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The Relationship Between Mindfulness and Wellbeing in First Responders: A Systematic Review --Manuscript Draft--

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Abstract:	<p>Objectives The review aims to explore the relationship between dispositional mindfulness (DM) and wellbeing, including positive psychological wellbeing and poor physical and mental health in first responders, including police, fire and emergency medical personnel.</p> <p>Methods A systematic review was conducted, with a search of four academic databases (PsycInfo, Medline, CINAHL, EmCare). Following duplicate removal, screening and forward and backward searches, 27 papers reporting findings from 22 quantitative studies were identified. Quality appraisal of the studies was completed, with a subsection of these peer-rated to increase reliability. Data were extracted, then analysed using narrative synthesis.</p> <p>Results The findings suggest that DM is positively related to wellbeing in first responders, in terms of higher positive psychological wellbeing and fewer mental and physical health symptoms. Greater DM also attenuated the negative effect of mental health symptoms and stress on their wellbeing. The results indicate that DM may benefit first responders' wellbeing through its influence on using more adaptive coping mechanisms and perceiving oneself as having greater coping resources and fewer stressors. However, the lack of longitudinal research limits conclusions about the direction of causation in these relationships.</p> <p>Conclusions DM appears to be positively related to wellbeing outcomes in first responders. Further research exploring positive outcomes, the long-term impact of DM on wellbeing, and under-represented first responder populations would add to the current evidence base.</p>
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Response to Reviewers:

Dear Dr Ferraro,

Thank you for reviewing this paper and for collating the comments of the reviewers. We are very grateful for the interest that you have shown in this piece of work. We have taken the time to review your comments and edited the manuscript accordingly.

We detail our responses below and the more extended additions have been highlighted in the manuscript:

1. The terms negative well-being outcome and positive well-being outcome are considered somewhat arbitrary. Even if you think of the concept of well-being in a broad sense, you should keep in mind that the definition of well-being is mainly positive. I would like you to consider what terms can be used to replace it. I think it would be a example idea to combine the two into a 'mental health' term, or to divide them into psychological maladaptiveness or well-being.

Thank you for your suggestion. On page 5, a short explanation has been added as to why negative outcomes were included in the review, as often research and definitions of wellbeing include both positive and negative aspects. Throughout, the wording has been altered to give more clarity, such as 'positive psychological wellbeing' outcomes for positive outcomes, and terms such as 'mental health difficulties' and 'adverse physical health' for negative outcomes relating to wellbeing.

2. It seems that a supplementary explanation is needed on why DM was selected as a major risk factor in first responders . For now, there seems to be only the evidence in line 15 of page 3. For example, it would be good if you could consider the following questions and express your opinion on the necessity of research.

e.g.) Do you think DM has a stronger relationship with mental health in the first responders group than in other groups? If so, it will be necessity of study.

e.g.) or the theoretical and clinical reasons why DM is a particularly important factor in other traumatized groups, including first responders, need additional description.

A section has been added on page 3-4 to give more explanation about on why DM was selected. This includes theoretical aspects regarding possible mechanisms through which DM might support the wellbeing of traumatised groups such as first responders. These mechanisms include lower neurological reactivity to threat, reduced attentional bias to threatening stimuli, greater ability to attend to the present moment, and ability to approach with non-judgement rather than avoid unpleasant internal experiences related to trauma.

3. Page 3, line 17 sounds pretty definitive. I haven't gone through all the studies, so rather than using the term 'no reviews', I'd like to tone it down to the point where 'it's hard to find such a study'.

This wording, now on page 4, has been amended as follows: "it was difficult to find any reviews that explored the relationship between DM and wellbeing in first responders."

4. The limitation and application of the discussion seem to have been written formally. The discussion needs to be written in a way that goes beyond a summary of the research results and helps suggest future applicability and future research.

More information has been added to the Limitations section regarding further research that could follow from this review and how this could be applied. More detail has also been added to the Implications section.

Best wishes

The Authors

Abstract

Objectives

The review aims to explore the relationship between dispositional mindfulness (DM) and wellbeing, including positive psychological wellbeing and poor physical and mental health in first responders, including police, fire and emergency medical personnel.

Methods

A systematic review was conducted, with a search of four academic databases (PsycInfo, Medline, CINAHL, EmCare). Following duplicate removal, screening and forward and backward searches, 27 papers reporting findings from 22 quantitative studies were identified. Quality appraisal of the studies was completed, with a subsection of these peer-rated to increase reliability. Data were extracted, then analysed using narrative synthesis.

Results

The findings suggest that DM is positively related to wellbeing in first responders, in terms of higher positive psychological wellbeing and fewer mental and physical health symptoms. Greater DM also attenuated the negative effect of mental health symptoms and stress on their wellbeing. The results indicate that DM may benefit first responders' wellbeing through its influence on using more adaptive coping mechanisms and perceiving oneself as having greater coping resources and fewer stressors. However, the lack of longitudinal research limits conclusions about the direction of causation in these relationships.

Conclusions

DM appears to be positively related to wellbeing outcomes in first responders. Further research exploring positive outcomes, the long-term impact of DM on wellbeing, and under-represented first responder populations would add to the current evidence base.

Keywords: Dispositional mindfulness; first responders; wellbeing; mental health; trauma

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3 **The Relationship Between Mindfulness and Wellbeing in First Responders: A**
4 **Systematic Review**
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7 ‘First responders’, such as police, fire and emergency medical personnel, are frequently
8 exposed to potentially traumatic events such as death, threats and aggression (Jahnke et al.,
9 2016; Lawn et al., 2020; Reid et al., 2022) at a higher rate than the general population
10 (Skeffington et al., 2017). This puts them at risk of negative wellbeing outcomes such as
11 mental health problems (Petrie et al., 2018; Reid et al., 2022; Soravia et al., 2021), drinking
12 alcohol at hazardous levels (Syed et al., 2020; Tomaka et al., 2017), suicidal thoughts and
13 behaviours (Stanley et al., 2016), burnout, secondary traumatic stress (STS), and compassion
14 fatigue (Burnett et al., 2019; Kula, 2017; Lawn et al., 2020). This can lead to increased long-
15 term sickness absence (Borritz et al., 2010), which may increase economic burden on services
16 and pressure on other staff members. There can also be a negative impact on personal
17 relationships (Lawn et al., 2020), with interpersonal conflict caused by desensitisation,
18 cynicism and irritability (Jahnke et al., 2016).
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36 Research has explored individual risk factors for negative wellbeing outcomes.
37 Individual factors related to increased post-traumatic distress disorder (PTSD) symptoms
38 include higher self-efficacy, a sense of inadequacy and ‘maladaptive’ coping strategies such
39 as avoidance, distraction, denial, and self-blame (Reid et al., 2022; Skeffington et al., 2017;
40 Soravia et al., 2021; Syed et al., 2020). ‘Compartmentalising’ emotions was shown to be
41 helpful initially, but unhelpful long-term (Jahnke et al., 2016; Lawn et al., 2020).
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51 Mindfulness, defined as “paying attention in a particular way: on purpose, in the
52 present moment, and non-judgementally” (Kabat-Zinn, 1994, p.4), is an individual factor that
53 has been positively related to wellbeing in other populations. ‘Dispositional mindfulness’ -
54 the tendency to take a mindful approach (DM; Brown et al., 2007) - is hypothesised to relate
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1 to better wellbeing because it entails being attuned to sensory experiences without judging
2 them (Brown & Ryan, 2003), allowing individuals with high DM to gain insight and
3 awareness into their internal experiences. This may reduce engagement in rumination, self-
4 judgement or unhelpful avoidance, which would lower their mood, thus allowing more
5 effective emotion regulation (Brown et al., 2007; Grabovac et al., 2011).
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11 Research has explored DM and wellbeing in high-stress occupations. Greater DM was
12 associated with lower depression, anxiety, rumination, substance use, suicidal ideation and
13 trauma in USA military personnel (Barr et al., 2019; Bravo et al., 2018; Kachadourian et al.,
14 2021). Increases in mindfulness following intervention predicted reductions in PTSD and
15 depression in veterans (Boden et al., 2012), and higher baseline mindfulness predicted lower
16 distress and anxiety 15 months post-deployment, even when controlling for baseline distress
17 and anxiety, combat zone deployments and combat experiences (Call et al., 2015). Higher
18 DM was associated with lower levels of depression, anxiety and burnout, and greater mental
19 health, personal accomplishment and wellbeing in healthcare staff (Lu et al., 2019; Prudenzi
20 et al., 2022; Salvarani et al., 2019; Westphal et al., 2015).
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36 DM may be particularly important for the wellbeing of people exposed to trauma such
37 as first responders. In a general population sample, higher DM was related to lower amygdala
38 activation in response to emotionally threatening stimuli during fMRI brain scanning
39 (Creswell et al., 2007), indicating that those with greater DM may be less reactive to threat at
40 a neurological level. Further, mindfulness supports the ability to focus attention and attend to
41 the present moment. Those with greater DM may therefore have less attentional bias towards
42 trauma-related stimuli, so experience fewer intrusions and less rumination which can lead to
43 persistence of post-trauma symptoms (Boyd et al., 2018; Lang et al., 2012). It is suggested
44 that the ability to attend to the present moment may be particularly important for those in
45 highly stressful occupations, as it may support working memory and adaptive reasoning and
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1 allows them to direct their attention more effectively, for example, attending to coping
2 strategies and problem-solving. A study with special operations combat medics found that
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4 great DM was related to more effective decisions in the moment (Deuster & Schoomaker,
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7 2015).

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9 DM has also been related to the ability to approach unpleasant internal experiences.
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11 Therefore, people with greater DM may be less likely to attempt to avoid or suppress trauma-
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13 related cognitions and emotions, facilitating the ability to emotionally process the experience
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15 (Nitzan-Assayag et al., 2015). The non-judgemental approach engendered by DM is
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17 suggested to allow people who experience trauma to accept their experiences without
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19 interpreting them so negatively or over-identifying with them, which can reduce the intensity
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21 of emotions in response to trauma-related cues (Boyd et al., 2018; Lang et al., 2012; Nitzan-
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23 Assayag et al., 2015). Research in traumatised populations has found the non-judgement facet
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25 of mindfulness to be associated with fewer PTSD symptoms, and avoidance in particular
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27 (Lang et al., 2012; Thompson & Waltz, 2010). Thus, DM may support individuals' ability to
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29 bounce back from adverse circumstances, buffering against the negative effects of trauma,
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31 which is important for first responders who regularly encounter stressful situations as part of
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33 their daily work (Glück et al., 2016; Joyce et al., 2018).

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35 A meta-analysis found that the negative association between DM and PTSD
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37 symptoms was stronger for individuals in high-stress occupations than other populations
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39 (Harper et al., 2022), suggesting that DM may be even more important for them than the
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41 general population. However, it was difficult to find any reviews that explored the
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43 relationship between DM and wellbeing in first responders. Harper et al. (2022) only
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45 included firefighters and the only outcome measured was PTSD symptoms. Given that
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47 individuals from any first responder occupation may experience such outcomes, this review
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49 will explore the relationship between DM and wellbeing in first responders. The term
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1 wellbeing here include a range of positive outcomes as well as adverse outcomes such as
2 mental and physical health symptoms. While there is a lack of consensus on the definition of
3 wellbeing, it tends to be considered a multidimensional construct encompassing both
4 affective and cognitive aspects (Adler et al., 2017; Tennant et al., 2007). Definitions tends to
5 include the presence of positive affect and satisfaction with life as well as the absence of
6 negative emotions (Adler et al., 2017; Chutiyami et al., 2022) sometimes being viewed on a
7 spectrum from high levels of wellbeing ('thriving/flourishing') to lower levels of wellbeing
8 ('languishing') (Simons & Baldwin, 2021; Wissing et al., 2021). Thus both positive and
9 negative aspects of wellbeing will be included in this review. If mindfulness is beneficial for
10 first responders' wellbeing, such techniques could be incorporated into employee support
11 programmes.
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26 Method

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29 The review protocol was published in the PROSPERO registry before full
30 commencement (CRD42022332536).
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34 Inclusion and Exclusion Criteria

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36 Papers exploring the relationship between DM and wellbeing in first responders were
37 sought for the review. Studies were included if they:
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- 41 • Were peer-reviewed papers published in English,
- 42 • Quantitatively measured the relationship between DM and wellbeing, using a
43 validated measure of DM and at least one validated wellbeing measure. A broad
44 definition of wellbeing was used, including positive psychological outcomes (e.g. life
45 satisfaction, compassion satisfaction, psychological wellbeing) and negative mental
46 and physical health outcomes (e.g. mental health symptoms, stress, suicidal thoughts,
47 pain, health symptoms),
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- Focused on one or more first responder occupations including ambulance staff, firefighters or police personnel,
- Focused on adult populations, aged 18 or over.

Reasons for exclusion were:

- Intervention studies without reported baseline associations,
- Did not focus mainly on currently serving first responders (e.g. studies solely including retired first responders were excluded).

There was no restriction on publication date or participant demographics other than occupation. Intervention studies were included if they reported associations between mindfulness and wellbeing or mental or physical health measures. Papers on trainee first responders were retained, as trainees are as likely to report experiencing certain potentially traumatic events as qualified staff (Regehr et al., 2003) and report similar levels of negative outcomes such as PTSD, depression and alcohol use (Berger et al., 2012; Jones, 2017).

Search Strategy

The search strategy was developed in consultation with an academic librarian and was conducted on 29th April 2022 using four databases: PsycInfo, Medline, CINAHL, and EmCare. The concepts of “mindfulness” and “first responders” were searched for. The subject heading “mindfulness” was used in each database. Recommended subject headings for first responders were used for each database: “emergency personnel” in PsycInfo; “emergency responders” in Medline; “first responders” in EmCare. There was no first responders group subject heading in CINAHL, so “firefighters”, “emergency medical technicians”, and “police” were selected from the list of professions.

The following free text terms were used in title and abstract fields in all databases:
"first responder*" OR first-responder* OR firstresponder* OR paramedic* OR firefighter*
OR fire-fighter* OR "fire fighter*" OR police* OR “law enforcement” OR “emergency

1 medical technician*” OR EMT OR “relief worker*” OR “emergency medical service*” OR
2 “emergency service” OR ((fire OR police OR emergenc* OR ambulance OR rescue) N3
3
4 (person* OR staff* OR responder* OR fighter* OR man OR men)); and mindful* to capture
5
6 mindfulness. No wellbeing terms were used to ensure no wellbeing outcomes were excluded.
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9 The searches resulted in 542 papers. Following removal of 80 duplicates, titles and
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11 abstracts of remaining studies were screened for eligibility, with a further 396 papers
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13 removed at this stage. The full texts of the resulting 66 papers were read to determine
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15 eligibility, resulting in 26 papers. Next, forward and backward searches were conducted to
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17 identify additional papers by screening reference lists and citing articles of included papers.
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19 The selection process resulted in a total of 27 papers to be included. See Figure 1 for the full
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21 search strategy.
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26 [Figure 1 here]
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28 29 **Data Extraction and Analysis**

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31 Data extracted from each paper included: sample size, age, profession and gender,
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33 country, study design, data analysis, mindfulness measure, wellbeing outcome and main
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35 findings. Effect sizes were mainly determined via reported correlation coefficients. The
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37 findings were analysed using narrative synthesis. As studies were heterogenous in design and
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39 wellbeing outcomes, a meta-analysis was not conducted.
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43 44 **Quality Assessment**

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46 Due to the heterogeneity of study designs, the Quality Assessment for Diverse Studies
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48 (QuADS; Harrison et al., 2021) tool was used to assess the methodological quality of
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50 included studies. This tool consists of 13 items related to methodological issues such as
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52 theoretical underpinning, appropriateness of study design, sample selection, data collection
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54 and analysis. Studies were scored 0-3 on each item and assigned an overall score by summing
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1 item scores. Five papers were rated by a peer to ensure reliability of ratings. Discrepancies
2 were overcome through discussion to achieve a consensus on the final score.
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4 **Results**

5 **Study Characteristics**

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7 The search strategy identified 27 papers on 23 studies, with 6,276 participants.
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9 Fourteen papers were on firefighters, 10 were on police personnel, two were on mixed first
10 responder groups and one was on ambulance staff. Where given (22 studies), participants'
11 mean ages ranged from 21.3 to 45.6 years. Males made up 45-100% of participants. Most
12 studies came from the USA ($N = 15$), followed by China ($N = 4$), with two each from
13 Australia and Italy, and one each from Austria, Canada, Korea and Spain. Regarding design,
14 17 were cross-sectional, four used longitudinal methods, five used baseline data from
15 randomised controlled trials (RCTs; $N = 3$) or uncontrolled intervention studies ($N = 2$) and
16 one was a cohort study. Table 1 gives an overview of the papers, including demographics,
17 design, measures and zero order correlations. Further details of the main findings are given in
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36 [Table 1 here]

37 **Mindfulness Measures**

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39 The most widely used measure was the Mindful Attention Awareness Scale (MAAS;
40 Brown & Ryan, 2003), in 13 studies. The Five-Factor Mindfulness Questionnaire (FFMQ;
41 Baer et al., 2006) was used in 11 studies, which measures DM facets of 'Observing'
42 experiences, 'Describing' internal experiences, 'Acting with awareness' of the present, 'Non-
43 judgement' of internal experiences and 'Non-reactivity' to internal experiences. The
44 Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al., 2004) was used in two studies
45 and the Freiburg Mindfulness Inventory (FMI; Walach et al., 2006) was used in one.
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58 **Summary of Quality Appraisal**

1 Scores ranged from 19 to 33 out of a possible 39 points. Most papers gave a clear
2 theoretical underpinning, stated aims in detail and provided details on the research setting and
3 sample. Study designs, data collection methods and data analysis were often appropriate and
4 described clearly. However, justification of sample sizes and measures were rarely reported,
5 with lack of reported stakeholder input into the design or conduct of most studies.
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11 **Summary of Main Findings**

12 Studies which used correlation and regression analyses to explore relationships
13 between DM and wellbeing have been summarised across six categories: trauma responses,
14 mental health difficulties, positive psychological wellbeing outcomes, adverse physical health
15 outcomes, coping and occupational experience. Studies using structural equation modelling,
16 mediation analyses and moderation analyses are then covered.
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26 ***Trauma Responses***

27 Overall, DM had a consistently negative association with PTSD symptoms, with a
28 medium to large effect size in firefighters and first responders (Chen et al., 2019; LeBeaut et
29 al., 2022; McDonald et al., 2022; Smith et al., 2011; Stanley et al., 2019; Yu et al., 2020).
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31 There was a small effect size in trainee police (Chopko et al., 2022), which may be due to
32 participants being trainees, as Chopko et al. (2022) theorized that police officers tend to use
33 more avoidance, a component of PTSD symptoms, over time. DM negatively correlated with
34 STS, with medium to large effect sizes in firefighters and first responders (Argentero et al.,
35 2015; McDonald et al., 2022; Setti & Argentero, 2014). Mindfulness facets of describing,
36 acting with awareness and non-judgement were negatively related to PTSD symptoms,
37 whereas observing had a small positive relationship, and non-reactivity had either a
38 negligible ($r < 0.1$) or small negative relationship (Chopko et al., 2022; Chopko & Schwartz,
39 2013; LeBeaut et al., 2022; Stanley et al., 2019). In regression analyses, greater DM predicted
40 lower PTSD severity and STS across professional groups when controlling for demographic
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1 variables (Chopko et al., 2022; Chopko & Schwartz, 2013; McDonald et al., 2022; Setti &
2 Argentero, 2014; Smith et al., 2011), prior trauma exposure (Chopko et al., 2022) or work-
3 related factors such as number of calls, stressors, income and first responder organisation
4 (McDonald et al., 2022; Smith et al., 2011). Further, LeBeaut et al. (2021) found that
5 firefighters with probable PTSD and alcohol use disorder (AUD) and those with probable
6 PTSD alone reported lower DM than those with probable AUD alone, who in turn reported
7 lower DM than trauma-exposed individuals without mental health symptoms, suggesting a
8 protective effect of mindfulness against negative trauma responses.
9

10 DM had a small positive relationship with post-traumatic growth (PTG) in firefighters
11 (Chen et al., 2021; Huang et al., 2019), predicting greater PTG in firefighters and trainee
12 police (Chopko et al., 2022; Huang et al., 2019). Observing had a small positive relationship
13 with PTG in police and trainee police, whereas awareness and non-judgement had a small to
14 medium negative relationship (Chopko et al., 2022; Chopko & Schwartz, 2009).
15

16 ***Mental Health Difficulties***

17 DM negatively correlated with mental health symptoms in firefighters, police and first
18 responder groups, with small to medium effect sizes for anxiety, medium to large for
19 depression (Counson et al., 2019; Fleischmann et al., 2021; McDonald et al., 2022; Senger et
20 al., 2022; Serrano et al., 2020; Smith et al., 2011; Williams et al., 2010; Yu et al., 2020) and
21 medium for general mental health symptoms and mental strain (Fisher et al., 2019; Williams
22 et al., 2010). DM had a small negative relationship with suicidal thoughts and behaviours in
23 firefighters (Serrano et al., 2020; Stanley et al., 2019), as did describing, awareness and non-
24 judgement facets, while observing had a small positive relationship. In regression analyses,
25 DM negatively predicted depression and anxiety symptoms in firefighters and first
26 responders when controlling for demographic and work-related factors (Counson et al., 2019;
27 McDonald et al., 2022; Smith et al., 2011), while in a longitudinal study, greater baseline DM
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1 predicted fewer depression symptoms in trainee police at a 10-12 month follow-up when
2 controlling for baseline depression score (Williams et al., 2010).
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4 DM had a negative association with stress in first responders, police and trainee
5 police, with medium to large effect sizes (Kaplan et al., 2018; Márquez et al., 2021;
6 McDonald et al., 2022; Williams et al., 2010) and negatively predicted perceived stress in
7 firefighters and police when controlling for demographic factors (Lee et al., 2020) and
8 operational and organisational stressors (Kaplan et al., 2018). DM also had a small to
9 medium negative relationship with occupational stressors in firefighters and police (Fisher et
10 al., 2019; Lee et al., 2020; Serrano et al., 2020). Thus, those with greater DM may perceive
11 fewer stressors at work and be less negatively affected by stress. Describing, awareness and
12 non-judgement facets were negatively related to occupational and organisational stress in
13 firefighters and police, whereas observing had a small positive relationship (Colgan et al.,
14 2021; Fleischmann et al., 2021; Kaplan et al., 2018; Lee et al., 2020; Serrano et al., 2020).
15 Non-reactivity had either a negligible, small negative (Colgan et al., 2021; Fleischmann et al.,
16 2021; Kaplan et al., 2018) or small positive relationship with stressors (Lee et al., 2020). In a
17 longitudinal study over 21 days, greater DM predicted smaller increases in negative affect
18 and loneliness and smaller decreases in positive affect in firefighters on high stress days
19 (Smith et al., 2019), suggesting that DM may attenuate the negative effects of stress on
20 wellbeing.
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22 DM was related to lower burnout, with a large effect size for firefighters (Chen et al.,
23 2019), small to medium for first responders (McDonald et al., 2022) and small to large for
24 different DM facets in police (Márquez et al., 2021). Differences in effect sizes may be
25 accounted for by the use of different burnout measures between studies. DM negatively
26 predicted burnout in firefighters and first responders in regression analyses which controlled
27 for demographic and work-related factors (Counson et al., 2019; McDonald et al., 2022;
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1 Smith et al., 2011). Compassion fatigue was negatively related to describing, acting with
2 awareness and non-judgement in police, but positively related to observing and non-reactivity
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4 (Márquez et al., 2021). Thus, overall DM is related to lower burnout, while the facets have a
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6 mixed relationship with compassion fatigue.
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8 9 **Positive Psychological Wellbeing Outcomes**

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12 Positive outcomes were less frequently studied than negative ones. DM was positively
13 associated with subjective psychological wellbeing (Counson et al., 2019), optimism, sense
14 of mastery (Smith et al., 2011), life satisfaction, resilience (McDonald et al., 2022),
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16 compassion satisfaction (Márquez et al., 2021; McDonald et al., 2022), and overall self-
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18 compassion (Fleischmann et al., 2021; Márquez et al., 2021). Effect sizes ranged from small
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20 to large. DM predicted greater psychological wellbeing in firefighters when controlling for
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22 age and years of service (Counson et al., 2019). DM did not predict psychological wellbeing
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24 in experienced paramedics (Mitmansgruber et al., 2008), though this may be because
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26 experiential avoidance was included in the model and accounted for a significant proportion
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28 of the variance. Greater DM did predict greater life satisfaction in experienced paramedics
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30 over that explained by experiential avoidance (Mitmansgruber et al., 2008), but did not
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32 predict life satisfaction in a mixed first responder group when controlling for demographic
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34 variables, income and first responder organization (McDonald et al., 2022). As
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36 Mitmansgruber et al. (2008) was the only study on paramedics, these differences may reflect
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38 differences in the relationship between DM and aspects of wellbeing across professional
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40 groups.
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50 51 **Adverse Physical Health**

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53 DM had a small to medium negative association with pain-related difficulties (Colgan
54 et al., 2021; LeBeaut et al., 2022), sleep disturbance (Serrano et al., 2020), general physical
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56 symptoms, alcohol use (Smith et al., 2011) and physical strain (Fisher et al., 2019). In
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1 regression analyses, greater DM predicted fewer physical health symptoms when controlling
2 for demographic factors and occupational stressors (Fisher et al., 2019; Smith et al., 2011).
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4 The observing facet had a negligible relationship with pain intensity and disability (LeBeaut
5 et al., 2022), and both observing and non-reactivity had a small positive relationship with
6
7 sleep disturbance (Serrano et al., 2020), thus these aspects of mindfulness may not be related
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9 to better physical wellbeing in first responders.
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14 *Coping*

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16 DM correlated positively with cognitive reappraisal and negatively with expressive
17 suppression in firefighters, with a small effect size (Huang et al., 2019; Yu et al., 2020), and
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19 negatively with experiential avoidance and thought suppression in trainee police, with a
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21 medium to large effect size (Williams et al., 2010). Social support has been described as a
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23 helpful coping mechanism for first responders (Reti et al., 2022; Stanley et al., 2016; Syed et
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25 al., 2020). In included studies, DM had a medium to large positive relationship with
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27 perceived social support (Chen et al., 2019; Chen et al., 2021; Smith et al., 2011). Thus, first
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29 responders with higher DM tend to rate themselves as having more coping resources in terms
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31 of greater social support.
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39 *Occupational Experience*

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41 Mitmansgruber et al. (2008) found that experienced paramedics reported greater DM
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43 than novices when controlling for age, but that DM was not related to number of traumatic
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45 workplace experiences. Other included studies also found that trauma exposure had a
46
47 negligible relationship with DM (LeBeaut et al., 2022; Serrano et al., 2020), suggesting that
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49 DM is not related to experience of traumatic incidents. However, unlike Mitmansgruber et al.
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51 (2008), time in role had a negligible relationship with DM in studies with other first
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53 responders (LeBeaut et al., 2022; LeBeaut et al., 2021; Lee et al., 2020; Smith et al., 2011).
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57 This may be due to differences in development of DM over time between professional
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1 groups. However, as only one study was on paramedics, these findings may not generalise to
2 ambulance personnel more widely.
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4 **Mediators and Moderators**

5 *Mediation*

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10 Greater cognitive reappraisal mediated the negative association between DM and
11 PTSD symptoms and the positive association between DM and PTG, while lower expressive
12 suppression mediated the relationship between DM and PTSD symptoms, in Structural
13 Equation Models (SEM; Huang et al., 2019). Greater perceived social support mediated the
14 negative relationships between DM and both PTSD symptoms and burnout using SEM (Chen
15 et al., 2019). In mediation analyses, more moral transgressions at work mediated the negative
16 relationship between DM and mental health symptoms (Senger et al., 2022). This suggests
17 that DM may indirectly benefit wellbeing through its influence on use of coping strategies
18 and perceiving oneself as having greater coping resources and fewer stressors.
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31 *Mindfulness as a Moderator*

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34 Greater DM reduced the positive associations between suicide risk and both PTSD
35 symptoms and sleep disturbance (Serrano et al., 2020; Stanley et al., 2019), although the
36 observing facet had the opposite effect, strengthening the effect of sleep disturbance on
37 suicide risk. Greater DM attenuated the positive relationship between PTSD symptoms and
38 pain-related disability in firefighters (LeBeaut et al., 2022) and reduced the positive
39 relationship between stress and signs of poorer physical or mental health, including pain
40 interference (Colgan et al., 2021), anxiety (Fleischmann et al., 2021), perceived stress
41 (Kaplan et al., 2018), mental and physical health symptoms (Fisher et al., 2019) and
42 musculoskeletal disorders (Lee et al., 2020). In a longitudinal study, greater DM reduced the
43 positive relationship between stressors and perceived stress over a week (Chen & Grupe,
44 2021), where those with greater DM perceived occupational stressors to be less stressful than
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1 those with lower DM. Therefore, DM appears to attenuate the negative effect of PTSD, sleep
2 disturbance and stress on first responders' wellbeing.
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4 Further, DM moderated the relationship between perceived social support from family
5 and PTG in a longitudinal study, such that greater baseline social support predicted greater
6 PTG three months later, but only for those with high DM (Chen et al., 2021). This suggests
7 that greater DM can strengthen the positive relationship between perceived social support and
8 wellbeing.
9

10 *Moderators of Mindfulness*

11 McDonald et al. (2022) found that DM negatively predicted anxiety and depression,
12 but only for those with high distress intolerance. Perceived social support moderated the
13 relationship between baseline DM and expressive suppression at a three-month follow-up,
14 with DM only predicting lower use of expressive suppression for those with high perceived
15 social support (Yu et al., 2020).
16

17 **Discussion**

18 **Main Findings**

19 This review explored the relationship between DM and wellbeing in first responders.
20 Greater DM was related to lower levels of mental health symptoms, STS, stress, suicidality,
21 and pain. DM attenuated the effect of mental health symptoms and stress on first responders'
22 wellbeing and predicted fewer depression symptoms in longitudinal studies. This supports the
23 idea that mindfulness can protect against the negative effects of stressful experiences (Boelen
24 & Lenferink, 2018; Huang et al., 2022), in line with previous research in other high-stress
25 occupations (Kachadourian et al., 2021; Salvarani et al., 2019). As DM negatively predicted
26 anxiety and depression for those with high, but not low, distress intolerance (McDonald et al.,
27 2022), mindfulness may buffer the negative effect of distress by allowing non-judgemental
28 engagement with experiences for those who otherwise have difficulty tolerating distress,
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whereas this may not be required for those with greater distress tolerance. In the few studies that explored positive **psychological wellbeing outcomes**, greater DM was associated with greater wellbeing, as found in healthcare workers (Lomas et al., 2018). However, each outcome was only explored by one or two studies. Greater inclusion of wellbeing outcomes in research would allow for greater clarification of these relationships.

With regard to coping mechanisms, DM was related to greater use of cognitive reappraisal, which is generally considered adaptive, and less avoidance and suppression, generally considered maladaptive (Gross & John, 2003). Greater use of cognitive reappraisal and lower use of expressive suppression mediated the relationship between DM and PTSD symptoms, suggesting that mindfulness may indirectly benefit wellbeing through facilitating the use of helpful coping strategies. Mindfulness may facilitate the use of active coping strategies because it involves non-judgemental acceptance of experience, thus is related to less need to avoid or suppress difficult internal experiences and a greater ability to engage with them (Hayes et al., 2006; Prakash et al., 2017), though more longitudinally designed studies would help to determine the causality of these relationships. Further, the current results found that greater DM predicted lower use of expressive suppression for those with high perceived social support (Yu et al., 2020). Thus, greater social support may interact with DM to encourage the use of active coping, whereas those with lower support may rely on internal suppression strategies to cope with stressful events (Zhou et al., 2014).

In this review, greater DM was related to workplace wellbeing, including lower burnout and compassion fatigue, and higher compassion satisfaction. Previous research found burnout had a negative impact on occupational functioning in first responders, including worse job performance, following fewer safety procedures, increased behaviours that could compromise patient safety and higher turnover intention (Baier et al., 2018; Bria et al., 2013; Smith et al., 2018). In one study, compassion satisfaction increased and burnout decreased in

1 emergency medical technicians following a mindfulness intervention (Ducar et al., 2020).

2 Thus, increasing staff DM could benefit emergency service organisations and the public by
3
4 improving their workplace wellbeing.
5

6
7 With regards to DM facets, describing, acting with awareness and non-judgement
8
9 were the most consistently related to the outcomes studied in this review, including lower
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11 levels of PTSD symptoms, stress, compassion fatigue and suicidality. This is similar to
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13 findings in the general population (Carpenter et al., 2019; Mattes, 2019; Reffi et al., 2019;
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15 Tomlinson et al., 2018). However, awareness and non-judgement unexpectedly had a
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17 negative relationship with PTG, whereas observing had a positive relationship in reviewed
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19 studies (Chopko et al., 2022; Chopko & Schwartz, 2009). Therefore, being able to observe
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21 and thus cognitively appraise traumatic experiences may be necessary for PTG, while non-
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23 judgementally accepting the experience does not lead to the same growth (Chopko &
24
25 Schwartz, 2009).
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31 Non-reactivity had a mixed relationship with wellbeing. This may be accounted for by
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33 non-reacting to inner experiences being linked to suppression of experience (Warner et al.,
34
35 2021). Further research into the relationship between non-reactivity and expressive
36
37 suppression would lend support to this proposal. Observing had a small positive relationship
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39 with PTSD symptoms, stress, compassion fatigue, sleep disturbance and suicidality in this
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41 review, as well as a positive relationship with PTG and compassion satisfaction. This fits
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43 with Baer et al. (2006)'s suggestion that those who observe their experiences may still make
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45 critical judgements of it, so that observing may not lead to greater wellbeing unless there is
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47 also a non-judgemental approach (Harrington et al., 2016).
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53 **Limitations and Recommendations for Future Research**

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55 First, studies rely heavily on self-reported DM. This assumes individuals accurately
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57 assess their DM which may not be the case, particularly for those with low DM (Rau &
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1 Williams, 2016). Research has been further criticised due to lack of consensus on a definition
2 of mindfulness (Van Dam et al., 2018). Definitions vary between whether it is a unitary
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4 (Brown et al., 2007) or multi-faceted construct (Baer et al., 2006), which affects measurement
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6 tools; for example, the FFMQ was developed by incorporating items from five mindfulness
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8 questionnaires including the MAAS thus covers a broader concept (Baer et al., 2006).
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10 Further, as the FFMQ covers distinct mindfulness aspects, reporting facet scores is more
11
12 appropriate than a general mindfulness score (Karl & Fischer, 2020), though several studies
13
14 only report the total score. **Therefore, future research may benefit from the development of**
15
16 **mindfulness measures based on a clearer definition, which could lend greater support to the**
17
18 **current findings.**

23
24 Second, most included studies relied on correlational data which cannot determine
25
26 causality. The few longitudinal studies reviewed support the view that DM has a beneficial
27
28 effect on first responders' wellbeing, consistent with prior longitudinal research that found
29
30 DM buffered the negative effects of stress or trauma (Donald et al., 2016; Huang et al.,
31
32 2022), and predicted lower depression and anxiety in the general population (Prieto-Fidalgo
33
34 et al., 2021) and in soldiers following combat deployment (Call et al., 2015). **Further**
35
36 **longitudinal studies measuring baseline DM and wellbeing over time could help to establish**
37
38 **the direction of causality in the relationship between mindfulness and wellbeing in first**
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40 **responders.**

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46 Third, the high degree of heterogeneity between studies precluded the use of meta-
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48 analysis and limited comparisons across studies. High heterogeneity across first responders'
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50 wellbeing outcomes has been highlighted in previous reviews (Berger et al., 2012; Petrie et
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52 al., 2018; Stanley et al., 2016). Suggested explanations for this include the use of different
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54 combinations of professional groups, differing outcome measures, unexplored correlates of
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56 mental health, lack of methodological rigour, and variation between countries (Petrie et al.,
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1 2018; Stanley et al., 2016). Future research could include factors that introduce heterogeneity,
2 such as professional group, country, type of location (e.g. rural/urban), and gender (Petrie et
3 al., 2018) as moderators of wellbeing in first responders. This may clarify sources of
4 heterogeneity and important factors in determining their wellbeing.
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9 Research suggests that organisational factors can negatively affect first responder
10 wellbeing, particularly lack of support (Kula, 2017; Lawn et al., 2020), frequent policy
11 changes, lack of communication, and workplace culture and stigma (Lewis-Schroeder et al.,
12 2018). Thus, it may be helpful for future research with first responders to focus on how
13 organisational and systemic factors affect their wellbeing and whether these moderate the
14 effect of individual factors such as DM on wellbeing. This could then guide services in the
15 development of policies around how to best support staff. A qualitative approach to such
16 research may be beneficial in providing in-depth perspectives of staff members.
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18

19 Finally, ambulance staff were under-represented in the research. Only one of the 27
20 studies focused solely on ambulance staff, despite this group being exposed to more
21 workplace violence than firefighters (Setlack, 2019), reporting higher rates of PTSD than
22 firefighters and police (Berger et al., 2012), being more likely to attempt to end their own life
23 than other first responders (Sawyer et al., 2022), and being more likely to end their own life
24 than other healthcare professionals (Office for National Statistics [ONS], 2017). This
25 indicates that research on the wellbeing of ambulance staff is important in understanding this
26 increased rate of psychological difficulties and finding ways to ameliorate them.
27
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29 **Implications**

30
31 The findings of this review suggest that greater DM is associated with better
32 psychological and physical wellbeing in first responders, supporting the view that DM may
33 benefit the wellbeing of individuals in such highly stressful occupations. Therefore,
34 mindfulness techniques could be used to support first responders' wellbeing. In the UK,
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1 public sector employers have been recommended to identify staff at increased risk of stress or
2 trauma and create plans to support staff wellbeing (Stevenson & Farmer, 2017). As lower
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4 DM was related to worse wellbeing in first responders in this review, mindfulness measures
5
6 could be used to identify staff who may be at greater risk of negative wellbeing outcomes as
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8 one way to meet this recommendation.
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12 Further, many senior emergency service staff in the UK have recognised the
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14 importance of staff wellbeing and committed to prioritise the mental health and wellbeing of
15
16 their staff (Mind, 2021). Mindfulness could be included in plans to support staff wellbeing as
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18 previous research found mindfulness-based interventions to improve aspects of wellbeing in
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20 police officers (Hoeve et al., 2021), firefighters (Denkova et al., 2020), and emergency
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22 medical staff (Ducar et al., 2020). This review may support those developing interventions
23
24 for staff in choosing which mindfulness facets to focus on, in particular acting with
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26 awareness and non-judgement, which were the most consistently linked with wellbeing in the
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28 findings.
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34 **Conclusion**

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36 First responders who have greater DM tend to report greater positive psychological
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38 wellbeing, along with fewer mental and physical health symptoms, with DM attenuating the
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40 negative effect of stress on wellbeing. DM may benefit wellbeing by facilitating the use of
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42 more adaptive coping strategies and perceiving oneself to have greater coping resources and
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44 fewer stressors. However, given the limitations of the current literature, further research is
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46 needed to determine the long-term effects of mindfulness on the wellbeing of first responders,
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48 particularly regarding positive outcomes.
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Statements and Declarations

Data Availability Statement

Due to the sensitive nature of the data, ethical approval has not been approved for data to be shared publicly.

Compliance with Ethical Standards

No funds, grants, or other support was received.

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This is a systematic review, therefore ethical approval was not required and consent to participate was not sought.

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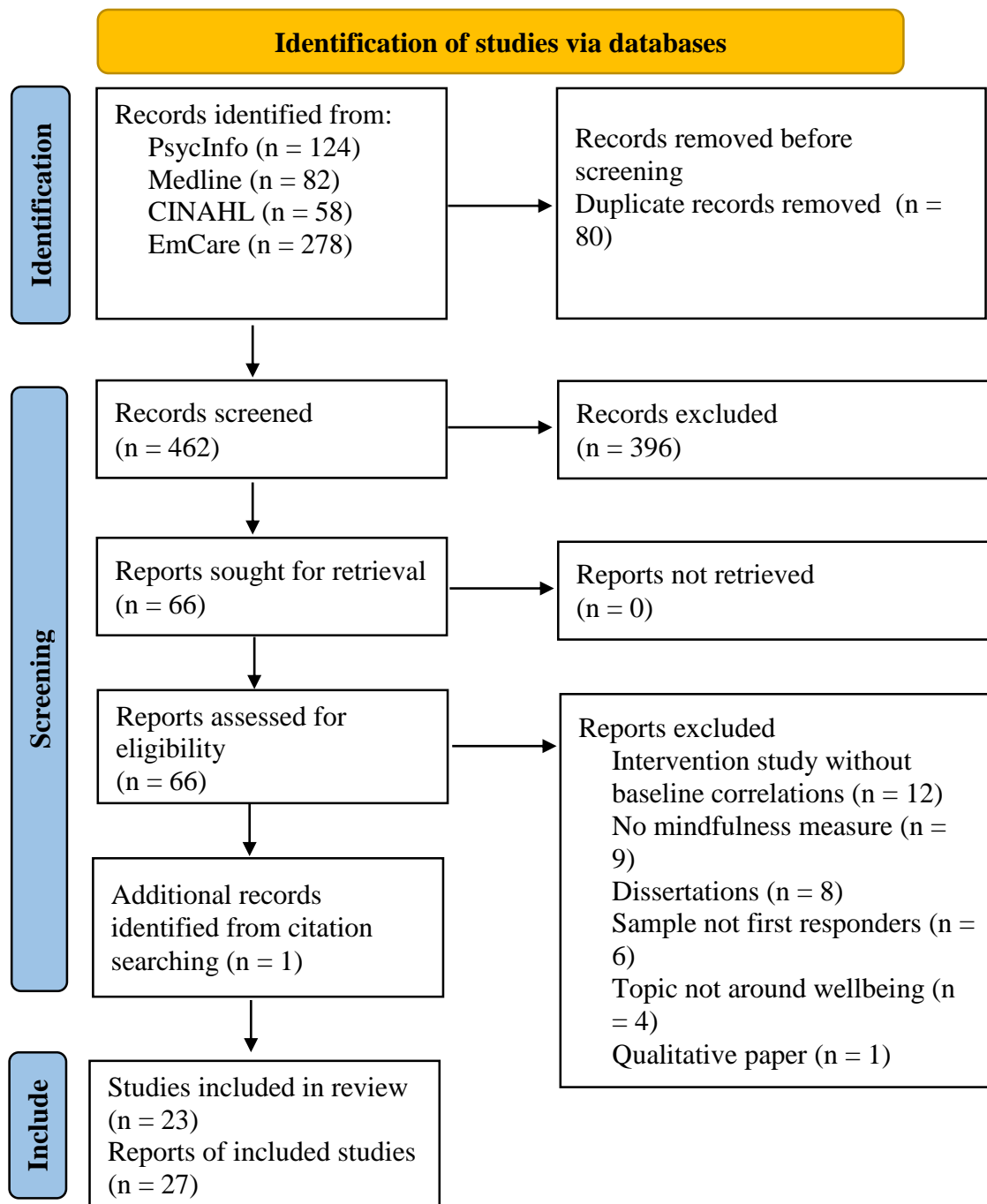
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Figure 1

Flow Chart of Search Strategy and Study Selection



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Table 1
Characteristics of Included Studies

Study	N; Mean Age (SD); Reported Gender	Organization	Country	Design	Mindfulness and Wellbeing Measures	Correlation Effect Size (<i>r</i>) with DM	QuaDS ^a
Argente ro et al. (2015)	255; 37.0 (3.7); 98% male	Fire	Italy	Cross-section	MAAS; STSS; GHQ-12	Intrusion: -.34*; General dysphoria: -.37*	19
Chen & Grupe (2021)	144; 40.0 (8.4); 58.8% male, 41.2% female	Police	USA	Longitudinal, RCT baseline data	FFMQ-SF; PSS-10; PSQ; BRS	No correlations	29

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Chen et al. (2019)	409; 21.3 (1.7); 100% male	Fire	China	Cross-section	MAAS; PCL-5; PSSS; MBI	Social support: .35*; Burnout: -.51*; PTSD symptoms: -.60*	29
Chen et al. (2021)	340; 21.3 (1.7); 100% male	Fire	China	Longitudinal	MAAS; PSSS; PTGI	Time 1 perceived social support: .26* (in family); .36* (outside family); Time 2 post-traumatic growth (PTG): .09	29
Chopko et al. (2022)	379; 26.7 (5.5); 92.1% male	Police (trainee)	USA	Cross-section	FFMQ-SF; PCL-5; PTGI; CIHQ	(Observing; describing; awareness; non-judging; non-reactivity) PTSD: .14*; -.15*; -.24*; -.41*; .06 PTG: .26*; .07; -.13*; -.12*; .06	29
Chopko & Schwarz (2009)	183; 37.9 (8.4); 92.9% male, 7.1% female	Police	USA	Cross-section	KIMS; PTGI	(Non-judgement; describing; observing; awareness) PTG: -.30*; .16*; .27*; -.08	26

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Chopko & Schwarz (2013)	183; 37.9 (8.4); 92.9% male, 7.1% female	Police	USA	Cross-section	KIMS; IES-R	(Non-judgement; describing; awareness; observing) Intrusion: -.50*; -.13; -.25*; .28* Hyperarousal: -.43*; -.18*; -.19*; .23* Avoidance; -.49*; -.13; -.26*; .28*	25
Colgan et al. (2021)	60; 42.6 (7.1); 66% male	Police	USA	Cross-section, intervention baseline data	FFMQ-SF; PSQ; PROMIS	(Non-reactivity) Pain interference: -.26* Organisational stress: -.09	23
Counson et al. (2019)	114; 42.1 (8.8); 95.6% male, 4.4% female	Fire	Australia	Cross-section, RCT baseline data	FMI-14; HADS; WHO-5	Depression: -.48*; Anxiety: -.49*; Psychological wellbeing: .52*	33

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Fisher et al. (2019)	239; 36.2 (8.2); 87.3% male, 7.6% female, 5.2% unknown	Police	USA	Cross-section	MAAS; QWI; PSI	Workload: -.15*; Organisational constraints: -.31*; Experienced incivility: -.32*; Mental strain: -.46*; Physical strain: -.41*; Job dissatisfaction: -.27*	25
Fleischmann et al. (2021)	138; No mean given; 64.6% male, 35.4% female	Police	Canada	Cross-section	FFMQ-SF; PSQ; SCS-SF; DASS-21	(Observing; describing; awareness; non-judging; non-reactivity) Self-compassion: .16; .49*; .51*; .67*; .45* Operational stress: .14; -.24*; -.38*; -.43*; -.07 Organisational stress: .22*; -.20*; -.44*; -.38*; -.03 Anxiety: .00; -.26*; -.40*; -.50*; -.23* Stress: -.06; -.36*; -.53*; -.58*; -.35* Depression: .00; -.38*; -.58*; -.71*; -.25*	27

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Huang et al. (2019)	409; 21.3 (1.7); 100% male	Fire	China	Cross-section	MAAS; ERS; PCL-5; PTGI	Cognitive reappraisal: .15*; Expressive suppression: -.25*; PTSD symptoms: -.60*; PTG: .15*	25
Kaplan et al. (2018)	72; 43.5 (7.7); 57% male	Police	USA	Cross-section, RCT baseline data	FFMQ-SF; PSQ; PSS	(Awareness; non-judging; non-reactivity) Organisational stress: -.22; -.17; -.14; Operational stress: -.13; -.17; -.06; Perceived stress: -.48*; -.46*; -.31*	26
LeBeau et al. (2022)	266; 40.5 (9.7); 92.5% male	Fire	USA	Cross-section	FFMQ-SF; PCL-5; GCPS	(Total; observing; describing; awareness; non-judging; non-reactivity) Trauma exposure: -.07; .18*; -.05; -.19*; -.18*; .06 PTSD symptoms: -.45*; .08; -.36*; -.41*; -.43*; -.17* Pain intensity: -.26*; .02; -.18*; -.23*; -.26*; -.08 Pain disability: -.33*; .02; -.18*; -.35*; -.30*; -.12*	31

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LeBeau	657;	Fire	USA	Cross-section	FFMQ-SF; PCL-5;	No correlations	29
t et al.	38.7 (8.6);				AUDIT; ASI-3;		
(2021)	94.0%				DTS; DERS-16;		
	male, 6.0%				LEC-5		
	female						
Lee et	549; No	Fire	Korea	Cross-section	FFMQ-SF; KOSS-	Occupational stress: -.38*; Turnover intention: -	26
al.	mean given;				SF; Musculoskeletal	.25*; Musculoskeletal disorders: -.004	
(2020)	100% male				disorders count		
Márque	20; 45.6	Police	Spain	Cross-	FFMQ-SF; SCS;	(Observing; describing; awareness; non-judging;	30
z et al.	(10.2);			section,	ProQOL; PSS-10	non-reactivity)	
(2021)	45% male,			intervention		SCS over-identification: .17; -.13; -.58*; -.67*; .01	
	55% female			study		SCS self-kindness: .12; .63*; .36; .51*; .21	
				baseline data		SCS mindfulness: .23; .41; .37; .49*; .21	
						SCS isolation: .10; -.33; -.40; -.68*; -.00	
						SCS common humanity: .38; .28; -.01; .11; .44	
						SCS self-judgement: -.10; -.38; -.48*; -.61*; -.22	

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Compassion satisfaction: .28; .74*; .17; .10; .26

Burnout: -.55*; -.64*; -.38; -.47*; -.27

Compassion fatigue: .10; -.21; -.65*; -.57; .28

Perceived stress: -.02; -.47*; -.35; -.55; -.16

McDon ald et al. (2022)	176; No mean given; 74% male	Mixed	USA	Cross-section	MAAS; DII; DASS- 21; PCL-5; STSS; MBI: ProQOL; SWLS; BRS	Distress intolerance: -.55*; Depression: -.52*; Anxiety: -.49*; Stress: -.57*; PTSD symptoms: - .58*; Secondary traumatic stress: -.51*; Personal accomplishment: .17*; Depersonalisation: -.29*; Emotional exhaustion: -.40*; Compassion satisfaction: .32*; Life satisfaction: .39*; Resilience: .37*	30
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Mitman sgruber et al. (2008)	239; Experienced : 33.3 (6.7); 61.9% male	Parame dic	Austria	Cohort study	MAAS; SWLS; PWB; PANAS	No correlations	25
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Novice:

25.0 (5.3);

53.5% male

Senger et al. (2022)	242; No mean given; 83.9% male, 16.1% female	Mixed	USA	Cross-section	MAAS; MIES; GRAT-S; PCL-C; GAD-7; PHQ-8	No correlations	30
Serrano et al. (2020)	865; 38.5 (8.6); 94.0% male, 5.3% female, 0.7% transgender	Fire	USA	Cross-section	FFMQ-SF; SOOS-14; IDAS; PSQI; SBQ-R	(Total; observing; describing; awareness; non-judging; non-reactivity) Occupational stress: -.19*; .25*; -.10*; -.41*; -.39*; .31* Trauma exposure: .09*; .18*; .08*; -.16*; -.10*; .20* Distress: -.24*; .18*; -.16*; -.38*; -.36*; .06	27

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Sleep disturbance: -.17*; .16*; -.15*; -.34*; -.28*;

.13*

Suicide risk: -.13*; .20*; -.05; -.28*; -.31*; .09*

Setti & Argente ro (2014)	176; 37.6 (8.7); 100% male	Fire	Italy	Cross-section	MAAS; STSS; GHQ-12	Intrusion: -.45*; Arousal: -.61*; General dysphoria: -.41*; Social dysfunction: -.25*; Loss of confidence: -.33*	31
Smith et al. (2019)	78; 39.4 (9.0); 73% male	Fire	USA	Longitudinal	MAAS; HADS; BDI-II; PDS; Item on loneliness	No correlations	25
Smith et al. (2011)	124; 33.7 (8.1); 93% male	Fire	USA	Cross-section	MAAS; AUDIT; BDI-II; LOT-R; PMS; PHQ; PDS; ISEL	Stress; -.08; Optimism: .27*; Mastery: .38*; Social support: .54*; PTSD symptoms: -.40*; Depression: -.50*; Physical symptoms: -.41*; Alcohol use: -.18*	23

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Stanley et al. (2019)	831; 38.4 (8.5); 94.5% male, 4.8% female, 0.7% transgender	Fire	USA	Cross-section	FFMQ-SF; PCL-5; SBQ-R	(Total; observing; describing; awareness; non-judging; non-reactivity) PTSD symptoms: -.30*; .17*; -.19*; -.43*; -.39*; .05 Suicide risk: -.14*; .16*; -.06; -.28*; -.29*; .08*	30
Williams et al. (2010)	60; No mean given; 73% male, 27% female	Police (trainee)	Australia	Longitudinal	MAAS; WBSI; GHQ-12; DASS-21	Time 1. Alexithymia: -.56*; Experiential avoidance: -.38*; Thought suppression: -.53*; Mental health symptoms: -.40*; Depression: -.34*; Anxiety: -.22; Stress: -.43*; Time 2. Alexithymia: -.62*; Experiential avoidance: -.58*; Thought suppression: -.58*; Mental health symptoms: -.34*; Depression: -.50*; Anxiety: -.27*; Stress: -.52*	28

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Yu et al. (2020)	340; 21.3 (1.6); 100% male	Fire	China	Longitudinal	MAAS; ERS; PSSS; PCL-5; CES-D	Time 1 cognitive reappraisal: .12*; Time 1 expressive suppression: -.25*; Time 1 perceived social support: .35*; Time 2 PTSD symptoms: -.39*; Time 2 depression: -.36*; Time 2 cognitive reappraisal: .14*; Time 2 expressive suppression: -.10	27
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* $p < .05$

^a Quality rated using the QuADS tool which has a minimum score of 0 and a maximum score of 39.

ASI-3 Anxiety Sensitivity Inventory; *AUDIT* Alcohol Use Disorders Identification Test; *BDI-II* Beck Depression Inventory; *BRS* Brief Resilience Scale; *CES-D* Centre for Epidemiological Studies Depression Scale; *CIHQ* Critical Incident History Questionnaire; *DASS-21* Depression Anxiety and Stress Scale; *DEERS-16* Difficulties in Emotion Regulation Scale; *DII* Distress Intolerance Index; *DTS* Distress Tolerance Scale; *ERS* Emotion Regulation Scale; *FFMQ-SF* Five Factor Mindfulness Questionnaire-Short Form; *FMI-14* Freiburg Mindfulness Inventory; *GAD-7* Generalized Anxiety Disorder Scale; *GCPS* Graded Chronic Pain Scale; *GHQ-12* General Health Questionnaire; *GRAT-S* Gratitude, Resentment and Appreciation-Short Form; *HADS* Hospital Anxiety and Depression Scale; *IDAS* Inventory of Depression and Anxiety Symptoms; *IES-R* Impact of Events Scale-Revised; *ISEL* Interpersonal Support Evaluation List; *KIMS* Kentucky Inventory of Mindfulness Skills; *KOSS-SF* Korean Occupational Stress Scale-Short Form; *LEC-5* Life Events Checklist; *LOT-R* Revised Life Orientation Test; *MAAS* Mindful Attention Awareness; *MBI* Maslach Burnout Inventory; *MIES* Moral Injury Events Scale; *PANAS* Positive and Negative Affect Schedule; *PCL-5* PTSD Checklist for DSM-5; *PCL-C* Posttraumatic Disorder Checklist-Civilian; *PDS* Posttraumatic Diagnostic Scale; *PHQ-8* Patient Health Questionnaire; *PMS* Personal Mastery Scale; *PROMIS* Patient-Reported Outcomes Measurement Information System; *ProQOL* Professional Quality of Life Scale; *PSI* Physical Symptoms Inventory; *PSQ* Police Stress Questionnaire; *PSQI* Pittsburgh Sleep Quality Index; *PSS-10* Perceived Stress Scale; *PSSS* Perceived Social Support Scale; *PTGI* Post-Traumatic Growth Inventory; *PWB* Psychological Wellbeing Scale; *SBQ-R* Suicide Behaviours Questionnaire-Revised; *SCS* Self-Compassion Scale; *SCS-SF* Self-Compassion Scale-Short Form; *SOOS-14* Sources of Occupational Stress; *STSS* Secondary Traumatic Stress Scale; *SWLS* Satisfaction with Life Scale; *QWI* Quantitative Workload Inventory; *WBSI* White Bear Suppression Inventory; *WHO-5* World Health Organisation-5 Wellbeing Index

The Relationship Between Mindfulness and Wellbeing in First Responders: A Systematic Review

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Dear Dr Ferraro,

Thank you for reviewing this paper and for collating the comments of the reviewers. We are very grateful for the interest that you have shown in this piece of work. We have taken the time to review your comments and edited the manuscript accordingly.

We detail our responses below and the more extended additions have been highlighted in the manuscript:

1. The terms negative well-being outcome and positive well-being outcome are considered somewhat arbitrary. Even if you think of the concept of well-being in a broad sense, you should keep in mind that the definition of well-being is mainly positive. I would like you to consider what terms can be used to replace it. I think it would be a example idea to combine the two into a 'mental health' term, or to divide them into psychological maladaptiveness or well-being.

Thank you for your suggestion. On page 5, a short explanation has been added as to why negative outcomes were included in the review, as often research and definitions of wellbeing include both positive and negative aspects. Throughout, the wording has been altered to give more clarity, such as 'positive psychological wellbeing' outcomes for positive outcomes, and terms such as 'mental health difficulties' and 'adverse physical health' for negative outcomes relating to wellbeing.

**2. It seems that a supplementary explanation is needed on why DM was selected as a major risk factor in first responders . For now, there seems to be only the evidence in line 15 of page 3. For example, it would be good if you could consider the following questions and express your opinion on the necessity of research.
e.g.) Do you think DM has a stronger relationship with mental health in the first responders group than in other groups? If so, it will be necessity of study.
e.g.) or the theoretical and clinical reasons why DM is a particularly important factor in other traumatized groups, including first responders, need additional description.**

A section has been added on page 3-4 to give more explanation about on why DM was selected. This includes theoretical aspects regarding possible mechanisms through which DM might support the wellbeing of traumatised groups such as first responders. These mechanisms include lower neurological reactivity to threat, reduced attentional bias to threatening stimuli, greater ability to attend to the present moment, and ability to approach with non-judgement rather than avoid unpleasant internal experiences related to trauma.

3. Page 3, line 17 sounds pretty definitive. I haven't gone through all the studies, so rather than using the term 'no reviews', I'd like to tone it down to the point where 'it's hard to find such a study'.

This wording, now on page 4, has been amended as follows: "it was difficult to find any reviews that explored the relationship between DM and wellbeing in first responders."

4. The limitation and application of the discussion seem to have been written formally.

The discussion needs to be written in a way that goes beyond a summary of the research results and helps suggest future applicability and future research.

More information has been added to the Limitations section regarding further research that could follow from this review and how this could be applied. More detail has also been added to the Implications section.

Best wishes

The Authors



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Supplementary Material
Supplementary table 1.docx

