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Psychological impacts and self-management by responders to emergency and disaster events involving animals: findings from a cross-sectional international survey

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ABSTRACT

Aims: To examine the self-reported psychological impacts for professional and volunteer responders associated with attending animal-related emergencies and disasters, focusing on their experience and self-reported management.

Methods: An online survey of professional and volunteer responders to animal-related emergencies was shared via social media and international response organisations. Questions addressed demographic, training and event-related factors, perceptions of effects on well-being and post-event management recovery techniques. A particular event was recalled in free-text, and respondents indicated how they had been affected using free-text reflection and Likert scale assessment. The revised Impact of Event Scale (IES-R) was used to identify evidence of possible post-traumatic stress disorder (PTSD). Factors associated with the self-assessed binary outcome of compromised mental well-being (yes or no) were evaluated using single-predictor and multivariable logistic regression.

Results: Of 227 responses deemed sufficiently complete for analysis, participants' rescue experience ranged from 1–60 years; 67% identified as female. Most respondents (57%; 129/227) reported that the incident described affected their mental well-being. A multivariable model found female responders more likely than males to report compromised well-being (OR = 2.37, 95% CI = 1.25–4.57; $p = 0.009$). The presence of an animal injury (OR = 2.84, 95% CI = 1.44–5.75; $p = 0.003$), injuries to a member of the public (OR = 3.73, 95% CI = 1.68–8.99; $p = 0.002$), or a team member (OR = 8.65, 95% CI = 2.25–57.67; $p = 0.006$), increased the odds of self-reported adverse mental health outcomes. Six per cent (13/227) of respondents had an IES-R score for which partial PTSD may be a clinical concern, and 3% (7/227) had a score indicative of possible PTSD, including four with a score that has been associated with PTSD and long-term health consequences. Of those who tried well-being support techniques, 95% (187/197) ranked talking with friends, family or teammates as effective. Debriefing with the team or mentor was also effective (95%; 187/197). Socialising was effective for 88% (119/135), and mindfulness or meditation for 87% (91/105).

Conclusion and clinical relevance: Responders to emergencies involving animals are at risk of psychological trauma associated with these events, potentially leading to the compromise of mental well-being. Psychosocial supports self-identified as helpful for recovery include talking with others, socialising, physical or recreational activity, debriefing, and mindfulness or meditation, but their effectiveness requires objective evaluation so that education on mitigation and recovery strategies is well-informed.

Abbreviations: IES-R: Impact of Event Scale – Revised; PTSD: Post-traumatic stress disorder

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Introduction

Disasters and other emergencies affect millions of people annually (Moore *et al.* 2020) and are likely to become more frequent with the effects of climate change (Dey and Lewis 2021). Human behaviour during, and in response to, disasters and other emergencies can be impacted by animal attachment (Squance *et al.* 2018; Trigg *et al.* 2019). These impacts

are not limited to pets; they also extend to farmed animals, where the loss of livestock can have psychological (Travers *et al.* 2017) and financial impacts (Smith *et al.* 2015; Westcott *et al.* 2017). Evacuation orders during emergencies have been refused by owners/guardians when their animals are not included (Travers *et al.* 2017) or when suitable shelter options for animals are unavailable (Chadwin 2017).

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Additionally, when owners do evacuate, they may return to their home or farm before it is safe to do so (Heath and Linnabary 2015; Van Manen *et al.* 2021). In addition to endangering their own lives (Byard and Langlois 2021), the behaviour of animal owners/guardians can exacerbate risks to emergency responders. These risks can be physical (Thompson *et al.* 2015), but they can also be psychological.

The psychological risks faced by professional emergency responders involved with human casualties include anxiety, depression and other maladaptive or life-threatening psychiatric disorders, and increased rates of post-traumatic stress disorder (PTSD) (Benedek *et al.* 2007; Neria *et al.* 2008; Goldmann and Galea 2014). PTSD is characterised by intrusive thoughts, persistent avoidance of stimuli associated with the trauma, an alteration in cognition and mood with hyperarousal and reactivity for more than 1 month (American Psychiatric Association 2013). The prevalence of psychological health disorders among emergency responders to humanitarian disasters, as reported in systematic reviews, varies from 0–44% for PTSD and 21–53% for depression (Neria *et al.* 2008; Garbern *et al.* 2016).

Veterinary professionals are at risk of impaired psychological health during and after a disaster response involving animal casualties. For example, Vroegindewey and Kertis (2020) found that half of 242 veterinary participants surveyed reported sleep loss, anxiety, relationship difficulties, moodiness, depression, nightmares, or suicidal thoughts after a disaster response. Paul *et al.* (2024) explored distress and trauma among veterinary workers after the Australian Black Summer bushfires, reporting that a third of respondents exhibited moderate to severe symptoms of depression, anxiety and/or stress, and 96% (89/93) reported mild to severe grief.

Despite a well-developed body of research documenting the psychological risks faced by professional emergency responders involved with human casualties, as well as burgeoning research on the psychological effects on veterinarians when responding to animal emergencies, there is a need for research considering the psychological risks to the broad range of responders to animal emergencies (Wasson and Wieman 2018). This diverse group includes spontaneous volunteers from the affected community, good Samaritans from outside the affected community, animal professionals such as veterinary technicians/nurses, professional emergency responders and trained animal emergency responders.

The authors of the present study hypothesised that responders (not just veterinarians) involved in emergencies and disasters involving animal casualties are at risk of psychological injury and reduced mental well-being, including PTSD. This international survey aimed to investigate the self-reported impact on the

psychological well-being of professional and volunteer responders deployed to provide support for emergencies or disasters involving animal casualties. The secondary aim was to identify factors and strategies that may mitigate the risks to mental well-being these responders face. This is essential for understanding and mitigating the psychological health effects on emergency responders of deployment.

Materials and methods

An anonymous online survey design was selected as the most suitable method for collecting data from an international sample of respondents. The questionnaire was written in English by a multidisciplinary research team with subject expertise in emergency response and disciplinary expertise in veterinary medicine, cultural anthropology, and clinical psychology. The survey was piloted with five trained professional animal responders. Their feedback was used to inform adjustments to the clarity and flow of the survey questions.

The survey had sections capturing consent, demographic information, training, responder experience and how recent this was, the self-reported psychological impacts of a rescue event that they had experienced during the previous 5 years, the mitigation strategies they had tried, and illness and injury data. Question structure and response options were dependent on the data sought and included free text, numeric, multiple choice, and Likert scales. Twelve per cent of questions had a required response, and 88% of questions permitted respondents to opt in or out (hence different denominators are presented in the results below). The survey questions for which data are presented in this manuscript are available in Supplementary Information 1. The survey incorporated the revised Impact of Event Scale (IES-R) questionnaire (Weiss 2007; Hosey *et al.* 2019), a validated cross-cultural, self-reporting tool of 22 scaled response questions used for the assessment of signs and symptoms associated with psychological trauma, and recognised for its high correlation with PTSD assessments by mental health professionals (Creamer *et al.* 2003). The IES-R questions (survey questions 5.2–5.23) assess the stress response symptoms of re-experiencing or intrusion (eight questions), emotional numbing and avoidance (seven questions), hyperarousal (six questions), and one to parallel the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders diagnostic criteria for PTSD (American Psychiatric Association 1994; Weiss and Marmar 1997; Weiss 2007). For each question, responses were assigned a score as follows: "none at all" = 0; "a little" = 1; "a moderate amount" = 2; "a lot" = 3; "a great deal" = 4 (Weiss and Marmar 1997). The scores for all IES-R questions were summed. When administered

by health professionals, a score ≥ 24 indicates PTSD is a clinical concern (Asukai *et al.* 2002), ≥ 33 is the cutoff for a probable diagnosis of PTSD (Creamer *et al.* 2003), and a value ≥ 37 has been associated with PTSD and the suppression of immune function (Kawamura *et al.* 2001).

Qualtrics (North Sydney, Australia) software was used to create and host the online survey. Upon clicking the survey link, potential survey respondents were provided with information on the purpose of the research and confirmation that the study had ethical approval. Respondents who elected to participate were required to confirm they were aged 16 or older, informed of their rights, and provided with a confidentiality statement. Respondents were informed they could withdraw at any stage during the survey or pause and complete it later. Due to the sensitive nature of the research, a link that listed contact information for psychological support groups was provided on the footer of every page of the survey. No incentive was offered to survey respondents for attempting or completing the questionnaire.

A convenience sample of survey respondents was recruited through a call for voluntary participants via technical rescue organisations and influencers in Australia, NZ, the UK, and the USA with an international following in the technical animal response field. As there are no national or international registries of such organisations or animal-related emergency responders, the initial invitations were shared through the informal and formal networks of four of the authors (SD, CR, KT, HS), actively practising or affiliated with the field (Supplementary Table 1). This was achieved by email or via social media, where on-sharing of the survey link was encouraged as a snowball sampling method (Baltar and Brunet 2012). The survey was open April–October 2019, and efforts were focused on maximising the number of responses by repeating emails to organisations identified by the authors, and social media posts of text or video. Due to the lack of existing data on the numbers or distribution of volunteer or trained emergency animal incident responders, a sample size based on a finite population could not be estimated.

The study protocol was reviewed and approved by the Massey University Human Ethics Committee: Southern B (application 19/02).

Statistical analysis

Data was stored in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and primarily analysed using R (R Core Team; R Foundation for Statistical Computing, Vienna, Austria). Survey data was deemed useable for analysis if $\geq 80\%$ of the questions associated with the IES-R section of the questionnaire were answered (Downey and King 1998). Those remaining

surveys with $< 20\%$ missing data in the IES-R returns were checked to ensure that the missing IES-R entries were randomly distributed, then person mean imputation was used to estimate the missing data and calculate the total IES-R score (Downey and King 1998). The data was graphed in a histogram; no grouping by category was attempted.

For some demographic variables, survey responses were recoded to reduce disparities in group sizes within variables: age categories, which were originally in 5-year blocks (from 16 to > 66 years), were recoded as shown in Table 1; categories describing the level of education as “high school graduation”, “elementary/primary school”, and “other” were merged in to a single category of “high school or below”, and all countries of residence other than USA, NZ and Australia were recoded as “other”. The categories of event type for the recalled event were also recoded and some responses were moved to a more appropriate category: 16 responses were moved from the “other” category: 11 to a new “human-related” category for grouping of welfare issues or those related to the actions of humans, three to “fire”, and one each to “animal entrapment” and “motor vehicle accident”. Responses of stranding, earthquake, structural collapse, and volcanic were added to “other”.

Replies to the request to describe the type of event recalled (Question 4.3 of the survey) were sorted into two classes: disaster or rescue response. Responses to the request to indicate injury or loss of life of animals and/or people that were associated with the described incident (Question 4.5 of the survey) provided the options of none, single or multiple. These categories were dichotomised to indicate whether injury or loss of life was, or was not, associated with the incident.

A binary outcome variable for the self-reported effect on mental well-being was created from Question 4.6 of the survey (1 = self-reported as slightly, moderately, or markedly affected; 0 = self-reported as unaffected), and a generalised linear model built with a logit link to evaluate the relationship between self-reported compromised well-being and variables associated with the responder and features of the event described.

Single predictors were individually included in this model, and statistical significance was determined using the Wald test. Variables with $p \leq 0.25$ were considered for further initial consideration in a multivariable model via backward stepwise elimination of variables with the least significant p-value, until all retained variables had $p > 0.05$. The variance inflation factors were calculated to test for multicollinearity, and residuals plotted against fitted values to evaluate linearity in the final model. A quantile-quantile plot was generated to evaluate the normality of standardised residuals. Influential data points were identified

Table 1. Demographic characteristics of participants in a survey investigating the psychological impacts on respondents to emergency and disaster events involving animals.

Variable	n (%)
Gender (n = 227)	
Female	152 (67%)
Male	75 (33%)
Age (n = 227) ^a	
16–30	22 (10%)
31–40	41 (18%)
41–50	59 (26%)
51–60	67 (30%)
≥ 61	38 (17%)
Highest level of education (n = 225)	
College or bachelor's degree	64 (28%)
Professional or master's degree	62 (28%)
Certificate or diploma	44 (20%)
Apprenticeship, technical or trade	21 (9%)
High school or below	34 (15%)
Country of residence (n = 227)	
USA	92 (41%)
New Zealand	53 (23%)
Australia	45 (20%)
Other ^b	37 (16%)
Animal types owned (n = 226)	
Dogs	174 (77%)
Cats	113 (50%)
Horses	104 (46%)
Livestock	70 (31%)
Wildlife/exotic	31 (14%)
Birds	37 (16%)
Pocket pets	23 (10%)
None	21 (9%)
Occupation (n = 217)	
Animal industry professional	79 (36%)
Emergency response professional (human)	35 (16%)
Other	103 (47%)
Type of training ^c	
Animal first aid (n = 212)	177 (83%)
Human first aid (n = 206)	195 (94%)
Technical large animal rescue (n = 212)	170 (80%)
Small animal technical rescue (n = 200)	148 (74%)
Wildlife land rescue (n = 195)	104 (53%)
Wildlife marine rescue (n = 193)	104 (53%)
Other animal rescue (n = 37)	20 (54%)
Communication (n = 217)	167 (77%)
Disaster management (n = 212)	167 (79%)
Military emergency response (n = 196)	40 (20%)
Stress mitigation or support (n = 202)	130 (64%) ^d
Other disaster response (n = 38)	22 (58%)
Experience in animal rescue or disaster response (years; n = 225)	
< 2	25 (11%)
2–5	51 (23%)
6–10	45 (20%)
11–15	33 (15%)
16–20	27 (12%)
21–30	26 (12%)
≥ 31	18 (8%)
Recent experience (number of rescues over past 2 years; n = 207)	
< 5	111 (54%)
5–10	58 (28%)
11–20	20 (10%)
21–30	7 (3%)
≥ 31	11 (5%)

^aPercentages do not sum to 100 due to rounding.

^bIncluded one respondent from Canada, 12 from UK, two from Chile and one each from Austria, France, Germany and Niger.

^cThe number of respondents who answered these questions is given in parentheses. Categories of training are not mutually exclusive. Two respondents indicated no training in any skill category, nine were trained in at least one category, and 216 had training in multiple categories, with a mean of responders indicating training in six categories

^dOf these respondents, three considered themselves trained to an expert level, 42 to a responder or technician level and 85 to an introductory or awareness level.

by plots of Cook's statistic. Observations with Cook's distance > 3 times the mean Cook's distance were evaluated, and if influential, removed, and the model adjusted. Goodness of fit of models was compared by calculating the pseudo-R² value using the Nagelkerke method (Mangiafico 2016) and Akaike information criterion.

Outcomes of analyses are reported as coefficients, SE, and OR with 95% CI for the OR of each variable. Responses to questions regarding self-directed recovery strategies for mental well-being were stratified by respondent assessed effectiveness and descriptively summarised in frequencies.

Results

Descriptive data

In total, 409 surveys were returned, of which 227 met the inclusion criteria for analysis. Demographic data and the respondents' recollections of a memorable animal rescue event were summarised using frequencies (Table 1). Two hundred and seventeen respondents indicated an occupation; the four largest specified occupation groups included veterinarians or veterinary technicians (43/217, 20%), people who were retired or pensioners (24/217, 11%), fire and emergency responders (21/217, 10%), and those in the human medical field as nurses, doctors, or paramedics (10/217, 5%).

Over 112 governmental, non-governmental and volunteer emergency responder organisations were represented by 174/227 (77%) respondents, 14/227 (6%) did not belong to an organisation, and the remainder did not provide a response (Supplementary Table 2). Experience in animal rescue or disaster responses varied from < 1–60 years. Just under a quarter (51/225, 23%) had 2–5 years of experience, and a small proportion (88/225) had > 30 years. The number of incidents attended that each respondent reported within the past 2 years ranged from 0–100 with most (111/207, 54%) attending < 5 events in the past 2 years, and a small proportion (17/207, 8%) attending > 30 events.

Of the 227 respondents, 144/227 (63%) identified as volunteers with some level of training, 51/227 (22%) considered themselves professional responders, and 32/227 (14%) identified as untrained volunteers. The type of training that respondents reported completing is summarised in Table 1. Of the 227 respondents, two (1%) indicated no training in any skill category, nine (4%) trained in one category and 216 (95%) trained in two or more areas. The average responder reported training in six of the listed skill categories.

The respondents were invited to share an experience involving an animal rescue event to which they

Table 2. Description of the event recalled by participants in a survey investigating the psychological impacts on respondents to emergency and disaster events involving animals.

	n (%) ^a
Event recounted (n = 223)	
The most recent experience	123 (55%)
The most memorable positive experience	65 (29%)
The most memorable negative experience	20 (9%)
Some other experience	15 (7%)
Years event occurred before survey (n = 222)	
< 1	32 (14%)
1	75 (34%)
2	60 (27%)
3	34 (15%)
4	12 (5%)
5	9 (4%)
Event type (n = 226)	
Animal entrapment or misadventure	80 (35%)
Fire	54 (24%)
Flood/hurricane	41 (18%)
Other ^b	25 (11%)
Motor vehicle	15 (7%)
Human-caused (welfare, hoarding etc.)	11 (5%)
Scale of event (n = 225)	
Local	107 (48%)
Regional or county	74 (33%)
Multiple regions or counties	22 (10%)
State or provincial	14 (6%)
National	8 (4%)

^aPercentages in some sections do not add to 100 due to rounding.

^bIncluded responses of stranding (n = 8), entries with no text (n = 3), two each for earthquake, structural collapse, training or teaching and illness and one each for volcanic, marine injury, lockdown in Christchurch (mass shooting), oil spill, heatwave and cold/ice.

had been deployed in the previous 5 years (2014–2019), details of which are summarised as frequencies (Table 2). The exposure of the respondent to witnessing injury and fatalities, human and animal, during the response is summarised in Figure 1. This included a single human death (5/227 respondents, 2%) and multiple human deaths (41/227, 19%) during the described event. Twenty four out of 227 (11%) respondents reported a single animal death, while 102/227 (45%) reported multiple animal deaths at their incident.

Mental well-being

There were 227 responders who completed questions on the impact of their experiences on their mental health: 129 reported that their mental health had been affected by the incident (57%). For most of these respondents (82/129, 64%), the effect was slight; 34/129 (26%) were moderately affected, and 13/129 (10%) were markedly affected. This included 33/47 (70%) veterinary professional survey participants who reported being slightly (22/47, 47%), moderately (9/47, 19%) or markedly (2/47, 4%) affected. Supplementary Table 3 shows the result of the single predictor logistic models for all variables

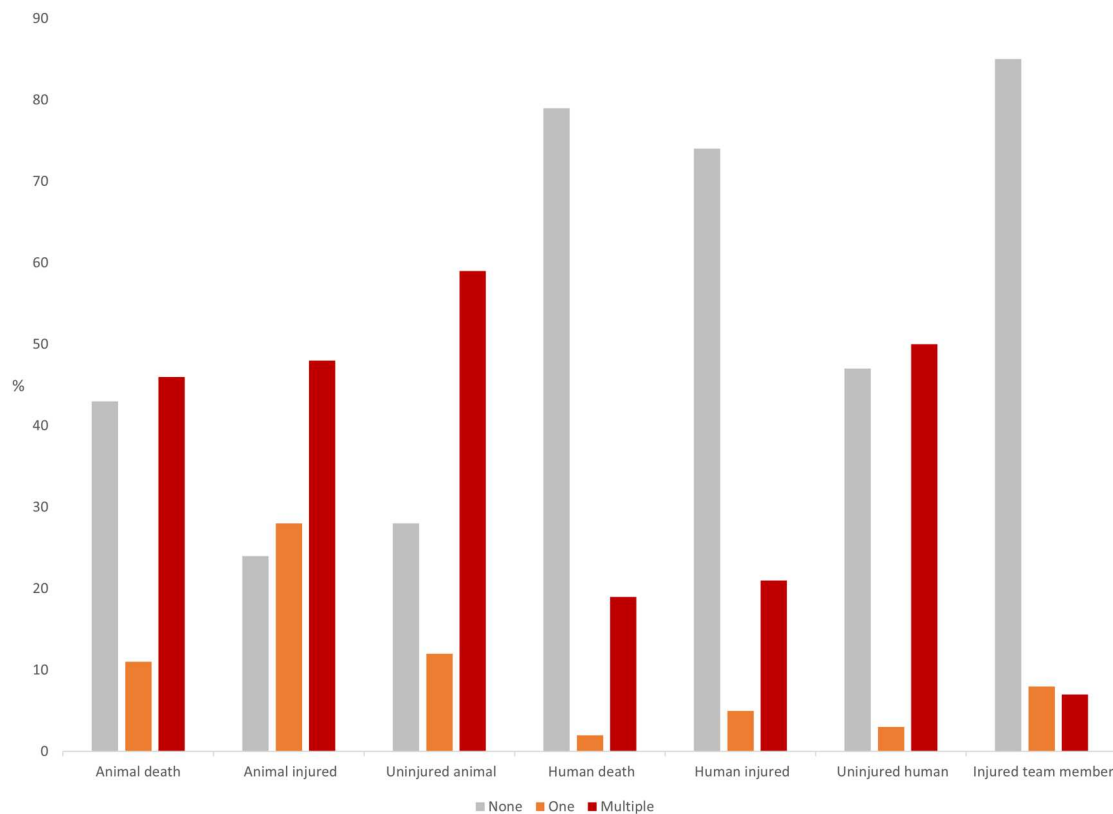


Figure 1. Percentage of respondents (n = 227) to a survey on the psychological impact for participants helping in emergency and disaster events involving animals, who reported incidents of injury and death in animals and humans in the recalled event. Responses were missing from Animal death (n = 6), Animal injured (n = 6), Uninjured animal (n = 10), Human death (n = 10), Human injured (n = 14), Uninjured human (n = 14), and Injured team member (n = 11).

Table 3. Results of multivariable general linear model based on data gathered from a survey of responders to emergency and disaster events involving animals, illustrating the associations between the self-assessed compromised mental well-being of the responders and descriptive variables associated with the responder and the event described.

Variable	Estimate of co-efficient.	SE	OR	95% CI	P-value ^a	P-value ^b
Intercept	-1.49	0.36	0.22	0.12–0.44		< 0.001
Sex of respondent						
Female	0.86	0.35	2.37	1.25–4.57	< 0.001	0.009
Male	Ref					
Animal injured during the incident						
Yes	1.04	0.35	2.84	1.44–5.75	< 0.001	0.003
No	Ref					
Member of the public injured during incident						
Yes	1.32	0.42	3.73	1.68–8.99	< 0.001	0.002
No	Ref					
A team member injured during the incident						
Yes	2.16	0.79	8.65	2.25–57.67	0.002	0.006
No	Ref					

^aWald test p-value for category within the variable.

^bWald test p-value for variable.

Ref = reference group.

associated with mental well-being at $p < 0.25$ and therefore considered eligible for inclusion in the multivariable model. Results for variables excluded from consideration for the final model are shown in Supplementary Table 4. The multivariable model found that females were more likely than males to report scores that may indicate compromised mental well-being (OR = 2.4, 95% CI = 1.3–4.6, Table 3). In addition, an injury involving an animal, member of the public, or a teammate was also associated with affected mental well-being.

IES-R findings

The distribution of the IES-R questionnaire summed score data is shown in Figure 2. Of the respondents, 207/227 (91%) scored < 24 , and 20/227 (9%) scored ≥ 24 . Further analysis of the latter category includes 13/227 (6%) scoring between 24 and 32, 3/227 (1%) between 33 and 36, and 4/227 (2%) scored ≥ 37 .

Recovery and support

For the event chosen and described by survey respondents, the percentage that tried different recovery techniques was stratified by responder-assessed effectiveness (Table 4). Talking with friends, family, or teammates was considered an effective recovery technique by almost all (187/197, 95%) respondents that tried it, and debriefing with the team or mentor was similarly rated by 163/172 respondents (95%). Socialising was considered an effective recovery technique by 119/135 (88%) of respondents, while 91/105 (87%) found mindfulness/meditation effective. Of the few respondents who tried counselling, 17/34 (50%) found it to be effective. Self-medication, prescribed medication, and alcohol had low efficacy. The perceived adequacy of psychological support ranged from 4–48% (Table 5). However, 132/206 respondents (64%) felt better after talking to a support person and a third (70/206) felt about the same. Irrespective of the self-reported effects of the experience on their mental well-being,

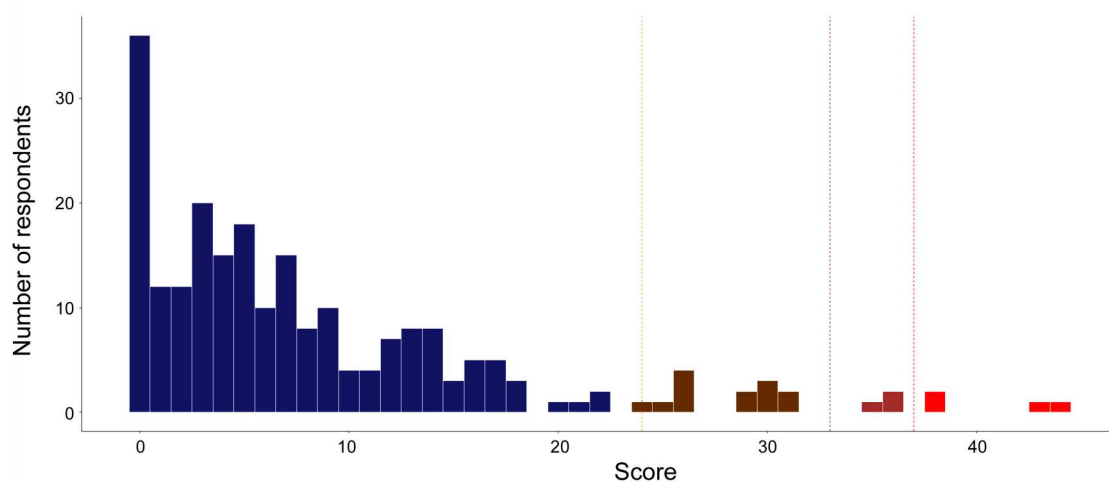


Figure 2. Histogram of the Impact of Event Scale calculated from the responses to a survey of 227 responders who participated in emergency and disaster events involving animals. Vertical dashed lines represent cut-points where scores of ≥ 24 indicates a clinical concern for post-traumatic stress disorder (PTSD), > 33 supports a probable diagnosis of PTSD, and ≥ 37 is likely to meet the criteria for full PTSD.

Table 4. Recovery strategies and their perceived efficacy, reported by responders to emergency and disaster events involving animals during a survey investigating the psychological impact on the responders of these events, and the self-management strategies adopted in mitigation.

Recovery strategies	Not effective	Partially effective	Effective	Did not try this
Alcohol (n = 210)	32 (15%)	12 (6%)	4 (2%)	162 (77%)
Counselling (n = 210)	17 (8%)	3 (1%)	14 (7%)	176 (84%)
Debriefing with team or mentor (n = 220)	9 (4%)	24 (11%)	139 (63%)	48 (22%)
Exercise or recreational activities (n = 213)	11 (5%)	33 (15%)	89 (42%)	80 (38%)
Mindfulness or meditation (n = 212)	14 (7%)	28 (13%)	63 (30%)	107 (50%)
Prescribed medications (n = 207)	21 (10%)	4 (2%)	3 (1%)	179 (86%)
Socialising (n = 212)	16 (8%)	41 (19%)	78 (37%)	77 (36%)
Talking with friends, family or teammates (n = 222)	10 (5%)	37 (17%)	150 (68%)	25 (11%)
Self-administered drugs (n = 205)	18 (9%)	1 (0.5%)	1 (0.5%)	185 (90%)
Other (n = 31)	3 (10%)	1 (3%)	6 (19%)	21 (68%)

for 181/227 (80%) respondents, the overall impression of the experience was positive, while 27/227 respondents (12%) reported neutral feelings about the deployment, and 19/227 (8%) reported that the experience affected them negatively.

Discussion

These findings support our hypothesis that some responders deployed to provide incident or disaster support for emergencies involving animal casualties are at risk of impacts on their psychological well-being. Factors and strategies that may, from the perspective of respondents, mitigate the risks to their mental well-being were also documented. Whilst veterinarians and veterinary professionals made up the largest cohort in

the current study, the study population encompassed a wider variety of animal industry professionals than many other similar studies, which have focused on specific professional responders or veterinarians.

Although 64% of survey respondents indicated that they had received training in stress mitigation or support, only 4% considered themselves expertly qualified, and it is unclear whether this training was considered beneficial, or if training increased the awareness of the respondents to self-report compromised mental well-being. However, training in programmes designed to increase resilience and manage stress among police officers is reported to be beneficial (Antony *et al.* 2020). The impact of stress mitigation training for veterinary professionals involved in animal disaster events is not often studied (Vroegindewey and Kertis 2021; Paul *et al.* 2024). However, a study of canine search and rescue handlers found that social support and training are protective against PTSD (Alvarez and Hunt 2005).

In the final multivariable model, female respondents had more than twice the odds of reporting compromised mental well-being when compared to males. Other studies have revealed a similar gender disparity in the prevalence of self-reported mental disorders and well-being, and this has been in part attributed to greater internalisation by women and externalisation by men, and other factors associated with sex/gender (Kuehner 2017; Li and Graham 2017). An association between witnessing an injury to humans, whether they be the public or team members, and compromised mental health was perhaps unsurprising. Veterinary and other animal professionals have been identified as at risk of compromised mental well-being in response to participation in disaster responses that include witnessing animal cruelty or required participation in objectionable or mass euthanasia (Hibi *et al.* 2015; Connolly and Norris 2024). Vroegindewey and Kertis (2021) have also reported these concerns for veterinary professionals who have participated in disasters. The current study identifies more specific associations with human and animal casualties that could frame future preparedness strategies for emergency responders in animal-related events.

Table 5. Number (%) of respondents in a survey of responders to emergency and disaster events involving animals reporting that the different sources of support offered in response to the psychological impacts of this role were adequate, the likelihood of talking with the support person and the effect on the respondent of this interaction.

	n (%)
Self-reported adequacy of psychological support (n = 205) ^a	
Partner	98 (48%)
Team	97 (47%)
Friend	79 (39%)
Organisation	79 (39%)
Work	66 (32%)
Other family member	38 (19%)
Counsellor/similar professional	9 (4%)
No one	8 (4%)
Other	9 (4%)
Likelihood of talking with a support person (n = 206) ^b	
Always	62 (30%)
Most of the time	52 (25%)
About half the time	12 (6%)
Sometimes	75 (36%)
Never	5 (2%)
Respondent's usual feelings after talking to the support person(s) (n = 206)	
Much better	61 (30%)
Moderately better	42 (20%)
Slightly better	29 (14%)
About the same	71 (34%)
Slightly worse	2 (1%)
Moderately worse	1 (0.5%)
Much worse	0 (0%)

^aPercentages sum to >100% due to respondents reporting multiple support options.

^bPercentages sum to > 100 due to rounding.

Approximately 10% of respondents in this study scored > 24 on the IES-R, indicating PTSD is a clinical concern (Creamer *et al.* 2003; Weiss 2007). This is similar to the proportion of human volunteers in canine search and rescue teams who met the threshold indicative of PTSD in a German study (Augsburger 2020), where 6% and 12% of 116 questionnaire respondents also reported symptoms of anxiety and depression, respectively. As a contrast, partial or full PTSD reported among veterinary and animal workers following the management of a foot and mouth disease outbreak in Japan was as low as 1.3% (Hibi *et al.* 2015).

Of the approximately 10% of participants in the current study with IES-R scores indicating some degree of PTSD, two-thirds had scores consistent with clinical concern, and one-third met the criteria for probable diagnosis of PTSD. The PTSD prevalence observed in this study, based on self-reported scores from a validated tool, is equivalent to a worldwide pooled current prevalence of 10% reported in a 2012 meta-analysis of 28 studies of rescue workers (Berger *et al.* 2012; Augsburger 2020). In contrast, the global lifetime prevalence of PTSD in the general population is approximately 4%, with higher rates (5%) observed in high-income countries (Koenen *et al.* 2017). However, while the findings suggest there is a notable psychological impact from probable PTSD for a small number of individuals, it is important to acknowledge that these results are based on self-reported data rather than clinical diagnoses and the use of the IES-R tool by trained mental health professionals.

Social activities such as talking with friends, families or teammates was a highly favoured recovery strategy by respondents and are supported by other studies as being some of the more effective coping strategies (Tran 2018). Embracing and enhancing social support with prevention programmes is seen as critical to preventing PTSD in emergency responders (Southwick *et al.* 2016; Kaufmann *et al.* 2020). Debriefing, such as intentional post-incident discussion, was equally valued by the survey respondents, suggesting a role for organisational support of trained volunteer and professional responders in preventing and managing challenges to mental health. This study did not determine whether the debriefing was formalised or was a casual discussion. Although there are concerns over the lack of evidence that validates best practices in this domain (Tan *et al.* 2022), debriefing has been reported to reduce stress and anxiety among German voluntary canine search and rescue workers (Augsburger 2020). It should be noted that this support is often not available to spontaneous volunteers or those not affiliated with a response organisation (Shaw *et al.* 2024). Compared with other activities – such as exercise or recreational

activities, talking with others or socialising – few survey respondents tried counselling as a recovery aid; of these, 50% found it beneficial. The reasons for the low number accessing counselling were not investigated in this study. The time availability for counselling and the stigma associated with psychological support have been described by others as barriers to seeking counselling (Andrade *et al.* 2014; Haugen *et al.* 2017; Jones *et al.* 2020).

Training that addresses the stressors identified in this study is recommended to decrease the risk of mental compromise in responders (Hibi *et al.* 2015; Augsburger 2020; Kaufmann *et al.* 2020). The application of specific skills, such as behavioural health resilience, has been suggested as critical to strengthening the capabilities of veterinary and other responders (Vroegindewey and Kertis 2020). Training that addresses the stress identified in this study from witnessing animal or human injury or death is also recommended. For example, system-based psychological first aid training increases the well-being and post-traumatic growth of emergency medical first responders, as compared to those without this preparation (Peng *et al.* 2024). Psychological skills training has also been demonstrated to be an effective approach to supporting the mental health of police officers by mitigating the risk of depression and anxiety (Lu and Petersen 2023). We suggest that future research should combine self-report measures with interview methods that permit in-person qualitative exploration of the role of training in relation to the mental well-being of responders to emergencies with animal casualties (Hunt *et al.* 2015).

The findings of this survey may have been influenced by limitations in participants' recollection of events that occurred up to 5 years previously, which could impact the accuracy and validity of the data provided (Colombo *et al.* 2020). Prior diagnoses of physical and mental health disorders have been shown to increase the risk of psychological distress, and it is not known how these factors, or mixed lifetime traumatic events, may have influenced IES-R scores in the current study (Asukai *et al.* 2002; Alvarez and Hunt 2005). Questions regarding these were not included in the survey and may have influenced results, particularly for those with a history of attendance at multiple incidents. The survey on the effects of the incident described on mental well-being was based on the self-identification of impacts on responders and perceived efficacy of recovery strategies and may not align with the assessments based on the implementation of the IES-R under the supervision of qualified mental health professionals. Future studies should consider the planning of the administration of the IES-R tool by trained mental health professionals within a consistent time frame after incidents, and at regular intervals thereafter, to better document its validity in this population

of responders. The approach to the survey's distribution and compilation in English may have resulted in sampling bias. The cross-sectional survey design and non-probability sampling limit the generalisability of the results and may be associated with response and self-selection biases.

Conclusions

This international survey of veterinary and non-veterinary responders to emergencies involving animal casualties shows that many are at risk of psychological trauma associated with these events, potentially leading to compromise of mental well-being. Types of psychosocial support self-identified by respondents as most frequently helpful to their recovery included activities such as talking with others, socialising, physical or recreational activity, debriefing, and mindfulness or meditation. The effectiveness of these techniques requires further objective evaluation to ensure that education on mitigation and recovery strategies is evidence-based. Overall impressions of engagement in emergency responses found in this study are mostly positive, despite many survey participants reporting some effect on their mental well-being, suggesting resilience among many responders. The generalisability of the results from this study is limited by the study design and possible respondent response and self-selection biases.

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