.
102. Kuntz, J. R., Malinen, S., & Näswall, K. (2017). Employee resilience: Directions for resilience development. *Consulting Psychology Journal: Practice and Research*, 69(3), 223.
103. Drury, J., Carter, H., Ntontis, E., & Guven, S. T. (2021). Public behaviour in response to the COVID-19 pandemic: understanding the role of group processes. *BJPsych Open*, 7(1).
104. Elcherorth, G., & Drury, J. (2020). Collective resilience in times of crisis: Lessons from the literature for socially effective responses to the pandemic. *British Journal of Social Psychology*, 59(3), 703-713.
105. Mannarini, T., Rizzo, M., Brodsky, A., Buckingham, S., Zhao, J., Rochira, A., & Fedi, A. (2021). The potential of psychological connectedness: Mitigating the

- impacts of COVID-19 through sense of community and community resilience. *Journal of Community Psychology*. doi: 10.1002/jcop.22775.
106. Slavich, G. M., Roos, L. G., & Zaki, J. (2021). Social belonging, compassion, and kindness: Key ingredients for fostering resilience, recovery, and growth from the COVID-19 pandemic. *Anxiety, Stress, & Coping*, 1-8.
 107. Stevenson, C., Wakefield, J. R., Felsner, I., Drury, J., & Costa, S. (2021). Collectively coping with coronavirus: Local community identification predicts giving support and lockdown adherence during the COVID-19 pandemic. *British Journal of Social Psychology*, 60(4), 1403-1418.
 108. Bowers, C., Kreutzer, C., Cannon-Bowers, J., & Lamb, J. (2017). Team resilience as a second-order emergent state: A theoretical model and research directions. *Frontiers in Psychology*, 8 (1360), 1– 14.
 109. Carmeli, A., Friedman, Y., & Tishler, A. (2013). Cultivating a resilient top management team: The importance of relational connections and strategic decision comprehensiveness. *Safety Science*, 51(1), 148– 159.
 110. Sakurai, M., & Chughtai, H. (2020). Resilience against crises: COVID-19 and lessons from natural disasters. *European Journal of Information Systems*, 29(5), 585-594.
 111. Alliger, G. M., Cerasoli, C. P., Tannenbaum, S. I., & Vessey, W. B. (2015). Team resilience: How teams flourish under pressure. *Organizational Dynamics*. 44(3), 176–184. <https://doi.org/10.1016/j.orgdyn.2015.05.003>
 112. Chapman, M. T., Lines, R. L., Crane, M., Ducker, K. J., Ntoumanis, N., Peeling, P., ... & Gucciardi, D. F. (2020). Team resilience: A scoping review of conceptual and empirical work. *Work & Stress*, 34(1), 57-81.
 113. Gucciardi, D. F., Crane, M., Ntoumanis, N., Parker, S. K., Thøgersen-Ntoumani, C., Ducker, K. J., ... & Temby, P. (2018). The emergence of team resilience: A multilevel conceptual model of facilitating factors. *Journal of Occupational and Organizational Psychology*, 91(4), 729-768.
 114. Hartmann, S., Weiss, M., Hoegl, M., & Carmeli, A. (2021). How does an emotional culture of joy cultivate team resilience? A sociocognitive perspective. *Journal of Organizational Behavior*, 42(3), 313-331 Kennedy, Landon, & Maynard, 2016;

115. Pangallo, A., Zibarras, L., Lewis, R., & Flaxman, P. (2015). Resilience through the lens of interactionism: A systematic review. *Psychological Assessment*, 27, 1– 20.
116. Gucciardi, D. F., Lang, J. W., Lines, R. L., Chapman, M. T., Ducker, K. J., Peeling, P., ... & Temby, P. (2021). The emergence of resilience: Recovery trajectories in sleep functioning after a major stressor. *Sport, Exercise, and Performance Psychology*. doi: 10.1037/spy0000268
117. Sharma, S., & Sharma, S. K. (2016). Team resilience: Scale development and validation. *Vision*, 20, 37– 53. <https://doi.org/10.1177/0972262916628952>
118. Stoverink, A. C., Kirkman, B. L., Mistry, S., & Rosen, B. (2020). Bouncing back together: Toward a theoretical model of work team resilience. *Academy of Management Review*, 45(2), 395-422.
119. Flint-Taylor, J., & Cooper, C. L. (2017). Team resilience: Shaping up the challenges ahead. In M. Crane (Ed.), *Manage for resilience: A practical guide for employee well-being and organizational performance* (pp. 129– 149). New York, NY: Routledge.
120. Naweed, A. (2020). Getting mixed signals: Connotations of teamwork as performance shaping factors in network controller and rail driver relationship dynamics. *Applied Ergonomics*, 82, 1-11. doi:[10.1016/j.apergo.2019.102976](https://doi.org/10.1016/j.apergo.2019.102976)
121. Brykman, K. M., & King, D. D. (2021). A resource model of team resilience capacity and learning. *Group & Organization Management*, 46(4), 737-772.
122. Meneghel, I., Salanova, M. & Martínez, I.M. (2016) Feeling good makes us stronger: how team resilience mediates the effect of positive emotions on team performance. *Journal of Happiness Studies* 17, 239–255.
<https://doi.org/10.1007/s10902-014-9592-6>
123. Tajfel, H. and Turner, J.C. (1985), “The social identity theory of intergroup behavior”, in Worchel, S. and Austin, W.G. (Eds), *Psychology of Intergroup Relations*, Nelson-Hall, Chicago, IL, pp. 7-24.
124. Stewart, G. (2010), “The past twenty years: teams research is alive and well at the Journal of Management”, *Journal of Management*, Vol. 36 No. 4, pp. 801-805.
125. Barton, M. A., Christianson, M., Myers, C. G., & Sutcliffe, K. (2020). Resilience in action: leading for resilience in response to COVID-19. *BMJ Leader*, leader-2020.

126. Delgado, J., Siow, S., de Groot, J., McLane, B., & Hedlin, M. (2021). Towards collective moral resilience: the potential of communities of practice during the COVID-19 pandemic and beyond. *Journal of Medical Ethics*, 47(6), 374-382.
127. Juvet, T. M., Corbaz-Kurth, S., Roos, P., Benzakour, L., Cereghetti, S., Moullec, G., ... & Weissbrodt, R. (2021). Adapting to the unexpected: Problematic work situations and resilience strategies in healthcare institutions during the COVID-19 pandemic's first wave. *Safety Science*, 139, 105277.
128. Anonymous, N., & MacDonald, A. (2021). The importance of adaptive coping, peer support, psychological input and team resilience among fire and rescue service workers in maintaining wellbeing throughout the Covid-19 pandemic: a cross sectional survey. *Lancet*, 398(S34).
129. Kaye-Kauderer, H., Feingold, J. H., Feder, A., Southwick, S., & Charney, D. (2021). Resilience in the age of COVID-19. *BJPsych Advances*, 27(3), 166-178.
130. Hom, M., de Terte, I., Bennett, C & Joiner, T.E. (2020) Resilience and attitudes toward help-seeking as correlates of psychological well-being among a sample of New Zealand Defence Force personnel. *Military Psychology*, 32:4, 329-340, DOI: 10.1080/08995605.2020.1754148
131. Wilson, J., Lee, J., Fitzgerald, H., Oosterhoff, B., Sevi, B., and Shook, N. (2020). Job insecurity and financial concern during the COVID-19 pandemic are associated with worse mental health. *Journal of Occupational and Environmental Medicine*. doi: 10.1097/JOM.0000000000001962 [Epub ahead of print].
132. Lombardi, S., e Cunha, M. P., & Giustiniano, L. (2021). Improvising resilience: The unfolding of resilient leadership in COVID-19 times. *International Journal of Hospitality Management*, 95, 102904.
133. Yamauchi, T., Suka, M., & Yanagisawa, H. (2020). Help-seeking behavior and psychological distress by age in a nationally representative sample of Japanese employees. *Journal of Epidemiology*, 30(6), 237-243.
134. Brooks, S. K., Dunn, R., Amlôt, R., Rubin, G. J., & Greenberg, N. (2019). Protecting the psychological wellbeing of staff exposed to disaster or emergency at work: a qualitative study. *BMC Psychology*, 7(1), 1-11.
135. Sage, C. A. M., Brooks, S. K., Jones, N., & Greenberg, N. (2016). Attitudes towards mental health and help-seeking in railway workers. *Occupational Medicine*, 66(2), 118-121.

136. Joyce, S., Tan, L., Shand, F., Bryant, R. A., & Harvey, S. B. (2019). Can resilience be measured and used to predict mental health symptomology among first responders exposed to repeated trauma?. *Journal of Occupational and Environmental Medicine*, 61(4), 285-292.
137. Wild, J., Greenberg, N., Moulds, M. L., Sharp, M. L., Fear, N., Harvey, S., ... & Bryant, R. A. (2020). Pre-incident training to build resilience in first responders: recommendations on what to and what not to do. *Psychiatry*, 83(2), 128-142.
138. Battams, S., Roche, A. M., Fischer, J. A., Lee, N. K., Cameron, J., & Kostadinov, V. (2014). Workplace risk factors for anxiety and depression in male-dominated industries: a systematic review. *Health Psychology and Behavioral Medicine: An Open Access Journal*, 2(1), 983-1008.
139. Mahalik, J. R., Burns, S. M., & Syzdek, M. (2007). Masculinity and perceived normative health behaviors as predictors of men's health behaviors. *Social Science & Medicine*, 64(11), 2201-2209.
140. Ross, V., Caton, N., Mathieu, S., Gullestrup, J., & Kølves, K. (2020). Evaluation of a suicide prevention program for the energy sector. *International Journal of Environmental Research and Public Health*, 17(17), 6418.
141. Michie, S., & Williams, S. (2003). Reducing work related psychological ill health and sickness absence: a systematic literature review. *Occupational and Environmental Medicine*, 60(1), 3-9.
142. Stansfeld, S., & Candy, B. (2006). Psychosocial work environment and mental health—a meta-analytic review. *Scandinavian Journal of Work, Environment & Health*, 443-462.
143. Brooks, S. K., Dunn, R., Amlôt, R., Rubin, G. J., & Greenberg, N. (2017). Social and occupational factors associated with psychological wellbeing among occupational groups affected by disaster: a systematic review. *Journal of Mental Health*, 26(4), 373-384.
144. Brooks, S. K., & Greenberg, N. (2018). Non-deployment factors affecting psychological wellbeing in military personnel: literature review. *Journal of Mental Health*, 27(1), 80-90.
145. Follmer, K. B., & Jones, K. S. (2018). Mental illness in the workplace: An interdisciplinary review and organizational research agenda. *Journal of Management*, 44(1), 325-351. Baker et al., 2021

146. Jallow, H., Renukappa, S., & Suresh, S. (2020). The impact of COVID-19 outbreak on United Kingdom infrastructure sector. *Smart and Sustainable Built Environment*, 10 (4), 581-593. <https://doi.org/10.1108/SASBE-05-2020-0068>
147. Gallagher, A. (2021). *The impact of COVID-19 on the UK rail industry*. OnTrac | Rail Safety Software. <https://on-trac.co.uk/covid-19-uk-rail-industry/>
148. Stewart-Brown, S., Tennant, A., Tennant, R., Platt, S., Parkinson, J., & Weich, S. (2009). Internal construct validity of the Warwick-Edinburgh mental well-being scale (WEMWBS): a Rasch analysis using data from the Scottish health education population survey. *Health and Quality of Life Outcomes*, 7(1), 1-8.
149. McFadden, P., Ross, J., Moriarty, J., Mallett, J., Schroder, H., Ravalier, J., Manthorpe, J., Currie, D., Harron, J., & Gillen, P. (2021). The Role of Coping in the Wellbeing and Work-Related Quality of Life of UK Health and Social Care Workers during COVID-19. *International Journal of Environmental Research and Public Health*, 18(2), 815. <https://doi.org/10.3390/ijerph18020815>
150. Shah, N., Cader, M., Andrews, B., McCabe, R., & Stewart-Brown, S. L. (2021). Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS): performance in a clinical sample in relation to PHQ-9 and GAD-7. *Health and Quality of Life Outcomes*, 19(1), 260. <https://doi.org/10.1186/s12955-021-01882-x>
151. Cohen, S., et al. (1983). "A global measure of perceived stress." *Journal of Health and Social Behavior*: 385-396.
152. Yildirim, M., & Guler, A. (2020). Factor analysis of the € COVID-19 perceived risk scale: A preliminary study. *Death Studies*. <https://doi.org/10.1080/07481187.2020.1784311>
153. Brug, J., Aro, A. R., Oenema, A., De Zwart, O., Richardus, J. H., & Bishop, G. D. (2004). SARS risk perception, knowledge, precautions, and information sources, the Netherlands. *Emerging Infectious Diseases*, 10(8), 1486.
154. Malach-Pines, A. (2005) The Burnout Measure, Short Version. *International Journal of Stress Management*, 12, 78-88. <https://doi.org/10.1037/1072-5245.12.1.78>
155. Pines, A., & Aronson, E. (1988). *Career burnout: Causes and cures*. Free press.
156. Sinclair, V. G., & Wallston, K. A. (2004). The development and psychometric evaluation of the Brief Resilient Coping Scale. *Assessment*, 11(1), 94-101.

157. Kocalevent, RD., Zenger, M., Hinz, A. *et al.* (2017) Resilient coping in the general population: standardization of the brief resilient coping scale (BRCS). *Health Qual Life Outcomes* **15**, 251. <https://doi.org/10.1186/s12955-017-0822-6>
158. Mallak, L. (1998) Putting organizational resilience process to work. *Industrial Management*, 40 (6), 8-14.
159. Wilson, CJ.; Deane, F.P.; Ciarrochi, J.V., Rickwood, D. (2005). Measuring help seeking intentions: Properties of the General Help Seeking Questionnaire. *Canadian Journal of Counselling*, 39 (1), 15-28.
<https://ro.uow.edu.au/hbspapers/1527>
160. Çokluk, Ö., & Kayri, M. (2011). The Effects of Methods of Imputation for Missing Values on the Validity and Reliability of Scales. *Kuram Ve Uygulamada Egitim Bilimleri*, 11, 303-309.
161. Mertler, C.A. and Vannatta, R.A. (2005) *Advanced and Multivariate Statistical Methods: Practical Application and Interpretation*. 3rd Edition, Pyrczak, Los Angeles.
162. Erdfelder, F., Buchner, E., & Lang, A. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41, 1149-1160.
163. Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). Lawrence Erlbaum.
164. Blanca, M. J., Arnau, J., López-Montiel, D., Bono, R., & Bendayan, R. (2013). Skewness and kurtosis in real data samples. *Methodology. European Journal of Research Methods for the Behavioral and Social Sciences*, 9(2), 78–84.
<https://doi.org/10.1027/1614-2241/a000057>
165. Krippendorff, K. (2018). *Content analysis: An introduction to its methodology*. Sage publications.
166. Schreier, M. (2012). *Qualitative content analysis in practice*. Sage publications.
167. Leech, N. L., & Onwuegbuzie, A. J. (2007). An array of qualitative data analysis tools: A call for data analysis triangulation. *School Psychology Quarterly*, 22(4), 557–584. <https://doi.org/10.1037/1045-3830.22.4.557>
168. Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences*, 15(3), 398-405.

169. Kyngäs, H. (2020). Inductive content analysis. In *The application of content analysis in nursing science research* (pp. 13-21). Springer, Cham.
170. National Skills Academy Rail. (2018). Diversity in the Rail Industry: An Analytical Overview. <https://www.nsar.co.uk/wp-content/uploads/2018/11/NSAR-WiR-Diversity-Report-FINAL-July-2018.pdf>
171. Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, 78(1), 98–104.
<https://doi.org/10.1037/0021-9010.78.1.98>
172. Corina, D., & Adriana, B. (2013). Impact of work related trauma on acute stress response in train drivers. *Procedia-social and Behavioral Sciences*, 84, 190-195.
173. Fonseca, S., Queirós, C., Guimarães, F., & Martins, V. (2018). Burnout and trauma risk among railway workers with and without accident experience. *Territorium*, (25), 113-127. doi: 10.14195/1647-7723_25_9
174. Bu, F., Mak, H. W., Fancourt, D., & Paul, E. (2022). Comparing the mental health trajectories of four different types of keyworkers with non-keyworkers: 12-month follow-up observational study of 21 874 adults in England during the COVID-19 pandemic. *The British Journal of Psychiatry*, 1-8.
175. Yildirim, M., & Arslan, G. (2020). Exploring the associations between resilience, dispositional hope, subjective well-being, and psychological health among adults during early stage of COVID-19. *Current Psychology*, 14, 1-11. doi: 10.1007/s12144-020-01177-2.
176. Bonanno, G. A. (2004). Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events?. *American Psychologist*, 59(1), 20.
177. Yildirim, M. (2019). Mediating role of resilience in the relationships between fear of happiness and affect balance, satisfaction with life, and flourishing. *Europe's Journal of Psychology*, 15(2), 183–198. <https://doi.org/10.5964/ejop.V15i2.1640> Edward & Hercelinskyj, 2007;
178. Lee, H. (2021). Changes in workplace practices during the COVID-19 pandemic: the roles of emotion, psychological safety and organisation support. *Journal of Organizational Effectiveness: People and Performance*, 8, 1, 97-128.
179. Edward, K. L., & Hercelinskyj, G. (2007). Burnout in the caring nurse: learning resilient behaviours. *British Journal of Nursing*, 16(4), 240-242.

180. Sánchez-Moreno, E., de La Fuente Roldán, I. N., Gallardo-Peralta, L. P., & Barrón López de Roda, A. (2014). Burnout, informal social support and psychological distress among social workers. *The British Journal of Social Work*, 45(8), 2368-2386.
181. Clement, S., Schauman, O., Graham, T., Maggioni, F., Evans-Lacko, S., Bezborodovs, N., ... & Thornicroft, G. (2015). What is the impact of mental health-related stigma on help-seeking? A systematic review of quantitative and qualitative studies. *Psychological Medicine*, 45(1), 11-27.
182. Dyrbye, L. N., Eacker, A., Durning, S. J., Brazeau, C., Moutier, C., Massie, F. S., ... & Shanafelt, T. D. (2015). The impact of stigma and personal experiences on the help-seeking behaviors of medical students with burnout. *Academic Medicine*, 90(7), 961-969.
183. Kulesza, M., Pedersen, E. R., Corrigan, P. W., & Marshall, G. N. (2015). Help-seeking stigma and mental health treatment seeking among young adult veterans. *Military Behavioral Health*, 3(4), 230-239.
184. Lai, R., Tan, L., Lai, X., Zhang, X., & Zhou, Q. (2020). Help-seeking behavior of returning to work in healthcare workers and its influencing factors during COVID-19 subsiding. *Journal of Occupational and Environmental Medicine*, 62(11), 898-903.
185. Lynch, L., Long, M., & Moorhead, A. (2018). Young men, help-seeking, and mental health services: exploring barriers and solutions. *American Journal of Men's Health*, 12(1), 138-149.
186. Rasmussen, M. L., Hjelmeland, H., & Dieserud, G. (2018). Barriers toward help-seeking among young men prior to suicide. *Death Studies*, 42(2), 96-103.
187. Watson, L., & Andrews, L. (2018). The effect of a Trauma Risk Management (TRiM) program on stigma and barriers to help-seeking in the police. *International Journal of Stress Management*, 25(4), 348.
188. Cho, E., Chen, T.-Y., Cheng, G. H. -L., & Ho, M.-H. R. (2022). Work–family balance self-efficacy and work–family balance during the pandemic: A longitudinal study of working informal caregivers of older adults. *Journal of Occupational Health Psychology*. Advance online publication. <https://doi.org/10.1037/ocp0000321>
189. Corley, J., Okely, J. A., Taylor, A. M., Page, D., Welstead, M., Skarabela, B., ... & Russ, T. C. (2021). Home garden use during COVID-19: Associations with

- physical and mental wellbeing in older adults. *Journal of Environmental Psychology*, 73, 101545.
190. Fan, J. & Smith, A. (2017) Positive Well-Being and Work-Life Balance among UK Railway Staff. *Open Journal of Social Sciences*, 5, 1-6.
doi: [10.4236/jss.2017.56001](https://doi.org/10.4236/jss.2017.56001).
 191. Lades, L. K., Laffan, K., Daly, M., & Delaney, L. (2020). Daily emotional well-being during the COVID-19 pandemic. *British Journal of Health Psychology*, 25(4), 902-911.
 192. Maugeri, G., Castrogiovanni, P., Battaglia, G., Pippi, R., D'Agata, V., Palma, A., ... & Musumeci, G. (2020). The impact of physical activity on psychological health during Covid-19 pandemic in Italy. *Heliyon*, 6(6), e04315.
 193. Williams, L., Rollins, L., Young, D., Fleming, L., Greal, M., Janssen, X., ... & Flowers, P. (2021). What have we learned about positive changes experienced during COVID-19 lockdown? Evidence of the social patterning of change. *PLoS One*, 16(1), e0244873.
 194. Gómez-Ochoa, S. A., Franco, O. H., Rojas, L. Z., Raguindin, P. F., Roa-Díaz, Z. M., Wyssmann, B. M., ... & Muka, T. (2021). COVID-19 in health-care workers: a living systematic review and meta-analysis of prevalence, risk factors, clinical characteristics, and outcomes. *American Journal of Epidemiology*, 190(1), 161-175.
 195. Holton, S., Wynter, K., Trueman, M., Bruce, S., Sweeney, S., Crowe, S., ... & Rasmussen, B. (2020). Psychological well-being of Australian hospital clinical staff during the COVID-19 pandemic. *Australian Health Review*, 45(3), 297-305.
 196. Koh, D. (2020). Occupational risks for COVID-19 infection. *Occupational medicine (Oxford, England)*, 70(1), 3.
 197. Bethlehem, J. (2010). Selection bias in web surveys. *International Statistical Review*, 78(2), 161–188.
 198. Blank G, Dutton WH, Lefkowitz J. Ox IS. (2019). Digital divides in Britain are narrowing but deepening. <http://dx.doi.org/10.2139/ssrn.3522083>
 199. Helsper, E. J., & Reisdorf, B. C. (2017). The emergence of a “digital underclass” in Great Britain and Sweden: Changing reasons for digital exclusion. *New Media & Society*, 19(8), 1253-1270.

200. Bonevski, B., Randell, M., Paul, C., Chapman, K., Twyman, L., Bryant, J., ... & Hughes, C. (2014). Reaching the hard-to-reach: a systematic review of strategies for improving health and medical research with socially disadvantaged groups. *BMC Medical Research Methodology*, 14(1), 1-29.
201. O'Connor, D. B., Thayer, J. F., & Vedhara, K. (2021). Stress and health: A review of psychobiological processes. *Annual Review of Psychology*, 72, 663-688.
202. Windgassen, S., Goldsmith, K., Moss-Morris, R., & Chalder, T. (2016). Establishing how psychological therapies work: the importance of mediation analysis. *Journal of Mental Health*, 25(2), 93-99.
203. Yildirim, M., Arslan, G., & Özaslan, A. (2020). Perceived risk and mental health problems among healthcare professionals during COVID-19 pandemic: Exploring the mediating effects of resilience and coronavirus fear. *International Journal of Mental Health and Addiction*, 1-11.
204. Kasyanova, E., & Vinogradova, N. (2020). Resilience as a factor of professional development of railway engineering students. *International Session of Factors of Regional Extensive Development (FRED-2019)*.
205. Zhang, Y., & Pan, K. (2020, December). Research on Organizational Resilience of Railway Transport Industry Under COVID-19 Epidemic. In *The Second International Symposium on Management and Social Sciences (ISMSS 2020)* (pp. 113-119). Atlantis Press.
206. Mealer, M., Conrad, D., Evans, J., Jooste, K., Solyntjes, J., Rothbaum, B., & Moss, M. (2014). Feasibility and acceptability of a resilience training program for intensive care unit nurses. *American Journal of Critical Care*, 23(6), e97-e105.
207. Sood, A., Prasad, K., Schroeder, D., & Varkey, P. (2011). Stress management and resilience training among Department of Medicine faculty: a pilot randomized clinical trial. *Journal of General Internal Medicine*, 26(8), 858-861.
208. Bennett, J.B, Aden, C.A, Broome, K, Mitchell, K, Rigdon W.D. (2010) Team resilience for young restaurant workers: research-to-practice adaptation and assessment. *Journal of Occupational Health Psychology*, 15(3), 223-236.
209. Bennett, J. B., Neeper, M., Linde, B. D., Lucas, G. M., & Simone, L. (2018). Team resilience training in the workplace: E-learning adaptation, measurement model, and two pilot studies. *JMIR Mental Health*, 5(2), e8955.

210. Partouche-Sebban, J., Rezaee Vessal, S., Sorio, R., Castellano, S., Khelladi, I., & Orhan, M. A. (2021). How death anxiety influences coping strategies during the COVID-19 pandemic: investigating the role of spirituality, national identity, lockdown and trust. *Journal of Marketing Management*, 37(17-18), 1815-1839.
211. Rao, M. (2021). Communities of Innovation: From Co-Creation to Resilience. *Communities of innovation: How Organizations Harness Collective Creativity and Build Resilience*, 297-325.
212. Andel, S. A., Shen, W., & Arvan, M. L. (2021). Depending on your own kindness: The moderating role of self-compassion on the within-person consequences of work loneliness during the COVID-19 pandemic. *Journal of Occupational Health Psychology*, 26(4), 276–290. <https://doi.org/10.1037/ocp0000271>
213. Britt, T. W., Adler, A. B., & Fynes, J. (2021). Perceived resilience and social connection as predictors of adjustment following occupational adversity. *Journal of Occupational Health Psychology*, 26(4), 339–349. <https://doi.org/10.1037/ocp0000286>
214. Folke, C., R. Biggs, A. V. Norström, B. Reyers, and J. Rockström. 2016. Social-ecological resilience and biosphere-based sustainability science. *Ecology and Society* 21(3):41. <http://dx.doi.org/10.5751/ES-08748-210341>
215. Kuba, K., & Scheibe, S. (2017). Let it be and keep on going! Acceptance and daily occupational well-being in relation to negative work events. *Journal of Occupational Health Psychology*, 22(1), 59–70. <https://doi.org/10.1037/a0040149>
216. Fan, J., & Smith, A. (2018). The mediating effect of fatigue on work-life balance and positive well-being in railway staff. *Open Journal of Social Sciences*, 6(6), 1-10.
217. Weibelzahl, S., Reiter, J., & Duden, G. (2021). Depression and anxiety in healthcare professionals during the COVID-19 pandemic. *Epidemiology & Infection*, 149.
218. Debbaut, K., Krysinska, K., & Andriessen, K. (2014). Characteristics of suicide hotspots on the Belgian railway network. *International Journal of Injury Control and Safety Promotion*, 21(3), 274-277.

219. Beaglehole, B., Williman, J., Bell, C., Stanley, J., Jenkins, M., Gendall, P., ... & Every-Palmer, S. (2022). Thriving in a pandemic: Determinants of excellent wellbeing among New Zealanders during the 2020 COVID-19 lockdown; a cross-sectional survey. *Plos One*, 17(3), e0262745.
220. Dong, L., & Bouey, J. (2020). Public mental health crisis during COVID-19 pandemic, China. *Emerging Infectious Diseases*, 26(7), 1616.
221. Esterwood, E., & Saeed, S. A. (2020). Past epidemics, natural disasters, COVID19, and mental health: learning from history as we deal with the present and prepare for the future. *Psychiatric Quarterly*, 91(4), 1121-1133.
222. Shoss, M. (2021). Occupational health psychology research and the COVID-19 pandemic. *Journal of Occupational Health Psychology*, 26(4), 259–260. <https://doi.org/10.1037/ocp0000292>