A CROSS-SECTIONAL STUDY ON RESILIENCE TO BURNOUT IN VETERINARY SURGEONS IN THE UNITED KINGDOM

Thesis submitted for the degree of

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by

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Declaration

I confirm that the literature review and research report are an original piece of work and have been submitted in partial fulfilment of the degree of Doctorate in Clinical Psychology. No part of the report has been submitted to any other degree or to any other institution.

A cross-sectional study on resilience to burnout in veterinary surgeons in the United Kingdom

By Donna Bella Back

Thesis abstract

Resilience is a multidimensional construct that refers to a wide range of characteristics and processes that enable positive adaptation in the context of adversities. The resilience of veterinary surgeons, along with other healthcare professionals such as medical doctors, is constantly being tested by occupational stressors that are inherent to their profession. This thesis examines factors that characterise resilience in both human and animal healthcare clinicians.

Literature review
Although there is wide disparity in the conceptualisation of resilience, there seems to be a consensus that resilience entails positive adjustment in the face of potentially traumatic experiences. The current systematic review appraised and synthesised findings from 13 quantitative articles. Overall, the findings suggest that higher resilience is associated with a wide array of both person- and context-specific factors.

Empirical report
The empirical study investigated the person- and occupation-specific resilience factors to burnout in veterinary surgeons in the United Kingdom. One of the main aims was to identify if the selected resilience variables *buffer* the impact of stress in burnout. The study employed a cross-sectional design.

A total of 404 veterinary surgeons took part in the survey. The data were examined using descriptive and logistic regression analysis.

Overall, the results showed that none of person- and occupation-specific resilience variables buffered the impact of stress on burnout. However, direct linear relationships were found between burnout, and sex, socially prescribed perfectionism, self-compassion, peer cohesion, and work pressure. The results also showed a consistently strong linear relationship between stress and burnout. The lack of buffering effect highlights the complexity of resilience to burnout in veterinary surgeons.

Critical appraisal
The critical appraisal reviews learnings and reflections on the research process. An evaluation of personal and professional developmental issues was also discussed.

Acknowledgement

Word count

Content	Word count
Thesis Abstract	284
Section one: Literature Review	
Abstract	233
Main Text	5,618
Tables (Qualitative synthesis)	1,531
References	2,009
Section two: Research Report	
Abstract	254
Main Text (excluding tables & figures)	10,001
References	2,188
Section three: Critical Appraisal	
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Non-mandatory Appendices	1,524
Total Word Count (excluding quantitative tables, figures, references and mandatory appendices)	**21,470**

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List of abbreviations and acronyms

BDFR   Bi-directional Framework for Resilience
ORF   Occupation-specific Resilience Factors, which include the four
work environment dimensions: peer cohesion, supervisor support,
work pressure, clarity, and control
PRF   Person-specific Resilience Factors, which include: self-oriented
perfectionism,
socially prescribed perfectionism, and self-compassion
SOP   Self-Oriented Perfectionism
SPP   Socially Prescribed Perfectionism
vets   Veterinary Surgeons

Section one

A systematic review of resilience factors in medical doctors

By Donna Bella Back

Abstract

Aim: The primary aim of this systematic review was to examine the literature to date on factors that are associated with resilience in both junior and senior medical doctors as measured by the standardised resilience questionnaires. The secondary aim was to examine the literature to date on the definitions and measures of resilience in this sample.

Introduction: Doctors are continually exposed to extremely emotive issues on a daily basis. The incidence of mental health difficulties, substance misuse, burnout, suicidal ideations, and suicide is on the rise. Yet, the literature on resilience in this profession remains very limited.

Method: A systematic review of the available quantitative literature regarding resilience in doctors were appraised and synthesised. The PRISMA flow diagram for conducting a systematic review was followed (Moher et al., 2003).

Results: A total of 13 articles were of relevance and included in the systematic review. The quality of these articles was appraised using the AXIS tool (Downes et al., 2016). A range of person- and occupation specific factors such as mindfulness, self-compassion and personal accomplishment were found to be positively associated with resilience. Correspondingly, a range of person- and occupation-specific factors such as anxiety, stress and burnout symptoms were found to be negatively associated with resilience.

Conclusion: The wide array of factors associated with resilience underscores it multifaceted construct. Fundamentally, it highlights the ongoing inconsistencies in its conceptualisation and measures.

Keywords: resilience; doctors; physicians

1. Introduction

Working as a medical doctor seems, at best, rewarding and at worst, punishing. Whilst caring for others can be enormously gratifying, it can also be very exhausting and highly stressful (Gyorffy et al., 2016). Doctors are repeatedly exposed to extremely emotive issues such as suffering, distress, fears, failures, and death. It is perhaps unsurprising that the prevalence of substance use (e.g. Firth-Cozens, 2001; Gold et al., 2005; Lindeman et al., 1998), burnout (e.g. Imo, 2017; Shanafelt et al., 2009), depression (e.g. Earle & Kelly, 2005; Fahrenkopf et al., 2008), suicidal ideations (e.g. Hem et al., 2000) and suicide (e.g. Gold et al., 2005; Hawton et al., 2001; Lindeman et al., 1998; Schernhammer & Colditz, 2004) in doctors is a growing concern.

There is evidence that resilience is not just important to the doctors themselves, it is also crucial to the delivery of high-quality health care and patient safety (Scheepers et al., 2015). Whilst it is important to understand *why* some doctors struggle in their role, it is equally important to recognise *what* enables others to flourish amidst adversities. The past 40 years of research have demonstrated the shift from a very *pathogenic* to a more *salutogenic* understanding of resilience. In contrast to early studies whose investigations focused mainly on negative outcomes (e.g. burnout & suicide; Shanafelt et al., 2009; Gold et al., 2005) and factors associated with these outcomes, more recent studies are now focusing on factors that enable positive adaptation (e.g. resilience factors). Although resilience is increasingly recognised as an important prerequisite amongst medical professionals (Horsfall, 2016), the definition of resilience remains vague and the resilience factors widely disparate.

The purpose of this systematic review is twofold. First is to examine the definitions and measures of resilience from studies that employed standardised resilience questionnaires in a sample of medical doctors. Second is to identify factors or characteristics that are associated with resilience in doctors as measured by standardised resilience questionnaires.

1.1. Definitions and complexities of the resilience concept

The concept of resilience has a wide array of definitions both in the broader resilience literature and the healthcare resilience literature. Early researchers describe it as a fixed, individual 'trait' (e.g. Block & Block, 1980; Rutter, 1987) whilst others describe it as a dynamic interaction 'process' between an individual and the individual's context (e.g. Egeland et al., 1993; Waller, 2001; Luthar et al., 2000). Although defined in various ways, it seems that the widely cited conceptualisation of resilience defines it as factors that facilitate *positive adaptation* in the context of *adversity* (e.g. Connor & Davidson, 2003; Rutter, 1985; Luthar et al., 2000). *Adversity* is often defined in the literature as negative day to day life circumstances that can lead to undesirable outcomes, which is linked to difficulties and/or trauma (e.g. Vanderbilt-Adriance & Shaw, 2008). Fletcher and Sarkar (2013) were among the very few authors who suggest that adversity can also be a positive life event. For instance, a job promotion can also be an adversity especially if the new role entails complex responsibilities which the individual may struggle to cope with at some point (Fletcher & Sarkar, 2013). In contrast, *positive adaptation* refers to behavioural manifestations of

social competence and positive internal well-being (e.g. Luthar & Cicchetti, 2000; Masten & Obradovic, 2006).

Within the healthcare literature, the concept of resilience seems to overlap with the concepts of *wellbeing* and *wellness*. The term *wellness* is often used to refer to the completeness of one's physical, mental and emotional well-being (Brady et al., 2018). It has been suggested that *wellness* may augment one's resilience and resilience may increase *wellbeing* (Murray et al., 2017). To ensure clarity on the topic, the researcher opted to only use the term resilience when searching for relevant literature.

With a number of previous resilience studies in doctors framing the concept of resilience as *factors* or *characteristics* that were associated with *not* burning out or low burnout symptoms, psychometric measures on a range of psychological 'wellbeing dimensions' (Keyes, 2005; e.g. optimism, mindfulness, affect) were often utilised in combination with burnout or work-related stress measures (e.g. Maslach Burnout Inventory; Maslach et al., 1997). Consequently, the definition and operationalisation of the resilience concept in this profession remains widely incompatible. For the purpose of this review, the concept of resilience was operationalised as self-reported, personal resources that enable positive adaptation despite adversities as measured by a standardised resilience questionnaire.

1.2. The 'resilient' versus the 'non-resilient' doctor

Previous quantitative studies have indicated that resilience in doctors is associated with demographic and occupation-specific variables such as older age, having fewer children, more years in practice, control over work schedule and hours, ability to manage their workload, positive work experiences, higher levels of income, and social prestige (e.g. Keeton et al., 2007; Montero-Marin et al., 2015; Murray et al., 2017). Person-specific variables that were found to be *positively associated* with greater resilience in doctors include self-directedness, mindfulness, self-compassion, optimism, self-efficacy, tolerance to uncertainties, less concern about bad outcomes, less reluctance to disclose uncertainties to patients, low harm avoidance, persistence, cooperativeness, emotional intelligence, agreeableness, emotional stability, and positive wellbeing (e.g. Keeton et al., 2007; Montero-Marin et al., 2015; Murray et al., 2017). In contrast, person-specific variables that were found to be *negatively associated* with greater resilience in doctors include emotional exhaustion, depersonalisation, stress, fatigue, depression, lower personal meaning in patient care, anxiety due to uncertainty, intolerance of uncertainty, reluctance to disclose uncertainties to patients, lower mindfulness, and lower self-compassion (e.g. Cooke et al., 2013; Lebares et al., 2017). It is important to note that the relationship between resilience and these factors was largely based on the direct linear relationships between resilience scores or selected resilience variables (e.g. self-compassion, mindfulness, & optimism) and outcome variables (e.g. burnout & stress).

In Firth-Cozens' (2001) seminal, longitudinal study on predictors of resilience in doctors, she concluded that a combination of both individual (personality, previous hardships & coping strategies) and organisation factors (workload & hours) predicted an individual's resilience.

1.3. Stress-related mental health difficulties in medical doctors

Individuals who pursue a career in medicine often do so with the intention of helping others (Arnetz, 2001; Gyorffy et al., 2016). Although altruistic emotions and behaviours are at best beneficial to an individual's wellbeing (Post, 2005), at worst these can also be very harmful and this is especially true in the case of doctors working in highly stressful environments.

The rates of mental health problems and burnout in doctors based in the United Kingdom (UK) are disturbingly high. Imo's (2017) systematic review on the prevalence of burnout and stress-related mental health difficulties (e.g. depression, anxiety & trauma) amongst UK doctors revealed that the rate of mental health problems ranges from 17% to 52%. This seems ominously high compared to the 21% prevalence rate of common mental health difficulties in UK private households over an 18-month period (Imo, 2017). She also found that compared to doctors in other countries such as Australia and New Zealand, UK doctors are more prone to burnout with the incidence of emotional exhaustion ranging from 31% to 54.3% (Imo, 2017).

It is important to note that the principal mental health difficulties discussed above also come with secondary consequences. There is evidence that

burnout in doctors can lead to poor patient care, medical errors, accidents, or even death of a patient (Shanfelt et al., 2002; Shanafelt et al., 2010). Burnout can also lead to behavioural responses such as drug and alcohol misuse, tardiness, increased absenteeism, or quitting work (Probst et al., 2012). Similar to burnout, mental health difficulties also negatively impacts on quality of patient care, relationships with colleagues, job satisfaction, productivity, and performance at work (NICE, 2009; Firth-Cozenz, 2001).

As with suicide in the general population, the incidence of suicide in doctors was found to be significantly linked to mental health difficulties, alcohol and substance abuse (Sansone & Sansone, 2009). Previous studies have shown that suicide remains as one of the major causes of early death in practising doctors. Hawton and colleagues' (2001) retrospective cohort study on 223 doctors who died by suicide in the UK revealed that the annual suicide rates per 100,000 for male and female doctors were 19.2 and 18.8 respectively. They also indicated that female doctors were particularly at an increased suicide risk whereas male doctors appeared to be at less risk than that of the general population (Hawton et al., 2001).

1.4. Rationale and aims of the current review

It is clear from the above section that resilience to stress has an important role in keeping the doctors, patients, and healthcare service thriving. The overarching aim of this paper was to systematically review quantitative literature to date on the conceptualisation of resilience in both junior and medical doctors across the healthcare system (primary, secondary, & tertiary).

In particular, the aims of this systematic review were to: 1) examine the definitions and measures of resilience, 2) identify factors or characteristics that were found to be associated with resilience, and 3) synthesise evidence on resilience to date from high quality resilience studies in medical doctors.

2. Method

The review process was threefold. First, a systematic literature search was conducted by creating a search strategy and selecting suitable papers for the review. Second, the quality of selected papers was appraised. Third, overall findings were synthesised. The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA; Moher et al., 2003) guidelines were used to guide the reporting of the review findings.

2.1. Systematic literature search

2.1.1. Step 1: Constructing the research question

Prior to conducting the search, an overarching research question was established: How was resilience in medical doctors conceptualised in the literature? More specifically, how was it defined and measured, and what factors were associated with resilience in doctors?

2.1.2. Step 2: Identifying relevant studies

To ensure the breadth of review, most commonly used health databases were utilised: *PubMed*, *PsycINFO, Scopus,* and *Web of Science*. The Cochrane Library Database was also searched for relevant review articles. The literature search was carried out on 01/01/2019. Using the Boolean logic 'OR' and 'AND',

the key search terms were: *physician* OR "medical doctor*" OR "doctor*" AND resilien* OR "psychological* resilien*" OR "resilience scale" OR "resilience measure" OR "resilience test" OR "resilience psychometric" OR "resilience questionnaire" OR "resilience survey" OR "self report* resilience" OR "resilience assessment"*. See Appendix A for a full list of search terms and breakdown of number of articles yielded per database.

Using the National Library of Medicine's (NLM) controlled vocabulary thesaurus, otherwise known as Medical Subject Headings (MESH) *Tree Structures* as a guide, the researcher opted to utilise 'broader' terms such as *physician**, *medical doctor**, and *doctor** in order to capture medical doctors from all specialties (e.g. cardiologists, general practitioners, surgeons & paediatricians to name a few). Terms or descriptors are organised hierarchically on the MESH Tree Structures and more specific terms such as cardiologists and surgeons fall under more general terms such as physician* and doctor*.

In contrast, a 'more focused' approach was employed when the search terms for the concept of *resilience* were generated. The researcher purposely opted for a more specific set of key search terms (e.g. psychological* resilien*; resilience scale; resilience survey) after having learnt from the pitfalls of the initial scoping exercise. One of the biggest drawbacks of including broad-based search terms for resilience such as *wellness* and *wellbeing* was having to screen several thousands of irrelevant papers.

Applied search limiters include: English language, studies on humans, and a time limit of 1st January 1998 to 31st December 2018. The search was limited to the past three decades due to the large volumes of yields.

2.1.3. Step 3: Selecting studies for the review

Inclusion and exclusion criteria were applied when screening papers to be included in the review. The inclusion criteria were: (a) studies on resilience in junior and senior medical doctors of any specialties; (b) studies must have employed standardised resilience questionnaires; (c) studies must have used quantitative methods of data collection and analysis; and (d) published studies since January 1998. The exclusion criteria were: (a) qualitative studies on resilience; (b) quantitative resilience studies on *undergraduate* medical school students; (c) studies published in non-English language; (d) studies that employed non-standardised resilience measure; (d) and articles that were not peer reviewed. Data were extracted using the data extraction form found in Appendix B.

2.2. Quality appraisal

Quality appraisal was carried out using a modified version of the AXIS (Assess the Quality of Cross-sectional Studies) tool (Downes et al., 2016). The AXIS tool was especially developed to critically appraise the study design and risk of bias in cross-sectional studies across disciplines (Downes et al., 2016). It was constructed using a rigorous process of a comprehensive review, testing and three rounds of consultation with a Delphi panel of 18 international experts from the field of medicine, nursing and veterinary (Downes et al., 2016).

To assess the quality of the papers, a scoring system was employed to replace the original 'yes/no' tick only AXIS structure. The 20-item checklist covers five domains: introduction, methods, results, discussion and others (funding sources & ethical approval). Each item under each domain is given a rating of '1' if criterion is met or '0' if criterion is not met. A score of '0' is also given if criterion cannot be determined. The AXIS was selected due to its high applicability to cross-sectional studies (Downes et al., 2016). See Appendix C for the version of the AXIS tool used in this review.

3. Results

The database search yielded a combined total of 1038 entries. Articles from an additional source was included (n = 2), identified from the reference list of a paper used for the background literature. Following removal of close and exact duplicates, 545 articles remained. A total of 429 articles were removed following review of titles. Of the remaining 116 articles, 103 were excluded as irrelevant based on abstracts. The process of identification and selection of papers is illustrated in the PRISMA flow diagram in Figure 1.

Figure 1. The PRISMA flow diagram for the systematic review of factors associated to resilience in medical doctors
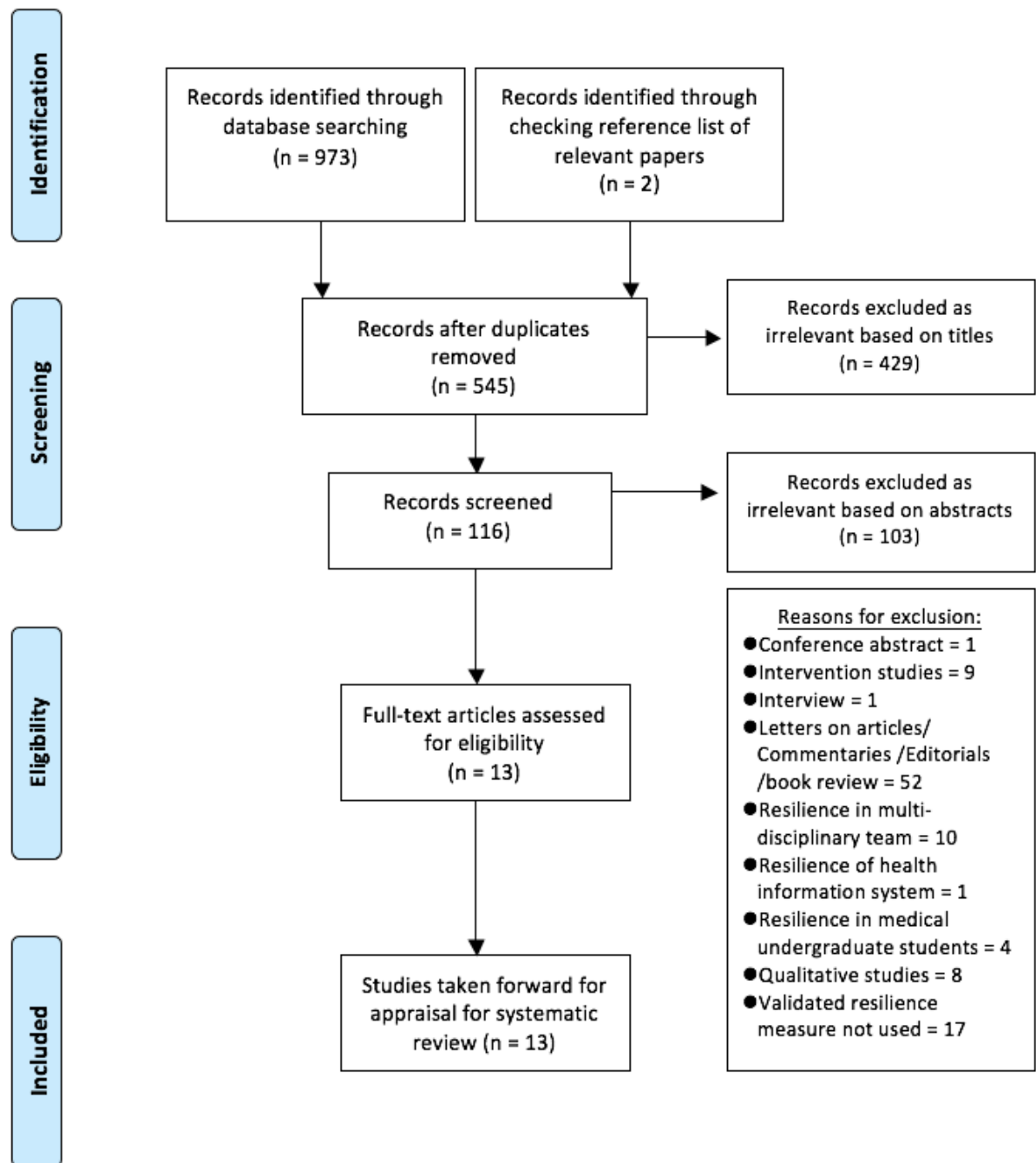
3.1. Summary of included papers

A total of 13 studies were identified as suitable to be included in the current review. All included studies were published in the last five years including four in 2013, two in 2015, four in 2017, and three in 2018. Eleven studies were cross-sectional while the other two studies were prospective. A summary of quality ratings and characteristics of the included studies is provided in Table 1. A synthesis of the findings from the AXIS (Downes et al., 2016) criteria is also presented in Appendix C.

3.2. Countries

All included studies originated from high income western countries: United States of America (n= 5), United Kingdom (n= 2), France (n= 1) Australia (n= 2), Canada (n= 1), Spain (n = 1) and South Africa (n= 1).

3.2. Response rates, population and setting

Response rates were reported in all studies excluding Lebares et al. (2017). *Reported* response rates across the twelve studies ranged from 34.5% (Taku, 2013) to 100% (Olson et al., 2015), with an overall mean of 71.2%.

There were more females (1786) than males (1129) across all thirteen studies. Only six of the thirteen studies reported the mean age of their participants (Lebares et al., 2017; MacFarland & Roth, 2017; Murray et al., 2017; Olson et al., 2015; Taku, 2013) with the age ranging from 22 to 74.

Table 1. Summary of quality ratings and characteristics of the included studies

Author/s (year) Location	AXIS Quality Rating	Sample size and response rate	Aim/s of the study	Resilience measure	Definition of resilience	Pattern of results associated with resilience
MacFarland & Roth (2017) USA	19	N = 56 (of 96) internal medicine house officers Response rate was 58%.	To identify the association of resident physician resilience with empathy and distress	Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003)	'Personal attributes' such as optimism, ability to adapt and face fear, a moral compass, social support, cognitive or emotional flexibility, etc.	Resilience level did not vary between sexes, interns/residents, and pre/post-rotation scores. Resilience was negatively correlated with distress but not with empathy nor with the change in empathy over the course of rotation. Resilience in males was negatively correlated with distress. No significant correlation between resilience and distress in females. Residents who described 'death' as the most stressful part of rotation had higher resilience. Those who derived a sense of meaning from working with dying patients also had higher resilience.
McCain et al. (2017) UK	19	N = 283 hospital doctors (52.2%) and GPs (41.8%) Response rate was 52.2%.	To measure resilience, coping and professional quality (including burnout, secondary traumatic stress and compassion satisfaction) of life in doctors from a single NHS Trust	CD - RISC (Connor & Davidson, 2003)	Personality and environmental factors that enables the individual "to adapt well in the face of adversity or significant stress'	Resilience did not differ between sexes and grades of doctors. Low resilience (along with substance use, behavioural disengagement, self-blame, high secondary traumatic stress, & low compassion) were positive associated with burnout.
Murray et al. (2017) * UK (Northern Ireland)	19	N = 221 (of 400) General Practitioners (GPs) Response rate was 55%.	To profile and contextualise GP positive mental health and personal psychological resources.	Brief Resilience Scale (BRS; Windle et al., 2011)	A 'malleable and modifiable personal resource'.	No significant difference between GP characteristics (sex, location, clinic partners, age) and self-efficacy or resilience scores. Optimism, self-efficacy, resilience & hope was moderately correlated with positive mental wellbeing.

Study / Country	Score	Sample	Aim	Resilience measure	Definition	Findings
Lebares, et al. (2017) * / USA	18	N = 566 general surgery trainees. Response rate published in previous paper.	To evaluate the relationship between: 1) high stress and burnout, 2) prevalence of associated distress symptoms, and 2) presence of potentially modifiable individual characteristics that can contribute to risk and resilience	Block Ego Resiliency Scale (BER; Farkas & Orosz, 2015)	The 'ability to adapt to changing environmental demands'	Resilience and mindfulness not associated with sex or training level. Greater trait resilience was significantly associated with a decreased risk of burnout from high emotional exhaustion, high depersonalization, or low personal accomplishment. Greater trait resilience was also each significantly associated with a decreased risk of moderate to severe depressive symptoms, suicidal ideation, and high anxiety. Greater trait resilience was associated with a 65% decrease in the risk of high stress.
Montero-Marin, et al. (2015) / Spain	18	N = 622 (of 636) primary care physicians from all of the Spanish regions. Response rate was 97.80%.	To evaluate the associations of mindfulness and resilience with features of burnout types (overload, lack of development, neglect) in primary care physicians, taking into account the potential mediating role of negative and positive affect.	CD - RISC (Connor & Davidson, 2003)	A 'dynamic and flexible adaptation process that could serve as a protective factor' and 'the personal strength, energy, and motivation that enables an individual to cope, recover and flourish in adversity'	Moderately high associations between mindfulness and resilience. Resilience with negative affect moderately correlated with mindfulness. Resilience highly correlated with positive affect. Resilience was negatively correlated with neglect.
Simpkim et al. (2018) / USA & Canada	18	N = 50 (of 86) eligible residents. Response rate was 58%.	To determine the relationship between stress from uncertainty and resilience, and depression, and burnout among paediatric residents from four freestanding	Resilience Scale - 14 (RS-14; Wagnild, 2009)	A 'personality attribute' that 'moderates the negative effects of stress and promotes the ability to bounce back following adversity'	Resilience was not related to age, gender, site, or year of residency. Overall, there was a strong negative correlation between stress from uncertainty and resilience. Depressed residents were significantly more likely to have low resilience than non-depressed residents. Similarly, depressed residents had

Author (Year) Country		Sample / Response rate	Aim	Measure	Findings
			children's hospital in North America		significantly lower mean resilience scores than non–depressed residents. Burned out residents were significantly more likely to have low resilience than non–burned out residents. Burned out residents had a significantly lower mean resilience score than non–burned out residents
Cooke et al. (2013) Australia	17	N = 128 (of 148) GP Registrars Response rate was 90%.	To measure resilience, burnout, compassion satisfaction, personal meaning in patient care and intolerance of uncertainty in Australian GP registrars	RS-14 (Wagnild, 2009)	A 'dynamic, evolving process of positive resilience scores. Resilience was positively associated with compassion satisfaction and personal meaning in patient care. Resilience was negatively associated with burnout, secondary traumatic stress, inhibitory anxiety, general intolerance to uncertainty, concern about bad outcomes and reluctance to disclose uncertainty to patients. Only ten percent of registrars had high attitudes and effective strategies that we employ in response to life stressors'
Eley et al. (2013) Australia	17	N = 479 family trainee practitioners Response rate was 61%.	To examine the relationship of resilience to personality traits and resilience in doctors in order to identify the key traits that promote or impair resilience	RS-14 (Wagnild, 2009)	A 'process that is influenced by one's combination of personality traits and their environment'. Strong to medium positive correlations were found between resilience and high self-directedness, high persistence and high cooperativeness and negative with low harm avoidance. Individual differences in personality explained 39% of the variance in resilience. The three traits which contributed significantly to this variance were self-directedness, persistence and harm avoidance.
Morice-Ramat et al. (2018) France	17	N = 137 GP residents Response rate was 40% (150 out of 380. Thirteen were distribution in French medical residents	To explore resilience, resilience factors and resilience predicting factors and resilience	CD-RISC (Connor & Davidson, 2003)	A person's 'ability to show positive psychophysiological outcomes despite experiencing aversive resilience. Resilience and empathy were positively correlated. Alexithymia was negatively correlated with resilience. Alexithymia, empathy, gender and year of formation correspond to predicting factors of resilience.

		discarded due to extreme scores).			situations or living in a stressful environment'	
Reed et al. (2018) USA	17	N = 108 medicine / paediatric residents Response rate was 74%.	To address some of these gaps in our understanding of burnout in residents.., using Olsen's model of resilience, mindfulness and self-compassion as defined protective features against burnout in cross-sectional analysis	BRS (Smith et al., 2008)	A person's 'the ability to bounce back from stress'	Resilience was negatively associated with emotional exhaustion at time 1. Resilience was predictive of increased compassionate care and decreased burnout at time 2.
Rossouw et al. (2013) South Africa	17	N = 135 (of 147) medical doctors Response rate was 92%.	To investigate burnout and depression in medical doctors in the context of work-related conditions and the role of resilience as a modifiable factor	CD-RISC (Connor & Davidson, 2003)	Not defined by authors in the *Introduction* section. Define resilience in the *Discussion* as a 'measure of a person's stress coping ability'	The CD-RISC score correlated negatively with emotional exhaustion, depersonalisation and the depression score. Furthermore, CD-RISC scores correlated positively with scores of personal accomplishment and delivered quality of care. In addition, participants using medication had a lower CD-RISC score. There were no statistically significant correlations between the CD-RISC score and gender, marital status, job description, overtime hours, number of years qualified or time employed.
Taku (2013) USA	17	N = 289 (of 839) physicians Response rate was 34.45%.	To investigate the relationships be-tween perceived growth, three domains of burnout, resilience, and perceived family support in physicians	RS-14 (Wagnild, 2009)	A 'dynamic personality states that can be modified, reflecting a complex combination of inherited susceptibility and environmental influences'	In the domain of emotional exhaustion, physicians were less likely to feel emotionally drained if they experienced growth, regardless of resilience or family support. In the domain of personal accomplishment, the interaction between growth and resilience was significant. If resilience was highly endorsed, personal

Author (Year) Country		Sample	Aim	Resilience measure	Findings
					accomplishment was experienced regardless of the level of growth; however, if resilience was not highly endorsed, then the moderating role of growth emerged, revealing that the role of growth depended on the level of resilience. The effect of growth was stronger for physicians who showed a lower level of resilience
Olson et al. (2015) USA	14	N = 45 paediatric and medicine paediatric residents selected intrinsic factors that are related to burnout in paediatric and medicine-paediatric residents Response rate was 100%.	To test a conceptual model that defined selected intrinsic factors that are related to burnout in paediatric and medicine-paediatric residents	BRS (Smith et al., 2008)	The 'ability to bounce back from adversity'. Proposed that wellbeing characteristics (e.g. emotional intelligence, self-compassion, & mindfulness) could explain 'resilience' in this study
					Gender not related to resilience. Resilience & burnout did not differ between residence type, marital status, or correlate with age. Emotional intelligence positively correlated with resilience but not with burnout. Mindfulness and self-compassion strongly correlated with each other, & positively correlated with resilience.

*Studies which provided a rationale for their selected resilience measure

Populations in all included studies consisted of *junior* doctors (foundation doctors & specialty registrars) and *senior* or fully qualified doctors (General Practitioners & Consultants or also known as Specialist doctors) from a range of healthcare settings (primary, secondary & tertiary). Five studies investigated junior doctors (Cooke et al., 2013; Eley et al., 2013; Lebares et al., 2017; Morice-Ramat, Goronflot & Guihard, 2018; Reed, Kemper, Schwartz, Batra, Staples et al., 2018), six studies investigated senior doctors (McCain et al., 2017; Montero et al., 2015; Murray et al., 2017; Rossouw et al., 2013; Simpkin et al., 2018; Taku, 2013), and two studies investigated a combination of both junior and senior doctors (MacFarland et al., 2017; Olson et al., 2015).

3.3. Aims of included studies

The principal aim of the included studies was to investigate the association of resilience with a range of psychological factors such as mood difficulties (Cooke et al., 2013; MacFarland & Roth, 2017; Lebares et al., 2017; Montero-Marin et al., 2015; Moreice-Ramat et al., 2018; Rossouw et al., 2013; Simpkin et al., 2018), coping (McCain et al., 2017), stress (Cooke et al., 2013; Lebares et al., 2017; McCain et al., 2017; Simpkin et al., 2018), personality traits (Eley et al., 2013), perceived growth (Taku, 2013), emotional intelligence (Olson et al., 2015), suicidal ideation (Lebares et al., 2017), and other personal characteristics (e.g. empathy, optimism, hope, mindfulness, compassion, etc.; MacFarland & Roth, 2017; McCain et al., 2017; Montero-Marin et al., 2015; Murray et al., 2017; Reed et al., 2018). Of the 13 studies, seven aimed to explore the association of resilience with burnout (Cooke et al., 2013; Lebares et al., 2017; McCain et al., 2017; Montero-Marin et al., 2015; Reed et al., 2018; Rossouw et al., 2013; Taku, 2013).

3.4. Measures and other variables

As specified in the inclusion criteria, all studies used *standardised* measures of resilience. Four studies used versions of the Connor-Davidson Resilience Scale (CD-RISC; Campbell-Sills & Stein, 2007; Connor & Davidson, 2003). One used the 10-item scale (Campbell-Sills & Stein, 2007) and four used the 25-item scale (MacFarland & Roth, 2017; McCain et al., 2017; Montero-Marin et al., 2015; Morice-Ramat et al., 2018). Four studies used the 14-item version of Wagnild and Young's (2009) Resilience Scale (RS-14; Cooke et al., 2013; Eley et al., 2013; Simpkin et al., 2018; Taku, 2013), three studies used Smith et al.'s (2008) Brief Resilience Scale (BRS; Murray et al., 2017; Olson et al., 2015; Reed et al., 2018), and one study used Alessandri et al.'s (2008) Ego Resilience 89 Scale – Revised (ER89-R; Lebares et al., 2017).

Other psychological variables (e.g. depression & coping) were also measured using standardised questionnaires such as Harvard National Depression Screening Day Scale or HANDS (Baer, Jacobs, Meszler-Reizes et al., 2000 as cited in Simpkin et al., 2018) and Brief COPE (Carver, 1997 as cited in McCain et al., 2017).

To measure burnout, five studies used Maslach et al.'s (1996) Maslach Burnout Inventory (Lebares et al., 2017; Olson et al., 2015; Reed et al., 2018; Taku, 2013), one study used Stamm's (2010) Professional Quality of Life (McCain et al., 2017), and one study used Montero-Marin et al.'s (2011) Burnout Clinical Subtype Questionnaire (Montero-Marin et al., 2015).

Just over half of the studies explored the differences in resilience across a range of demographic characteristics such as age, sex/gender and marital status (Lebares et al., 2017; MacFarland et al., 2017; McCain et al., 2017; Murray et al., 2017; Olson et al., 2015; Rossouw et al., 2013; Simpkin et al., 2018). Job-related variables measured and reported in the studies included: grade of doctors, location, number of years qualified, residence type, years of residency, and overtime hours (e.g. Olson et al., 2015; Simpkin et al., 2018).

3.5. Synthesis of findings

3.5.1. Definition of resilience

Eight studies described resilience as *personality attributes* (Simpkin et al., 2018) or *personal characteristics* (MacFarland & Roth, 2017; Murray et al., 2017; Olson et al., 2015) that enable individuals to *cope* with adversities (Lebares et al., 2017; Morice-Ramat et al., 2018; Reed et al., 2018; Rossouw et al., 2013). Interestingly, the idea of resilience as a 'malleable' personal resource was only described in Murray et al.'s (2017) paper.

Two studies defined resilience as a combination of *personality states* and *environmental* factors that 'enable the individual to adapt well in the face of adversity or significant stress' (McCain et al., 2017; Taku, 2013). According to Taku (2013), these personality states are both dynamic and modifiable, reflecting a complex combination of the individual's traits and his/her environmental influences.

Two studies concluded that resilience is a 'process' of adaptation (Cooke et al., 2013; Montero-Marin et al., 2015). Only one study described resilience as a *process*

that is influenced by the person's personality traits and his/her environment (Eley et al., 2013). Although the concept of resilience as a combination of personality states and environmental was also shared by McCain et al. (2017) and Taku (2013), they did not explicitly describe resilience as a 'process' unlike Eley et al. (2013).

3.5.2. Person-specific characteristics associated with resilience

Seven studies examined the relationship between resilience and mood (including mood difficulties; e.g. Cooke et al., 2013; MacFarland et al., 2017; Rossouw et al., 2013; Simpkin et al., 2018). One study found that distress in male doctors was negatively associated with resilience (MacFarland et al., 2017). Lebares et al. (2017) found that greater trait resilience was positively associated with decreased risk of moderate to severe depressive symptoms and anxiety. Similarly, Simpkin et al. (2018) found that depressed paediatric residents showed lower resilience levels than the non-depressed residents. A comparable pattern of results was found in two studies which showed that higher resilience was negatively correlated with depression scores (Rossouw et al., 2013), negative affect (Montero-Marin et al., 2015), and alexithymia (Morice-Ramat et al., 2018). Anxiety was also found to be negatively correlated with resilience (Cooke et al., 2013). In contrast, one study found that greater resilience was positively correlated with positive affect (Montero-Marin et al., 2015).

Five studies that explored the association between resilience and a range of personal characteristics (e.g. MacFarland et al., 2017; McCain et al., 2017; Murray et al., 2017). Two studies found that mindfulness was positively correlated with resilience (Montero-Marin et al., 2015; Olson et al., 2015). Other personal

characteristics that were also positively correlated with resilience include: positive wellbeing (Murray et al., 2017), empathy (Morice-Ramat et al., 2018), compassion to others (Cooke et al., 2013), self-compassion (Olson et al., 2015), high self-directedness, high persistence, and high cooperativeness (Eley et al., 2013). Surprisingly, distress in females was not significantly associated with resilience.

Only one study looked at the predictors of resilience. Morice-Ramat and colleagues (2018) found resilience in French GP residents were predicted by gender, empathy, year of formation, and alexithymia. In contrast, Reed et al.'s (2018) study on medicine and paediatric residents in the US examined the predictive value of resilience. They reported the resilience was predictive of increased compassionate care and decreased burnout symptoms at follow-up (Reed et al., 2018).

3.5.3. Occupation-specific issues associated with resilience

Seven studies examined the association between burnout and resilience (e.g. McCain et al. 2017; Simpkin et al., 2018; Taku, 2013). Three studies reported that resilience was negatively correlated with burnout symptoms (Cooke et al., 2013; Lebares et al., 2017; Reed et al., 2018; Rossouw et al., 2013). Correspondingly, Simpkin et al.'s (2018) found that burned out doctors have lower resilience scores than the non-burned out colleagues. A positive correlation was also found between low resilience and burnout in McCain et al.'s study (2017). Intriguingly, conflicting results were found in Taku's (2015) study. Taku (2015) suggested that resilience did not influence the experience of emotional exhaustion in senior doctors.

Only three studies investigated the association between resilience and job-related factors (Cooke et al., 2013; McCain et al., 2017; Rossouw et al., 2013). On the one hand, resilience was *positively* correlated with secondary traumatic stress (McCain et al., 2017), personal accomplishment, delivered quality of care (Rossouw et al., 2013), and personal meaning in patient care (Cooke et al., 2013). On the other hand, resilience was *negatively* correlated with intolerance to uncertainty, concern about bad outcomes, and reluctance to disclose uncertainty to patients (Cooke et al., 2013).

No significant association was found between resilience and a range of other job-related characteristics such as sex (e.g. Lebares et al., 2017; MacFarland et al., 2017), age (Olson et al., 2015; Simpkin et al., 2018), grades of doctors or training level (Lebares et al., 2017; McCain et al., 2017), location (Murray et al., 2017; Simpkin et al., 2018), years of residency (Simpkin et al., 2018), job description, overtime hours, and number of years employed (Rossouw et al., 2013).

4. Discussion

The overall objective of this paper was to systematically review the quantitative literature to date on the conceptualisation of resilience in both junior and senior medical doctors from a range of specialties. The primary aim was to identify person- and occupation-specific factors that were found to be associated with resilience as measured by standardised resilience questionnaires. The secondary aim was to examine the definitions and measures of resilience that were employed in the included studies. Unlike previous systematic reviews that looked at resilience in healthcare professionals as a whole, the current review focused on junior and senior

medical doctors only. Eleven cross-sectional studies and two prospective studies met the full inclusion criteria. Of these, over a third of the studies were conducted in the US. Factors associated with resilience varied across studies, though over half of the studies looked at the relationship between resilience and burnout (e.g. McCain et al. 2017; Simpkin et al., 2018; Taku, 2013).

The wide variety of factors that were associated with resilience in medical doctors emphasise the multi-faceted nature of resilience. More importantly, the association between resilience and a range of psychological difficulties (e.g. burnout, depression, & anxiety to name a few) in doctors highlights the challenges that are inherent in the medical profession. Despite the lack of consensus on its conceptualisation and a plethora of resilience measures, there seems to be a good number of studies on resilience training and intervention (Joyce, Shand, Tighe, Laurent, Bryant et al., 2018). A number of studies have shown that resilience trainings or interventions could enhance the person's wellbeing and mental health (Macedo, Wilheim, Goncalves et al., 2014). Further, several studies have also demonstrated that the measurable components of self-reported resilience could buffer the impact of potentially traumatic life events (Kukihara, Yamawaki, Uchiyama et al., 2014).

Findings from studies that examined the association between resilience and mood difficulties (e.g. MacFarland et al., 2017; Rossouw et al., 2013; Simpkin et al., 2018) replicated the results from studies in general population with histories of trauma in both adult and later life (e.g. Wingo et al., 2010; Kukihara et al., 2014). Kukihara and colleagues (2010) have found that self-reported resilience buffered the occurrence of

depression and post-traumatic stress disorder in disaster survivors in Fukushima, Japan. Similarly, Wingo et al. (2010) have found that self-reported resilience moderated the impact of trauma on depression severity of individuals with histories of childhood abuse or trauma exposure. The alignment of findings with these studies confirms that measurable components of the resilience construct are associated with factors that are related to mood or mood difficulties.

Findings from studies that found a correlation between self-reported resilience and occupation-specific factors (Cooke et al., 2013; McCain et al., 2017; Rossouw et al., 2013) are in agreement with the growing evidence on the impact of occupational stressors on an individual's wellbeing (e.g. Barling et al., 2005; Waldenstrom et al., 2008; Wang et al., 2008). Low control was found to be predictive of depressive and anxiety disorders in both male and female sexes (Wang et al., 2008). Equally, lack of work-life balance strongly predicted the incidence of mental disorders in the general population regardless of sex (Wang et al., 2008).

Findings on occupation-specific factors underscore the importance of context in the resilience levels of doctors. This is in agreement with the conceptualisation of resilience as a product of the interaction between the individuals and their environment (e.g. Masten et al., 1990; Rutter et al., 1987; Eley et al., 2013).

The inclusion of a burnout scale appears to be a central theme in resilience research in doctors. As discussed in Fertleman and Carroll's paper (2013), this may be because previous studies have framed occupational resilience in relation to stress and burnout.

There are some caveats when assessing the validity of the evidence on studies that examined the association between resilience and burnout. It is possible that some doctors may have overestimated their sense of wellbeing and underreported their burnout symptoms. Given the lack of information on non-responders, it is possible that the data may be biased. It is also reasonable to speculate that doctors who were severely burning out were probably less likely to take part. Equally, it is possible that the doctors who were *not* burning out possibly perceived the study as irrelevant and therefore less likely to take part in it. It is important to note, however, that the response rates were mostly high so it is also feasible that the risks of bias in these studies are low.

Based on the AXIS quality criteria, the included studies in this review were of respectable quality. Over half of the studies were multi-site, overall response rates were very good, and survey instruments in all studies were validated.

4.1. Strength and limitations

Although the systematic and structured nature of this review is a strength, it does have a number of limitations. First, limiting the search to English language and specific time frame may have excluded some important publications from countries whose first language is not English. Although we have included studies from various countries, all included studies were carried out in affluent western nations. High income countries are more likely to have adequately resourced healthcare systems with better working environments, which were found to be associated with greater staff wellbeing (Aiken, Sloane, Clarke et al., 2011). Second, the variation in the

resilience measures and more importantly, the definition of resilience across all studies meant that the comparison of studies was limited. The definitions of resilience as a constellation of *personality traits*, a range of *modifiable personal characteristics*, a combination of *personal* and *environmental* factors, and an adaptation *process* do not convey a coherent construct. Although these heterogeneous definitions underline the multifaceted nature of resilience, it perpetuates the lack of consensus on resilience measures and consequently, the incompatibility of results in the resilience literature. Third, the single-rater approach meant that the quality ratings could have suffered from rater bias. Although careful consideration of the AXIS guidelines was observed throughout the review, the absence of an additional rater meant that the results of of this systematic review could have been influenced by the sole rater's subjective judgement. Fourth, the cross-sectional design of the included studies meant that the data extracted for this review may have been influenced by a number of confounders. One important confounder is the different qualities of the healthcare settings (e.g. workload volume; hours worked; control over schedule; Firth-Cozens, 2001; Keeton et al., 2007). For instance, the work environment in publicly funded healthcare settings such as the National Health Service (NHS) in the UK may be different to the privately funded settings in the US. Further, with the absence of information on non-responders, it was difficult to ascertain if specific participant groups were under- or over-represented in the included studies. This is especially problematic if the characteristics of the doctors who took part in the surveys were different to those who did not take part. Of the thirteen studies, only three provided information on non-responders (Lebares et al., 2017; Murray et al., 2017; Olson et al., 2014). Although

the overall response rate was above average, no firm conclusions can be made about the 'predictive' value of resilience variables on any of the outcome variables.

4.2. Clinical and research implications

The findings of this review may be useful to individual doctors or healthcare organisations seeking to gain information on the different resilience factors in the medical profession. As highlighted by the results, resilience was equally associated with intrinsic (individual) and extrinsic (contextual) factors. The development of future resilience interventions may benefit from taking these two factors into consideration. At an individual level, developing mindfulness and self-compassion may be used as a feature to these interventions. Equally, learning about effective coping strategies against the impact of burnout and stress can also be a useful feature. At an organisation level, interventions may be designed to address the onerous workload, lack of social support, stressful working conditions, and extended working hours of doctors. In particular, employers should nurture working practices that promote recognition of work-life balance and boundaries.

The results of this review underscore not just the complexity of resilience but also the inconsistency in its definition and measure. Future research may benefit from having a coherent conceptualisation of resilience that is specific to medical doctors only. It has been suggested that doctors may be facing different difficulties from other healthcare professionals (Robertson, Elliot, Burton, Iversen et al., 2016). Future research may also benefit from having a singular, validated measure of resilience in doctors that takes into account its multifaceted nature. Having taken into consideration the results of this review, it would be useful to have an instrument that

explores resilience as both intrinsic and extrinsic factors. Given the significant correlation between burnout and resilience in both junior and senior doctors, incorporating resilience education in medical training and continuing professional development (CPD) courses may also prove valuable.

4.3. Conclusion

This paper has reviewed the evidence for person- and occupation-specific resilience factors in doctors. From this review, it is apparent that resilience is a multifaceted construct which goes beyond the individual characteristics. The wide array of person-specific factors highlights the spectral dimensions of the resilience construct (high versus low & negative versus positive spectrums). Findings on occupation-specific factors underline the importance of context in the resilience levels of practising doctors. Overall, this review emphasises the multidimensional nature of resilience. Crucially, it highlights the ongoing ambiguity in its conceptualisation and the need for a more specific definition. Resilience in doctors is critical not only for the individual doctors themselves, but also for the patients and healthcare organisations they work for (Firth-Cozenz, 2001).

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Section two

A cross-sectional study on resilience to burnout in veterinary surgeons in the United Kingdom

By Donna Bella Back

Abstract

Aim: To examine the relationship between *person-* (self-oriented perfectionism, socially-prescribed perfectionism, & self-compassion) and *occupation-specific resilience factors* (peer cohesion, supervisor support, work pressure, & control), *stress*, and *burnout* in veterinary surgeons in the United Kingdom.

Introduction: A notable systematic review has indicated that suicidal behaviour and psychosocial problems in the veterinary profession internationally may be due to occupational stressors that are inherent to veterinary practice. Similar to medical doctors, the veterinary surgeons are routinely exposed to a range of highly stressful situations. To date, there are only a handful of studies on resilience in this profession.

Method: A total of 404 practising veterinary surgeons in the United Kingdom took part in the survey. Statistical analysis explored both the linear and interaction effects of the resilience factors on stress and burnout.

Results: Being female increased the likelihood of burnout. An increase in self-compassion and peer cohesion decreased the odds of burnout, while an increase in work pressure decreased the odds of it. Unexpectedly, an increase in socially prescribed perfectionism also decreased the likelihood of burnout. After controlling for stress, only self-compassion, socially prescribed perfectionism, and work pressure remained as significant predictors. None of the resilience factors buffered the impact of stress on burnout. Stress was the strongest predictor of burnout.

Conclusion: The findings highlights the role of stress in the development of burnout. They also highlight the complexity of resilience as a construct and the need for a more robust resilience framework that is specific to the veterinary profession.

Keywords: resilience; wellbeing; veterinary surgeons; veterinarians

1. Introduction

Veterinarians are repeatedly exposed to a variety of occupational stressors which can sometimes lead to the development of psychological difficulties (Gardner & Hini, 2006; Platt et al., 2010), burnout (Bartram et al., 2009; Hansez et al., 2008), suicidal ideation (Bartram & Baldwin, 2008; Mellanby, 2005), and even death (Hawton et al., 2000; Platt et al., 2010). Although stressful experiences can also lead to positive outcomes such as individuals responding positively (Bonano & Mancini, 2008), the veterinary literature in general indicates a very negative focus, predominantly highlighting the negative outcomes such as stress, burnout, suicidal behaviour, and mental health problems (e.g. Bartram et al., 2009; Gardner & Hinni, 2006; Platt et al., 2010). With only a handful of studies on psychological wellbeing or resilience (e.g. Bartram et al., 2009; Cake et al., 2017), the goal of this study therefore is to redirect the research into a positive clinical psychology perspective by investigating relevant person- and occupation-specific resilient factors in UK-based veterinary surgeons (vets). Positive clinical psychology is a new area of research which aspires to move positive psychology and clinical psychology forward by merging significant research findings from both fields (Wood & Tarrier, 2010).

Despite its growing popularity over the past five decades, the concept of resilience remains unclear whilst the resilience research methodologies remain widely incompatible. This study seeks to address these limitations in resilience research within the veterinary profession, by employing the criteria proposed in Johnson's (2016) Bi-Dimensional Framework for Resilience (BDFR). The BDFR

suggests that in order to measure resilience, three parameters must be quantified: (a) *risk* variable or *adversity*, (b) proposed *resilience* variable, and (c) *outcome* variable (Johnson, 2016). The main aim of this study was to investigate the relationship between burnout, stress and person- (self-oriented perfectionism, socially-prescribed perfectionism, & self-compassion) and occupation-specific resilience factors (peer cohesion, supervisor support, work pressure, & control).

This section presents: (i) a brief review of literature on the proposed resilience factors in this study, and (ii) aims and hypotheses of the present study.

1.1. Definition and limitations of early resilience research

The word 'resilience' originated from the mid-17th century Latin word *resiliens*, which means 'leaping back' (Online Etymology Dictionary). In psychology, resilience means the ability to effectively leap back or 'bounce back' from adversity (Luthar et al., 2000). Early researchers describe it as a fixed, individual trait (e.g. Block & Block, 1980; Connor & Davidson, 2003) whilst others describe it as a dynamic process (Waller, 2001; Luthar et al., 2000). 'Thriving despite adversity' or 'positive adaptation following adversity' are some of the commonly cited definition of resilience (e.g. Connor & Davidson, 2003; Masten et al., 1990). Others describe it as the act of rebounding to one's 'normal' or 'baseline' form (Murray & Zautra, 2012). It is also described as the ability to adapt to the demands of difficult life circumstances (Walsh, 2006; Yates & Masten, 2004; Murray & Zautra, 2012). Despite the absence of definitive meaning to date, there seems to be a general consensus that

resilience refers to a person's ability to 'bounce back' from difficult or adverse experiences (Alexander, 2013; Block & Kremen, 1996). Equally, however, there also seems to be a continuing lack of consensus on what constitutes a resilient rebounding. This lack of well-defined criteria has two important consequences: (a) lack of exact and clear definition of resilience concept, and (b) inconsistent array of methodologies, making it problematic for any researcher to appraise and compare the validity and reliability of previous studies.

1.2. The Bi-Directional Framework: Towards a better understanding of resilience

The Bi-Dimensional Framework for Resilience (BDFR; Johnson, 2016) provides a structure for testing variables that characterise resilience. The BDFR has three core propositions arising from limitations of the existing resilience literature (BDFR; Johnson, 2016). Firstly, previous resilience studies have been limited by the idea that the constructs of resilience and risk are co-dependent, which means that risk calculations are required to understand resilience (Masten & Powell, 2003). The BDFR seeks to extend this idea by suggesting that resilience and risk are two independent dimensions (Johnson, 2016). Secondly, previous resilience studies have also been limited by the concept of resilience as a 'positive' variable and the concept of risk as a 'negative' variable. Given that all positive variables have corresponding negative inverses, the BDFR proposes both resilience and risk dimensions as continuums with positive and negative poles (Johnson, 2016). Thirdly, some previous studies describe resilience as an interaction between internal (person's characteristics) and external (context) factors (Masten et al., 1990), thus suggesting that

resilience is not a trait or fixed characteristic (Johnson, 2016). The BDFR

suggests that although the external factors may influence resilience, these do

not constitute resilience. The BDFR therefore proposes that resilience is a trait

of the object of under study (e.g. individual; family; institution; Johnson, 2016).

In brief, the BDFR suggests that to test the presence of resilience, researchers

must measure three parameters: (a) risk variables, (b) resilience variables, and

(c) outcome variables (Johnson, 2016).

The ideas behind the BDFR initially emerged after Johnson (2016) evaluated

limitations of the existing resilience literature. In collaboration with other

researchers, she first explored the feasibility of the BDFR criteria in a study on

suicidality (Johnson et al., 2010). They found that positive self-appraisal buffers

the impact of stressful life events on suicidality, which suggests that positive

self-appraisal is a resilience factor to suicidality in the context of stressful

experiences. Similarly, Wallace's (2017) attempt to extend the Job demand-

control-support model (Karasek et al., 1982, as cited in Wallace, 2017) by

incorporating coping strategies into the model reflects the BDFR's core premise

on resilience as a 'buffering' factor. For instance, Wallace (2017) found that

coping strategies such as active problem-solving buffer the impact of work

overload on burnout. Using the BFDR framework, Wallace's findings suggest

that problem solving is a resilience factor to burnout when individuals are faced

with work overload.

1.3. Stress, wellbeing and burnout among veterinary surgeons

According to Robinson and Hooker (2006), over 80% of UK-based veterinary surgeons perceived their work as stressful. In a large cohort study which examined occupational stress across 26 occupations in the UK, vets reported considerably poorer psychological well-being with a rank of 22nd out of 26 (Johnson et al., 2005). A growing number of studies are reporting high rates of stress and burnout in the veterinary profession. Findings from a cross-sectional study in Finland revealed that 73% of the vets were feeling stressed while 40% were experiencing symptoms of moderate burnout (Reijula et al., 2003). In Bartram et al.'s (2009) large cross-sectional study in UK-based veterinary surgeons, they found that vets showed significantly reduced mental well-being that was characterised by higher levels of anxiety and depression than the general population. A similar pattern of results was reported in the study by Hatch et al. (2011) which found significantly higher rates of stress, depression and burnout in Australian vets than the general population.

1.4. Occupational stressors in veterinary profession

A notable systematic review on suicidal behaviour and psychosocial problems in the veterinary profession internationally has indicated that suicide and mental health difficulties may be due to occupational stressors such extended working hours, excessive workload, challenging client interaction, administrating euthanasia, difficulties in management roles, and lack of work-life balance (Platt et al., 2010). However, it is important to note that most studies that were included in that systematic review had been carried out outside the UK. In Bartram et al.'s (2009) study on occupational stressors in UK-based vets, they

found that prolonged working hours and making professional mistakes were the most significant occupational stressors. They also found that poorer psychosocial working conditions, characterised by higher work demands with unsatisfactory managerial support, were correlated with increased levels of anxiety and depression (Bartram et al., 2009).

In the study by Mastenbroek et al. (2013) on predictors of burnout and engagement in 1,760 young vets in The Netherlands, they found that job demands were positively associated with burnout. In another publication, using the same pool of data but with a different analysis strategy, Mastenbroek (2017) reported that the main causes of burnout were high job demands combined with low resources. Workload is often used an index of job demand (Hausser et al., 2010). Within the veterinary profession, excessive workload is often characterised by prolonged working hours, being on call, inadequate consultation time with clients, heavy administrative duties, and unremitting, concurrent tasks including simultaneous emergencies and incessant interruptions in between (Platt et al., 2010; Reijula et al., 2003).

In contrast to the findings discussed above, authors of the study in occupational stress and burnout among Belgian veterinary practitioners have found that the mean job strain and job engagement in vets were not significantly higher than that of the general population (Hansez et al., 2008). They, however, reported that more severe burnout symptoms were present in 15.6% of the vets.

Positive clinical outcomes and relationships with colleagues were found to be associated with higher levels of satisfaction amongst qualified vets (Bartram et al., 2009). Cake et al. (2017) also found social support as the most frequently cited 'protective factor' in their qualitative literature analysis on how resilience was portrayed in contemporary research.

According to Bonano and Mancini (2008), stressful experiences or what they refer to as 'potentially traumatic experiences' (PTE) can either lead to a positive or a negative outcome. To illustrate, some vets respond negatively to occupational stressors and end up feeling stressed and burnt out (negative index of resilience) while others cope without any difficulties and continue to thrive in their profession (e.g. Platt et al., 2010; Wallace, 2017). While resilience studies aim to look at what enables these vets to thrive in adversity, the BDFR aims to identify which occupational factors in particular buffer the impact of stress on burnout in vets.

1.5. The effects of age and sex on veterinary surgeons' overall wellbeing
Previous wellbeing studies on vets suggest that the incidence of stress and burnout vary according to sex and age (e.g. Reijula et al., 2003; Gardner & Hinni, 2006). In a large cross-sectional survey on Finnish vets, women in the youngest age group and men in the oldest age group experienced significantly higher rates of burnout (Reijula et al., 2003). A survey study on New Zealand-based vets found the same pattern of results (Gardner & Hinni, 2006). Their findings showed that high levels of occupational stress and suicidal ideation were more prevalent in younger, and female small animal clinicians (Gardner &

Hinni, 2006). In particular, they reported that women were more likely to experience job stressors in relation to job demands, the need to keep their skills and knowledge up to date, and interactions with clients, peers, and employers (Gardner & Hinni, 2006). Men, in contrast, were more likely to report job stressors in relation to income, finances, and career prospects (Gardner & Hinni, 2006).

Opposite to Reijula et al.'s (2003) findings, a large cross-sectional study on 2,125 Australian vets found that *lower* levels of distress, anxiety and depression were associated with older age, *male* gender, and more work experiences as measured by time spent in current job and number of years from graduation (Fritschi et al., 2009). An analogous pattern of results was found in Mastenbroek et al.'s (2013) study in a sample of vets who graduated between 1999 and 2009 in The Netherlands. Masterbroek and her colleagues (2013) have found that male vets were less exhausted and more engaged than female vets. They also found that burnout was negatively associated with number of years from graduation (Mastenbroek et al., 2013). Similarly, Schoenfeld-Tacher and her colleagues (2017) have also found lower personal distress in vets with more clinical experience, and higher personal distress in newly qualified vets. These results were replicated in Dawson and Thompson's (2017) UK-based study as the overall outcome showed that recently qualified vets were more likely to suffer from higher levels of occupational stress than those with well-established careers.

Given that 60% of the veterinary industry are females and majority of the vets (22.87%) are aged between 26 to 30 years old here in the UK (Royal College of Veterinary Surgeons, 2016), it seems imperative to take into account the possible confounding effects of these two variables when testing for factors that confer resilience to burnout in this sample.

1.6. Self-compassion and perfectionism

To date, there has been only one study that investigated the relationship between self-compassion and resilience in vets. McArthur et al. (2017) have found that students with higher levels of non-judgmental and nonreactive mindfulness, and self-compassion had higher resilience scores. An earlier study on resilience and burnout in paediatric residents also reported a similar outcome (Olson et al., 2015). They indicated that self-compassion was negatively associated with emotional exhaustion, and positively associated with self-reported resilience (Olson et al., 2015). Similarly, a pilot study on the wellbeing of UK community-based nurses has also found that those who scored highly on self-compassion measure, reported less burnout (Durkin et al., 2016). Also in line with these results, a recent study on 799 nurses based in New Zealand has found that self-compassion predicted lower burnout and barriers to compassion (Dev et al., 2018).

According to Hewitt et al. (2008), trait perfectionism is a personality attribute that influences how an individual might appraise stressful events. For example, when athletes perceive not winning as a threat to self-worth, they are likely to experience acute stress (Smith, 1986). In a study conducted on trait

perfectionism and moral stressors in veterinary practice, the authors found that trait perfectionism increased the risk of distress in response to morally challenging events in veterinary work (e.g. euthanasia; Crane et al., 2015). In particular, they found that vets who were high in trait perfectionism experienced greater negative arousal emotions (e.g. irritation) and perceived stress when confronted with frequent significant stressors at work (Crane et al., 2015). They also found that self-reported resilience levels in vets with high trait perfectionism decreased as stressors in practice increased.

Studies on athlete burnout have suggested that a perfectionism increased the risk of burnout in athletes (Gould et al., 1996; Hill et al., 2008; Lemyre et al., 2008). A study on junior tennis players have found that those who were experiencing burnout had higher levels of parental expectations, perceived parental criticism, and concerns about making mistakes (Gould et al., 1996). Similarly, a study on elite athletes has found that burnout level was highest in those with high self-reported perfectionism (Lemyre et al., 2008). Interestingly, a study which examined two forms of perfectionism in elite junior soccer players has found that: (a) self-oriented perfectionism (SOP) has a direct negative association with athlete burnout, and (b) socially prescribed perfectionism (SPP) has a direct positive association with athlete burnout (Hill et al., 2008). Flett and Hewitt (2002) defined the SOP as the pursuit of extremely high standards according to what individuals expect from themselves, while the SPP refers to the pursuit of exceedingly high standards according to what individuals think others expect of them.

With previous findings demonstrating a negative link between self-compassion and burnout, and a positive link between perfectionism and burnout, it is unsurprising that high self-compassion and low perfectionism have been regarded as 'resilient' factors (e.g. Crane et al., 2015; Dev et al., 2018). Although there is some evidence of a buffering effect for perfectionism on negative emotional arousal when individuals were faced with occupational stressors (Durkin et al., 2016), the buffering effect of perfectionism on burnout in vets remains unexplored. Equally, no studies have yet explored the buffering effect of self-compassion on burnout.

1.7. Testing the proposed resilience factors using the BDFR

Previous quantitative studies that investigated the link between psychosocial factors and burnout in vets have often used a linear correlation approach (e.g. Nett et al., 2015; Mastenbroek, 2017). Although this methodology has been useful in ascertaining variables correlated with burnout, it remains unclear whether these variables can act as a buffer. To date, there are no studies that utilised the BDFR to identify which factors buffer the impact of stress in the development of burnout in vets.

To identify resilience factors in vets using the BDFR, these three parameters were identified and measured: (a) risk variables, (b) resilience variables, and (c) outcome variables. Guided by the findings from previous resilience studies in vets, the proposed *resilience variables* in this study were grouped into two: (i) person-specific resilience factors or PRF, and (ii) occupation-specific resilience factors or ORF. The PRF consist of two forms of perfectionism (self-oriented

perfectionism or SOP and socially prescribed perfectionism or SPP) and self-compassion. The ORF consist of four dimensions of the work environment (peer cohesion, supervisor support, work pressure, and control). As one of the widely reported and frequently experienced difficulty by many vets, it was deemed appropriate to have stress as the *risk variable*. And given its significantly high prevalence rate in this profession, it was deemed important to have burnout as the *outcome variable* for this study.

1.8. Researcher's epistemological position

The researcher's epistemological position statement can be found in Appendix E.

1.9. Aims of the study

Using a sample of UK-based veterinary surgeons: (a) with some degree of burnout symptoms, and (b) no burnout symptoms, the aims of the study are as follows:

1. To ascertain the effects of gender and age on the levels of burnout;
2. To examine the relationship between stress and burnout;
3. To explore the relationship between the proposed resilience factors (PRF & ORF) and burnout; and
4. To investigate if the proposed resilience factors (PRF & ORF) buffer the impact of stress in the development of burnout.

1.10. Hypotheses of the study

The following hypotheses were derived from the aims of the study:

1.10.1. Age, sex and burnout

1. Being female and younger in age increase the likelihood of burnout.

1.10.2. Stress and burnout

2. The likelihood of burnout increases as stress level increases.

1.10.3. Person-specific resilience factors, stress and burnout

3. The probability of burnout increases as self-oriented perfectionism, and socially prescribed perfectionism increases.

4. The odds of burnout decreases as self-compassion level increases.

5. Self-oriented perfectionism, socially prescribed perfectionism, and self-compassion buffer the impact of stress on burnout.

1.10.4. Occupation-specific resilience factors, stress and burnout

6. The likelihood of burnout decreases as levels of peer cohesion, supervisor support, and control increases.

7. The probability of burnout increases as work pressure increases.

8. Peer cohesion, supervisor support, control, and work pressure buffer the impact of stress on burnout.

2. Methods

2.1. Research design

This study employed a cross-sectional design. The study was presented both as an online-based and a paper-based survey to maximise participation by vets

in the UK. The online-based survey was delivered using the web-based

application, Online Surveys (formerly known as BOS or Bristol Online Survey).

The chronology of the research process can be found in Appendix F.

2.2. Ethical considerations

The main ethical concerns for this study were confidentiality, anonymity, and

potential impact of the survey questions on the participants' mental health.

Appropriate data handling and storage procedures were followed to ensure that

the emails collected from optional consents were stored in an encrypted file that

was separate from the rest of the data (see Section 2.4). A debriefing was also

carried out at the end of the survey to ensure that participants were signposted

to appropriate support organisations if needed.

The research proposal was initially reviewed by two academic course staff at

the University of Leicester (UOL) and the service user reference group affiliated

to the university. The study was granted ethical approval via the University of

Leicester Research Ethics (see Appendix G). The study did not require ethical

approval from the National Health Service (NHS) research committee as it had

no connection with the NHS patients or premises.

2.3. Population and sample

The target population for this study was qualified and *practising* vets who were

based in the UK at the time of survey. According to the Royal College of

Veterinary Surgeons (RCVS; 2016), there are 22,009 practising vets in the UK.

It is important to note that the term practising is not exclusive to those involved in clinical work or general practice as it also includes those who use their professional qualification but work in a different field (e.g. consultancy work).

Inclusion criteria for recruitment included: (a) qualified vets who are practicing in the UK, and (b) practicing vets who have been in their role (as a qualified vet) for at least six months. Exclusion criteria for recruitment included: (a) trainee vets or those who are not yet qualified, (b) those who have been in their role as a qualified vet for less than six months, (c) retired vets, and (d) former UK-based vets who are working overseas at the time of the survey.

The researcher was not able to access sources that provide comprehensive sampling frame for UK-based, practising vets (e.g. Royal College of Veterinary Surgeons & British Veterinary Association). Therefore, the promotion of the study and recruitment were predominantly carried out via online campaigns and electronic communication.

2.4. Procedure

With an inaccessible sampling frame, a simple random sampling strategy was employed via coin flipping to remove bias from the selection process. Coin flipping was employed to identify which groups to approach from a list veterinary professional organisations, communities, and social/support groups whose contact details were available online. Following obtaining ethical approval in April 2018, copies of the electronic covering letter and study leaflet were sent to these randomly selected organisations informing them of the

survey, its purpose and ways to take part, should they wish to participate. Organisations who agreed to take part in the survey published copies of the study leaflet on their websites and/or forwarded electronic copies of the study leaflet via a mass email to vets within their organisations. A Northern-Ireland (NI) based veterinary support group distributed hardcopies of the study leaflets on their monthly meeting in May 2018. Emails containing the covering letter and study leaflet were also sent to: (a) randomly selected UK-based vets whose contact details were published on the European Board of Veterinary Specialisation website, and to (b) randomly selected vets who were approached by a veterinary pharmaceutical sales representatives and agreed to take part in the study. One of the leading veterinary industry publication was also approached and published an article about the study in the *Letter to the Editor* section in one of their May 2018 weekly circulation. Appendix I show the study leaflet.

As mentioned earlier, the survey was delivered via the 'onlinesurveys.ac.uk' website. This particular survey website was chosen for two reasons: (a) the researcher's university had an account with this company, and (b) the use of software was of no cost to the researcher. Vets who opted to do the survey online were asked to: (a) read through the participant information sheet (PIS), (b) create an optional unique identifier in the event that they wish to withdraw their data later, and (c) complete the participant consent form prior to completing the questionnaire items. Once the survey questionnaire was submitted, the vets could only withdraw their participation by contacting the researcher with the unique identifier that they created. Upon completion of the

survey, the vets were then de-briefed about the study and provided with contact details for mental help organizations and veterinary support groups in the event that the survey questions triggered some difficult feelings. The vets had access to the survey for nine weeks before it was closed and the data were imported to Microsoft Excel file and then to SPSS. The PIS, participant consent form, and participant debrief sheet are found in Appendices J, K, and L respectively.

A research incentive was offered to all vets who took part in the study. Two *non-compulsory* consent options were provided at the bottom of the participant consent form: (a) consent to receive a copy of the results of study, and (b) consent to be included in a £50 Amazon prize draw. Those who agreed to at least one of these optional consents were asked to provide their email address. Immediately after the survey was closed, the survey data were imported to Excel and the vets' email addresses were separated from the rest of the data and saved in a separate encrypted file. The data was analysed using SPSS version 24 for Mac.

2.5. Measures

The survey consisted of seven measures, each measuring different elements of the BDFR. A brief demographic questionnaire was administered to collect person- and occupation-specific information which were previously evidenced as important resilience factors (e.g. age, sex, role; see Appendix M).

2.5.1. Outcome measure*s*

Single-item Burnout Measure (SBM; Dolan, Mohr, Lempa et al., 2015; Appendix N)**.**

As the name suggests, the SBM is a single, non-proprietary item which asks individuals to define their experience of burnout using a 5-point scale. The development of the SBM was based from the work of West et al. (2012) who validated single items from the widely-used Maslach Burnout Inventory (MBI; Maslach, Jackson et al., 1996) and found strong psychometric validity compared to the full MBI scale. Relative to the single MBI emotional exhaustion (EE) item, the SBM has a correlation of 0.79, an inter-rater agreement (kappa) of 70%, sensitivity of 83.2%, specificity of 87.4%, positive predictive value of 79.3%, and negative predictive value of 90.0% (Dolan et al., 2015). Similar findings were revealed in Helfrich et al.'s (2014) study which compared the SBM and the three-item MBI-EE. They found that the SBM closely matched the characteristics of the three-item MBI-EE and suggested that the previous can be used as a valid proxy for the latter, a conclusion that was replicated in Dolan and colleagues' study (2015). As a single-item measure, there is currently no published evidence on its internal consistency reliability. The SBM was deemed appropriate for this study because it is non-proprietary and has robust psychometric characteristics relative to the MBI-EE.

In line with previous studies (e.g. Dolan et al., 2015; West et al., 2012), responses from this 5-point scale item were dichotomised as ≤2 (no burnout symptoms) and ≥3 (one or more burnout symptoms). The dichotomised

responses were then used to categorise participants in the current study into two groups: (a) with burnout, and (b) without burnout.

2.5.2. Independent measures

2.5.2.a. Perceived Stress Scale - 4 or PSS-4 (Cohen et al., 1983; Appendix O).

The PSS-4 is a shortened form of the traditional PSS-14. As the name suggests, it is a 4-item, self-administered questionnaire which measures the extent to which circumstances in one's life over the past month are perceived as stressful. Participants rate how often they perceive thoughts and feelings to be unpredictable or uncontrollable in their life (0 = never, 5 = very often). It has a good internal reliability with Cronbach's α of 0.82 and factorial validity of 65.2% (Mitchell et al., 2008). The PSS-4 was deemed suitable for this study because it is a valid, reliable, and a concise measure of psychological stress in adults.

2.5.2.b. Multidimensional Perfectionism Scale or MPS (Hewitt & Flett, 1989; Appendix P).

The full scale MPS is a 45-item measure of three types of perfectionism: (a) self-oriented perfectionism or SOP, (b) other-oriented perfectionism or OOP, and (c) socially prescribed perfectionism or SPP. Each type (subscale) of perfectionism is allocated with 15 questions. For the purpose of this study, only the SOP and the SPP were measured with a total of 30 items. Both the SOP and SPP have acceptable internal consistencies with Cronbach's α coefficients of 0.88 and 0.81, respectively (Hewitt & Flett, 1991) and a mean Cronbach's α

of 0.84. With the lack of briefer measures for these particular types of perfectionism, the use of MPS was considered acceptable for the purpose of this study.

2.5.2.c. Self-Compassion Scale – Short Form or SCS-SF (Raes et al., 2011; Appendix Q).

The SCS-SF is a briefer version of the original 26-item SCS (Neff, 2003). It is a 12-item questionnaire which measures the key elements of self-compassions namely: (a) self-kindness versus self-judgment, (b) common humanity versus isolation, and (c) mindfulness versus over-identification. Responses are rated from 1 (almost never) to 5 (almost always). Scores for the negatively worded items are reversed prior to calculating the overall mean of the 12 items. The SCS-SF has an estimated Cronbach's α of 0.85 (Raes et al., 2011) and a 5-month test-retest reliability of 0.71. It is also highly correlated with the original SCS with a coefficient of 0.98 (Raes et al., 2011). The SCS-SF seemed apt for this study because of its validity and reliability in non-clinical samples (e.g. Leary et al., 2007).

2.5.2.d. Work Environment Scale or WES (Moos, 2008; Appendix R).

The 90 true or false WES measures the positive and negative aspects of a work environment. It consists of 10 subscales, which includes: Involvement, Peer Cohesion, Supervisor Support, Autonomy, Task Orientation, Work Pressure, Clarity, Control, Innovation, and Physical Comfort. The WES has three forms (Form R, Form I, Form E). Form R measures the perceived real work environment. Form I assesses the personally held *ideal* goals and value

orientations. Form E appraises the *expected* work environment. For the

purpose of this study, only Form R was administered. The internal consistency

of all WES subscales is within an acceptable range (Cronbach's α = 0.69 to

0.86; mean Cronbach's α = 0.78).

In line with the resilience literature in veterinary and other medical profession as

discussed in the previous section, only scores from four (peer cohesion,

supervisor support, work pressure, & control) of the original ten subscales were

included in the statistical analyses.

Table 1 provides a summary of measures used in this study and their reported

levels of internal consistency or reliability.

2.6. Power analysis

The sample size was calculated using G power (Faul et al., 2009). The

minimum number of participants required for logistic regression analyses with

five covariates is 77 with 0.8 power, 5% significance and an effect size of 0.18

(r^2).

Table 1. Summary of measures used in this study and their reported
Cronbach's alpha

Measure (Author, Date)	Measured construct	Reported Cronbach's α
Single-item Burnout Measure (Dolan, Mohr, Lempa et al., 2015)	Burnout	Not applicable (single-item only)
Perceived Stress Scale - 4 (Cohen et al., 1983)	Perceived stress	0.82
Multidimensional Perfectionism Scale (Hewitt & Flett, 1989)	Self-oriented perfectionism (SOP) and socially-prescribed perfectionism (SPP)	Mean Cronbach's α of 0.84
Self-Compassion Scale – Short Form or SCS-SF (Raes et al., 2011)	Self-compassion	0.85
Work Environment Scale or WES (Moos, 2008)	Peer cohesion, supervisor support, work pressure, and control	Mean Cronbach's α of 0.78

2.7. Data analysis

This research was a variable-focussed study of resilience in that it uses logistic

regression to examine the relationship among a set of covariates by quantifying

their independent or combined contribution to the variability in the outcome

variable. In this instance, the outcome variable was burnout, and the covariates

included the three PRF (SOP, SPP & self-compassion) and four CFR (peer

cohesion, supervisor support, work pressure, & control).

2.7.1. Evaluation of suitability for logistic regression

Although logistic regression does not require linearity, normality, and homoscedasticity in comparison to linear regression and general linear models, it requires 5 key assumptions to be met:

1) binary outcome or dependent variable;

2) large sample size;

3) little or no multicollinearity between the covariates;

4) independence of observations; and

5) linearity of covariates and log odds.

The study's large sample size and binary outcome variable satisfy assumptions 1 and 2. To satisfy assumption 3, Pearson's correlation was conducted between all covariates, with significance levels set at the .05 level. Multicollinearity statistics were also checked in each regression analysis. The results of the Pearson's correlation are presented in Appendix S. Assumptions were met for all of the covariates as no evidence of multicollinearity was found. To satisfy assumptions 4 and 5 while ensuring a more robust estimation method, bootstrapping was employed in all of the logistic regression analyses. Bootstrapping reduces error variance due to any violation of distributional assumptions in logistic models which can improve the ability to detect associations (Field, 2017). However, the bootstrapping did not make any significant changes in the results of the logistic regression analyses. Given the adequate sample size, the researcher decided not to use the bootstrapping statistics.

2.7.2. Logistic regression analysis

In order to test the possible buffering effect of the other covariates (PRF & ORF) on the relationship between the *main* covariate (stress) and outcome variable (burnout), the guidelines by MacKinnon et al. (2007) were implemented. First, in the logistic regression analyses, the researcher ascertained if the proposed resilience factors (PRF & ORF) significantly predicted burnout. Second, the researcher ascertained whether stress significantly predicted burnout while keeping the resilience covariates at constant. Third, the researcher ascertained if there was a significant *interaction effect* between stress and resilience covariate while keeping their main effect at constant. It is important to note that a significant *interaction effect* indicates that the resilience covariate *moderates* or *buffers* the impact of stress on burnout.

Prior to conducting a series of logistic regression analyses with interaction terms as described in the above section, a simple logistic regression was carried out in order to determine the effects of age and sex on burnout. With previous studies suggesting a link between burnout and these two variables, it was therefore deemed important to explore if such link also existed in this study. It was also deemed necessary to establish if the relationship between these two variables and the outcome variable of the study (burnout) was significant so that appropriate steps could be taken to control for the possible confounding effects of age and sex.

3. Results

3.1. Response rate

Recruitment and data collection was completed in nine weeks, from 23th April until 25th June 2018. An email containing the study leaflet and covering letter was sent to approximately 1,135 vets in total. The number of emails sent was itemised in Table 2. It was difficult to ascertain the number of views for the published online campaigns for the study but an approximate number of group members and/or subscribers where the promotions were made are found in Table 3. Given the large number of practising vets in the UK, response rate was relatively low. A number of vets who the researcher had direct contact with indicated that due to their extended day to day working hours, it was likely that others had the intention to take part but were too busy to do straight away and had simply forgotten to do it in the end.

Table 2. Approximate number of vets who received an invitation to take part in the study

Organisations who forwarded the study leaflet	Vets receiving forwarded emails
Corporate veterinary practice	30
Specialist Referrals Hospital	35
Corporate Veterinary Specialist	1000

Source of email address for randomly selected vets	Vets emailed by the researcher
Veterinary Pharmaceutical Company	70
Veterinary organisation website	50
Total number of vets who received the study leaflet	1185

Note: All identifiable information was purposely removed to protect anonymity of organisations and their staff

Table 3. Approximate number of members/subscribers for websites where the study leaflet was published

Organisations who published the study leaflet	Number of members or subscribers
Online Support Group for Vets 1	457
Online Support Group for Vets 2	6,700
Veterinary Industry Publication	19,000

Note: All identifiable information was purposely removed to protect anonymity of organisations and their staff

3.2. Sample size

A total of 404 questionnaires were completed. Cases were only excluded when the data were missing for a specific statistical analysis (cases were excluded pairwise), which meant that any missing data did not bias the statistical analysis. Details of missing data across all variables are found in Appendix H.

3.3. Participant characteristics

The sample used in the current study consisted of 89 males and 312 females, three individuals did not state their sex. The mean age for males was 45.67 (± 12.14) while the mean age for females was 37.35 (± 9.50). The overall mean age was 39.17 (± 10.67), with a range of 23 – 70 years old. The majority of participants were married (50.5%), white Caucasian (94.3%), First Opinion Vets or FOV (45.5%), and in full time employment (78.7%). The role of an FOV is equivalent to that of a General Practitioner. Burnout symptoms were present in 36.6% of the study sample. Participant characteristics are summarised in Table 4.

Table 4. Participant demographic characteristics

Variable	n (%)
Sex	
Male	89 (22.0%)
Female	312 (77.2%)
Others	0
Prefer not to say	3 (0.7%)
Marital Status	
Single, never married or civil partnered	153 (37.9%)
Married	204 (50.5%)
Civil partnered	17 (4.2%)
Widowed	3 (0.7%)
Divorced, including dissolved civil partner	18 (4.5%)
Missing data	9 (2.2%)
Ethnicity	
White (English, Scottish, Irish & others)	381 (94.3%)
Mixed (multiple ethnic groups)	9 (2.3%)
Asian/Asian British	6 (1.5%)
Black/African/Caribbean/Black British	0
Other ethnic group	3 (0.7%)
Missing data	5 (1.2%)
Role	
First Opinion Vet	184 (45.5%)
Partner/Owner*	32 (7.9%)
Clinical Director*	39 (9.7%)
Referral Vet/Specialist Vet	47 (11.6%)
Locum Vet	13 (3.2%)
Multiple roles with managerial responsibilities*	22 (5.4%)
Multiple roles without managerial responsibilities	20 (5.0%)
Hours	
Full time	318 (78.7%)
Part time	84 (20.8%)
Missing data	2 (0.5%)
Burnout symptoms	
With burnout	148 (36.6%)
Without burnout	256 (63.4)

*Roles with managerial responsibilities

3.4. Calculated internal consistency of measures used in the study

As a single-item scale, the SBM's internal consistency reliability cannot be determined in the current study.

Table 5 summarises the Cronbach's alpha of the measures calculated using the data from the current study.

Table 5. Summary of calculated Cronbach's alpha in this study

Measure (Author, Date)	Measured construct	Calculated Cronbach's α
Single-item Burnout Measure (Dolan, Mohr, Lempa et al., 2015)	Burnout	Not applicable (single-item only)
Perceived Stress Scale - 4 (Cohen et al., 1983)	Perceived stress	0.80
Multidimensional Perfectionism Scale (Hewitt & Flett, 1989)	Self-oriented perfectionism (SOP) and socially-prescribed perfectionism (SPP)	Mean Cronbach's α of 0.75
Self-Compassion Scale – Short Form or SCS-SF (Raes et al., 2011)	Self-compassion	0.90
Work Environment Scale or WES (Moos, 2008)	Peer cohesion, supervisor support, work pressure, and control	Mean Cronbach's α of 0.73

3.5. Age, sex and burnout

A logistic regression analysis was carried out to test if age and sex predicted burnout symptoms. The age and sex model as a predictor for burnout was significant at .05 level and predicted 63.20% of the responses correctly. As expected, sex as a predictor for burnout was significant at .05. The female

participants were 2.16 more likely than the male participants to experience burnout symptoms.

Contrary to expectations, age did not significantly predict burnout. Results for both sex and age are presented in Table 6.

Table 6. Summary of logistic regression analysis for prediction of stress by age and sex

Age & sex model	ß(p-value)	OR	SE	95% CI
Constant	-.346(.520)	.707	.538	
Sex	*.596(.039)	1.815	.288	1.031-3.194
Age	-.017(.104)	.983	.011	.962-1.004
χ^2 (p-value)	*10.232 (.006)			
Nagelkerke R^2	.035			
Classification accuracy	63.20%			

Notes: *p<.05

3.6. Stress and burnout

A separate logistic regression analysis was employed to examine the relationship between perceived stress and burnout. The stress model as a predictor for burnout was significant at the .001 level and predicted 73.50% of the responses correctly. For every one-point increase in the stress score, the odds of burnout were multiplied by 1.62 units. In brief, as the stress score increases, the odds of having burnout also increase. Overall stress level explained 40% of the variance in burnout. Stress remained a significant

predictor of burnout after controlling for sex. The results are presented in Table 7.

Table 7. Summary of logistic regression analysis for prediction of burnout by stress

Stress model	ß(p-value)	OR	SE	95% CI
Constant	-3.667(.000)	1.621	.373	
Stress (PSS)	***.483(.000)	.026	.052	1.464-1.795
χ^2 (p-value)	***137.660 (.000)			
Nagelkerke R^2	.395			
Classification accuracy	73.50%			
Stress & sex model	ß(p-value)	OR	SE	95% CI
Constant	-3.846(.000)	.021	.434	
Stress (PSS)	***.473(.000)	1.605	.052	1.449-1.779
Sex	.308(.334)	1.361	.319	.729-2.541
χ^2 (p-value)	***134.878 (.000)			
Nagelkerke R^2	.391			
Classification accuracy	74.60%			

Notes: ***$p<.001$
Perceived Stress Scale (PSS)

3.7. Person-specific resilience factors, stress, and burnout

A series of logistic regression analysis were completed to determine the relationship between the proposed PRF (SOP, SPP & self-compassion), stress and burnout whilst controlling for the impact of sex.

Model 1 consisted of SOP, SPP and self-compassion as predictors to burnout with sex held at constant. Both SPP and self-compassion predicted burnout at .001 level. As predicted, for every one-point increase in self-compassion, the likelihood of burnout decreases. Intriguingly, contrary to expectations, an increase in SPP also decreased the likelihood of burnout. The SOP did not significantly predict burnout, which was also not as predicted. Results are presented in Model 1 of Table 8.

Model 2 added the stress variable. Similar to the pattern of results in Model 1, SPP and self-compassion remained significant predictors to burnout when stress level was held at constant. However, the significance level for self-compassion decreased from .001 level to .05 level. The SOP remained non-significant. Stress also significantly predicted burnout at .001 level. An increase in stress also increased the likelihood of burnout (see Model 2 of Table 8).

Model 3 added the two-way interaction terms between individual PRF and stress. The results are presented in Model 3 of Table 8. Contrary to expectations, none of PRF significantly moderated the impact of stress on burnout. Only the SPP remained as significant predictor to burnout. The SOP, self-compassion, and stress did not significantly predict burnout.

Table 8. Summary of logistic regression analysis for prediction of burnout by person-specific resilience factors [self-oriented perfectionism (SOP), socially prescribed perfectionism (SPP), and self-compassion (SC)]

PRF	Model 1				Model 2				Model 3			
	B(p-value)	OR	SE	95% CI	B(p-value)	OR	SE	95% CI	B(p-value)	OR	SE	95% CI
Constant	5.540(.000)	254.585	.919		1.208(.280)	3.348	1.118		3.510(.184)	33.434	2.640	
SO Perfectionism (MPS)	.012(.415)	1.012	.014	.984-1.041	.005(.730)	1.005	.016	.975-1.037	.020(.672)	1.020	.048	.929-1.121
SP Perfectionism (MPS)	***-.075(.000)	.928	.015	.902-.955	***-.062(.000)	.941	.016	.912-.970	*-.101(.022)	.904	.044	.829-.986
Self-compassion (SCS-SF)	***-.088(.000)	.916	.016	.888-.945	*-.039(.028)	.961	.018	.928-.996	-.070(.167)	.932	.051	.843-1.030
Sex	.209(.504)	1.232	.312	.668-2.272	.055(.869)	1.057	.336	.547-2.043	.078(.818)	1.082	.341	.554-2.110
Stress					***.389(.000)	1.476	.058	1.319-1.652	.033(.924)	1.034	.351	.519-2.059
SOP* stress									-.002(.714)	.998	.006	.985-1.010
SPP*stress									.006(.322)	1.006	.006	.994-1.019
SC*stress									.005(.483)	1.005	.007	.991-1.019
χ² (p-value)	***108.339 (.000)				***166.405 (.000)				***168.040 (.000)			
Nagelkerke R²	.325				.466				.469			
Classification accuracy	74.00%				74.50%				74.80%			

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

*Perceived Stress Scale (PSS); Multi-Dimensional Perfectionism Scale (MPS); Self-Compassion Scale Short Form (SCS-SF)

3.8. Occupation-specific resilience factors, stress, and burnout

Similar to the previous section, a series of logistic regression analysis were carried out to examine the relationship between ORF (peer cohesion, supervisor support, work pressure, and control), stress, and burnout whilst controlling for sex.

Model 1 consisted of peer cohesion, supervisor support, work pressure, and control as predictors to burnout with sex held at constant. Contrary to expectations, only peer cohesion and work pressure significantly predicted burnout. The pattern of results was as predicted, an increase in peer cohesion *decreased* the likelihood of burnout while an increase in work pressure *increased* the likelihood of burnout. Supervisor support and control did not significantly predict burnout. The results are presented in Model 1 of Table 9.

Model 2 added the stress variable. Interestingly, only work pressure remained as a significant predictor to burnout when stress was held at constant. Peer cohesion, which was a significant predictor to burnout in model 1, did not significantly predict burnout following the addition of stress in Model 2. Similar to the patterns of results in Model 1, both supervisor support and control did not significantly predict burnout. Stress strongly predicted burnout at .001 level. The odds of burnout increased as stress level increased. The results are presented in Model 2 of Table 9.

Model 3 added the two-way interaction terms between individual ORF and stress. Contrary to predictions, the ORF did not buffer the impact of stress on burnout. There were no significant main effects either. The results are presented in Model 3 of Table 9.

Table 9. Summary of logistic regression analysis for prediction of burnout by occupation-specific resilience factors [peer cohesion, supervisor support, work pressure, and control]

	Model 1				Model 2				Model 3			
	B(p-value)	OR	SE	95% CI	B(p-value)	OR	SE	95% CI	B(p-value)	OR	SE	95% CI
Constant	-.558(.611)	.572	1.098		-3.261(.010)	.038	1.271		-3.609(.336)	.027	3.749	
Peer Cohesion (WES)	**-.038(.003)	.963	.013	.939-.987	-.021(.150)	.979	.015	.952-1.008	.009(.846)	1.009	.045	.924-1.102
Supervisor Support (WES)	-.020(.109)	.980	.013	.956-1.004	-.013(.368)	.987	.014	.961-1.015	-.048(.275)	.953	.044	.874-1.039
Work Pressure (WES)	***.049(.000)	1.050	.012	1.027-1.074	*.029(.022)	1.030	.013	1.004-1.056	.071(.078)	1.073	.040	.992-1.161
Control (WES)	-.004(.686)	.996	.011	.975-1.017	-.003(.831)	.997	.012	.974-1.021	-.042(.249)	.958	.037	.892-1.030
Sex	.558(.611)	.572	.301	.993-3.229	.281(.389)	1.325	.327	.698-2.514	.268(.422)	1.308	.334	.679-2.517
Stress (PSS)					***.420(.000)	1.522	.054	1.368-1.693	.500(.364)	1.649	.551	.560-4.854
Peer Cohesion*Stress									-.004(.481)	.996	.006	.984-1.008
SS*Stress									.005(.412)	1.005	.006	.993-1.017
Work Pressure*Stress									-.006(.286)	.994	.006	.982-1.005
Control*Stress									.006(.260)	1.006	.005	.996-1.016
χ² (p-value)	***71.748(.000)				***152.523(.000)				***155.453(.000)			
Nagelkerke R²	.225				.434				.441			
Classification accuracy	73.80%				76.30%				76.00%			

Notes: * $p<.05$; ** $p<.01$; *** $p<.001$

*Work Environment Scale (WES); Perceived Stress Scale (PSS); Supervisor Support (SS)

4. Discussion

The overarching aim of this study was to investigate the relationship between burnout, stress, and the proposed person- and occupation-specific resilience factors. To the author's knowledge, this is the first study to investigate the *buffering* effect of perfectionism and self-compassion on burnout when faced with stress in a sample of UK-based veterinary surgeons. Overall, the findings showed no evidence of buffering although direct linear relationships were found between burnout, and sex, SOP, self-compassion, peer cohesion and work pressure. The lack of buffering effect between the proposed resilience factors and stress highlights the complexity of resilience in relation to burnout in veterinary surgeons.

4.1. Age, sex and burnout

The significant effect of sex on burnout was consistent with previous research (Fritchi et al., 2009; Gardner & Hinni, 2006; Mastenbroek et al., 2013; Reijula et al., 2003). Female vets were more likely to experience burnout symptoms than male vets (Fritchi et al., 2009; Gardner & Hinni, 2006; Mastenbroek et al., 2013; Reijula et al., 2003). This seeming increased vulnerability to burnout in females, however, is not exclusive to veterinary surgeons only. Previous burnout studies in medical doctors also demonstrated an identical pattern of results with female doctors more prone to experiencing self-reported burnout symptoms than male doctors (e.g. Eley et al., 2013; Lindeman et al., 2017). Interestingly, there are also studies which provide evidence to the contrary. For instance, a study on burnout and stress among American surgery residents indicated that emotional exhaustion was equally prevalent in male and female doctors (Lebares et al., 2017). The incompatibility of evidence perhaps suggests certain characteristics of resilience in relation to burnout

in these stressful occupations: (a) the relation cannot be solely predicted by sex, and (b) the impact of sex on burnout is also likely to be influenced by other factors such as the context (e.g. occupational factors; Mastenbroek et al., 2013; Reijula et al., 2003; Waller, 2001) and other personal characteristics (e.g. age and self-compassion; Fritschi et al., 2009; Reijula et al., 2003). For example, Reijula et al. (2003) found that higher rates of burnout were found in female vets in the youngest age group but not in the older age groups.

The non-significant effect of age on burnout was unexpected. It is possible that the significant effect of age on burnout in previous studies did not control for the effect of sex. For example, in Fritschi et al.'s (2009) large cross-sectional study on Australian vets, measures of psychological health associated with demographic factors (e.g. age & sex) were explored using univariate statistics. It is also likely that given the total number of female vets was over three times more than the total number of male vets in this study, sex acted as a confounder to the relationship between age and burnout. The significant effect of sex on burnout has been reported in several studies (Gardner & Hinni, 2006; Mastenbroek et al., 2009). For instance, Gardner and Hinni (2006) found that female vets were more likely to report higher levels of occupational stress. The possibility that sex influenced the impact of age was in keeping with the discussion above about the possible role of other factors (i.e. context & personal characteristics) in the relation of resilience and burnout in vets (e.g. Mastenbroek et al., 2013; Waller, 2001; Reijula et al., 2003). This outcome is in line with the idea that resilience is a *multi-faceted* construct as opposed to being one-dimensional (Zautra et al., 2010).

4.2. Stress and burnout

Stress as a significant predictor to burnout was in agreement with a number of studies (Reijula et al., 2003; Bartram et al., 2009; Hart et al., 2011). The inconsequential influence of age and sex on the relationship between stress and burnout highlights the challenging nature of the veterinary profession. It was therefore unsurprising that over 80% of UK-based vets perceived their work as stressful (Robinson & Hooker, 2006). Equally, given the level of stress in veterinary work, it was also unsurprising that vets have ominously poorer wellbeing compared to other professions in the UK (Johnson et al., 2005).

The positive relationship between stress and burnout replicates the pattern of results from other studies. Higher levels of stress were found to be associated with higher levels of burnout (Reijula et al., 2003). Reduced 'wellbeing' (an index opposite to burnout) along with increased stress levels were also found in a sample of Australian vets (Hatch et al., 2011). These significantly higher incidence rates of stress and reduced wellbeing in vets as compared with the general population (e.g. Bartram et al., 2009; Hatch et al., 2011) further highlight the strains and difficulties in veterinary work.

4.3. Person-specific resilience factors, stress, and burnout

Socially prescribed perfectionism and self-compassion as predictors to burnout were in line with past research (McArthur et al., 2017; Olson et al., 2015; Hill et al., 2008). The positive relationship between self-compassion and burnout replicates results from McArthur et al.'s study (2017) on resilience and self-compassion in veterinary education students. In particular, they found that those with greater levels of self-

compassion scored higher on self-reported resilience measure (McArthur et al., 2017). A similar outcome was found in Olson et al.'s (2015) study on paediatric residents. Olson and her colleagues (2015) reported that self-compassion was inversely associated with emotional exhaustion (an index of burnout) and positively associated with self-reported resilience scores.

Although the significant relationship between SPP and burnout has not yet been explored in vets, a less specific form of perfectionism (trait perfectionism) has been previously investigated in relation to moral distress and resilience (Crane et al., 2015). They found that high trait perfectionism was found to be negatively associated with self-reported resilience (Crane et al., 2015), an index of wellbeing that is often viewed as the inverse of burnout.

The inverse relationship between SPP and burnout was unexpected and contrary to the findings in Hill et al.'s (2002) study on perfectionism in junior soccer players. Hills and colleagues (2002) reported a direct positive relationship between SPP and burnout. Reasons for the inverse relationship remain unknown. It can be speculated that as burnout intensifies, the individual may be less inclined to worry about performing well according to satisfy perceived expectations from others. Such speculation was purely based on the reported positive correlation between burnout and depression (Hatch et al., 2011). There are a number of studies that suggest motivational deficits in depression. For instance, there is some evidence that depression affects effortful processes (e.g. motivation to perform well; Austin et al., 2001).

The lack of influence from the stress covariate validates the significant relationship between burnout and self-compassion, and burnout and SOP, which has been discussed above. Similarly, the significant relationship between stress and burnout when controlling for self-compassion and SPP reiterates the previously discussed link between stress and burnout within the veterinary profession (Reijula et al., 2003; Bartram et al., 2009; Hart et al., 2011).

The absence of significant relationship between SOP and burnout is contrary to the outcome in Crane et al.'s (2015), which has also been discussed above. One possible reason for this is the relatively low number of male vets in the study. Male gender and SOP was found to be positively correlated in a previous study on gender difference and competitiveness (Carter & Weissbrod, 2010).

Contrary to expectations, all of the PRF did not buffer the impact of stress on burnout. The lack of interaction effect between PRF and stress supports the conceptualisation of resilience as a *process* of interaction between the individual and context as opposed to a being a *fixed trait* (e.g. Connor & Davidson, 2003; Johnson, 2016; Luthar et al., 2000; Waller, 2001). Although the PRF such as SPP and self-compassion initially predicted burnout, it seems that their impact was not strong enough to influence stress or vice versa. As stress in vets was found to be associated with a wide range of person- and occupation-specific variables (e.g. Hatch et al., 2011; Platt et al., 2010), it is possible that response to stress or the experience of stress is a cumulative effect of a variety of factors at different stages (Fletcher & Fletcher, 2005). In essence, a diverse set of resilience factors may be required to address a diverse set of issues or difficulties.

4.4. Occupation-specific resilience factors, stress, and burnout

Peer cohesion and work pressure as significant predictors to burnout replicates findings from previous studies (e.g. Platt et al., 2010; Bartram et al., 2009; Mastenbroek et al., 2013). The negative relationship between peer cohesion and burnout replicates the positive clinical outcomes reported by Bartram et al.'s (2009) in vets with higher levels of job satisfaction. Social support was also the most frequently cited 'protective factor' in a qualitative literature analysis on resilience in contemporary research (Cake et al., 2017).

The positive relationship between work pressure and burnout is also in line with findings from a notable systematic review on psychosocial problems in vets (Platt et al., 2010). Extended working hours and excessive work load (indices of job demand) were found to be associated with both suicide and mental health difficulties in vets internationally (Platt et al., 2010). An analogous pattern of results was also found in more recent studies. For instance, a large cross-sectional study in The Netherlands reported a positive relationship between job demands and burnout (Mastenbroek et al., 2013; Mastenbroek, 2017).

When stress was held at constant, peer cohesion lost its significance while work pressure remained significant. The reason for the changed relationship between peer cohesion and burnout may be due to the confounding effects of stress. If peer cohesion was found to be associated with positive clinical outcomes (Bartram et al., 2009), it seems reasonable to speculate that the absence or lack of it may lead to negative clinical outcomes such as stress. Given that no *multicollinearity* was found

between stress and peer cohesion, it is possible that the degree of correlation between the two covariates was not large enough to meet the criterion, but was adequate enough to suppress the effect of the other. It is also likely that peer cohesion was simply not a significant predictor to burnout in this study.

The unchanged significant relationship between work pressure and burnout after controlling for stress may be due to the considerable effect work pressure has on burnout. As discussed previously, excessive work demands were found to be strongly associated with burnout in vets (Mastenbroek et al., 2013; Mastenbroek, 2017; Platt et al., 2010). Similarly, the significant effect of stress while holding all of the PRF at constant emphasises its sizable impact on burnout as discussed in Section 4.2.

Comparable to the findings in Section 4.3, the ORF did not moderate the impact of stress on burnout. As discussed in the previous section, the lack of buffering effect may be due to the multifaceted and *dynamic* nature of resilience as opposed to being a *fixed* characteristic (e.g. Connor & Davidson, 2003; Johnson, 2016; Luthar et al., 2000; Waller, 2001; Zautra et al., 2010). Although factors specific to the context of veterinary practice are important when understanding resilience in vets, the interaction between vets and their context may have provided a more comprehensive approach to data analysis (Waller, 2001).

In sum, the overall results of the study did not provide supporting evidence to the hypothesised buffering effect of the selected resilience factors (PRF & ORF) on stress in the development of burnout in vets. Although the BDFR (Johnson, 2006)

has provided a useful framework to test resilience factors specific to burnout in the context of stress, its conceptualisation of resilience as a stable characteristic (of an individual or unit as a whole) may have been too restrictive. As the main *stressors* within the veterinary profession were consequences of the *interaction* between practitioners and contexts (e.g. difficulty managing workload; difficult interpersonal interaction with clients, peers & manager; Mastenbroek et al., 2013; Mastenbroek, 2017; Platt et al., 2010), it seems contradictory to have resilience factors that are only specific to the vets and their context but not the interaction between the two. As cited by Waller (2001), the interaction between people and their context must be a crucial consideration in the conceptualisation of resilience.

4.5. Clinical implication

This study provides the perspective of UK-based vets themselves who work in a profession where rates of stress and burnout are ominously high in comparison to other occupations in the country. Although the majority of vets continue to thrive in their work, a good proportion of them struggle to cope with the arduous emotional and physical demands of their job. This study provides evidence to person- and occupation-specific resilience factors that are associated with burnout in the context of stress. It highlights the need for future research to go beyond exploring the scale of burnout in UK-based vets, and aims towards identifying and understanding the mechanism that enable these vets to thrive despite adversity.

While the overall outcome of this study has not provided a novel insight into the mechanism of resilience factors, the results highlight the role of stress in the

development of burnout. Finding effective ways to address stressors that are intrinsic to the veterinary profession, may help reduce the risks of burnout in vets.

This study has implications for efforts to improve the vets' work environment. The extent to which vets are able to cope with the demands of their job and feel supported by their peers appear to protect them from burnout. Efforts to increase peer cohesion and decrease work pressure or job demands should rest on supporting the management to learn about effective team working and positive relational strategies.

4.6. Strengths and limitations

The key strengths of this study are its acceptable sample size and adequate amount of data which enabled the researcher to explore relationships between a number of variables. Further, unlike interview studies where respondents are hypothetically exposed to certain biases such as social desirability bias, the response bias in a survey study such as this may be relatively low (Bowling, 2005).

However, this study has a number of limitations. The use of single-item burnout scale meant that the researcher was unable to estimate its internal consistency reliability. It is, however, important to note that a number of studies have demonstrated that single-item reliability can be estimated using a combination of factor analytic models and innovative applications of psychometric theory (Ginns & Barrie, 2004; Sackett & Larson, 1990). For instance, Wanouse, Reichers and Hudy (1996) used the *correction for attenuation formula* to estimate the reliability of single-item measures of overall job satisfaction. As reported in Sackett and Larson's (1990)

paper, single-item measures may be appropriate if the construct is obviously specific and unequivocal.

The binary nature of the outcome variable (burnout) meant limited options for statistical analysis. It is possible that by splitting burnout symptoms into two distinct categories (with & without), the researcher failed to detect possible links between the different *levels* of burnout symptoms and proposed resilience variables. Accordingly, it is likely that the decision to treat burnout as a *binary* variable as opposed to an ordinal variable might have yielded a completely different pattern of results.

The lack of studies in the literature that closely mimics the research design of the current study and the absence of a pilot study meant that coming up with reasonable and meaningful estimates of the probabilities that are needed when calculating the power analysis for logistic regression was problematic. It is important to note, however, that whilst experts on research methodology are not in complete agreement as to how big sample sizes need to be to obtain stable estimates, it was suggested that sample sizes of less than 100 should be avoided and that 500 observations should be adequate for almost any situation (Long,1997). Although the sample size of the current study is closer to the latter than the previous, it is possible that the present study is under-powered

The complexity of resilience as a concept combined with the lack of a resilience framework that is specific to the veterinary profession meant that the current study may not have been set up adequately to find the predicted hypotheses. It is possible that the proposed resilience variables (PRF & ORF) did not buffer the impact of

stress on burnout for a number of reasons. It is possible that the selected resilience variables were simply not highly relevant to resilience to burnout in vets. It is equally likely that stress in vets are influenced by a wide range of resilience factors as opposed to a handful few, which confirms the complexity of resilience as a concept. It is also likely that the use of a shortened version of perceived stress scale (PSS-4) and the use of a single-item burnout scale (e.g. SBM) meant that the key variables in the study were measured inadequately.

Although the optional response in the survey offered participants the freedom to choose information they wish to disclose or share, this led to a number of missing data. It is important to note, however, that missing data were excluded pairwise to avoid any bias in the statistical analyses.

Further, the limited recruitment time frame meant that the survey was only open for a period of nine weeks. Given the rate of response over a short period of time, it is likely that more vets would have taken part had the survey been open for longer. With a very limited research budget, the resources available to promote the study was rather limited.

Finally, the cross-sectional design and use self-reported data meant that the temporal nature of observed associations between variables must be interpreted carefully and causation cannot be inferred from these associations.

4.7. Recommendations for future research

The findings from this study offer new insights into the resilience factors that influence the occurrence of burnout in vets when faced with stress. Following on from the limitations identified above, it is recommended for future research to investigate the concept of resilience to burnout *qualitatively* to develop a resilience framework that is both relevant and specific to the veterinary profession.

Although the buffering effect was not found, the results of the study demonstrated the significant role of stress in the incidence of burnout in vets. It may be useful to look beyond this immediate trigger or adversity and look into the precipitating and perpetuating factors for burnout in this particular sample. Further, it may also be useful to explore the potential 'buffering' impact of mindful self-compassion techniques on the maintenance of burnout given that both self-compassion and perfectionism (SPP) appear to be linked with burnout in vets.

With regard to future quantitative research, an obvious extension from the current findings would be to replicate the study in a much bigger sample of vets so that a pathway analysis can be used to test the BDFR. Equally, it would be useful to explore the benefit of mindful self-compassion in the development of burnout in a sample of vets who have considerable levels of stress and a history of burnout. Narrowing down the inclusion criteria for recruitment may provide a more robust dataset and reduce the potential influence of confounders.

4.8. Summary and conclusion

The main aim of this study was to investigate the relationship between the proposed resilience variables (PRF & ORF), stress, and burnout in UK-based vets. Although the results of the study did not provide evidence of 'buffering', it replicates findings from previous studies that demonstrated linear relationships between the resilience variables and burnout. More importantly, this study emphasises the role of stress in the development of burnout. Overall, this study highlights the complex and multidimensional nature of resilience.

Although previous studies have explored resilience factors in vets, a gap in the literature still persists. Given the ominously high suicide rate in vets, there seems to be a need for a more robust resilience framework that is specific to the veterinary profession. A number of future research ideas have been identified to expand on the current findings and develop a richer understanding on the mechanism of resilience in vets.

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Section three

Critical appraisal

By Donna Bella Back

1. Overview

This section presents my personal and professional account of the research process. In particular, this section discusses my appraisal and reflections on the experience of completing my thesis, and the learning I have made along the way. Throughout the research process, I kept a record of my observations, thoughts, experiences, and reflections in a journal. I used this journal to inform the narrative of my discussion in this paper. This section has not been written with a publication in mind hence I have written this using a first person perspective.

2. Research Process

Having been born and raised in a third world country like the Philippines, I witnessed the harsh realities of inequality and poverty in all its forms. Paradoxically, I did not quite recognise the harshness of other people's circumstances back then as everyone seemed outwardly cheerful and content despite the scarcity of resources. On reflection, perhaps I was simply not observant and sensitive enough at that time to pick up on their difficulties. Were they simply masking their misery? Equally, perhaps there was something about our collective belief (*i.e.* to embrace and accept adversities in life as they come) which enabled those in hardships cope better. Do awareness and acceptance of one's difficulties constitute resilience? Or is resilience more of a sense of 'mastery of the environment', a notion that is widely held in western culture (Zautra, Hall & Murray, 2010)? If we are to take into account all of the differences that make us unique as a person, a community, an institution, and a nation, how are we going to define resilience then? These questions, along

with my enthusiasm for learning, and commitment to be of help to others are the main reasons why I decided to pursue a topic on resilience. From my years of clinical training, I have come to recognise that while it is very useful to examine the precipitating and perpetuating factors to our problems, it is equally helpful to investigate the resilience factors and processes that facilitate positive adaptation in the context of adversity.

2.1. Choosing a research topic

The topic for my current research project stemmed from my original research topic which, unfortunately, did not come into fruition due to difficulties in accessing my participants. I originally intended to carry out a study on resilience factors in prison officers in the United Kingdom (UK). With the growing number of prison riots across the country and the rise of staff burnout among UK-based prison officers, I thought a study on resilience factors may help enrich the currently limited resilience literature in prison officers. Although I was very disappointed that I was unable to pursue this topic, I was encouraged by the prospect that I could still carry out a study on resilience but in a completely different setting. I initially felt motivated to learn more about the resilience factors in veterinary surgeons (vets) after I have learned about the astounding rate of successful suicide in this profession. With the rate of suicide in vets being four times higher than that of the general population, and two times higher than that of the healthcare professionals, I initially felt compelled to look into the possible reasons for this. I noticed that majority of the previous studies predominantly looked at the incidence rate and risk factors for psychiatric morbidity, burnout and suicidal behaviour. More importantly, I also

noticed that only a handful of studies have looked into the resilience factors in this particular group of professionals. Having completed my systematic review on resilience factors in medical doctors, the lack of resilience studies in vets was somewhat unsurprising. Motivated by the prospect of contributing to the current gap in literature, I decided to conduct my study in UK-based veterinary surgeons.

2.2. Deciding on the methodology

The overarching aim of my research study was to identify personal- and occupation-specific resilience factors in UK-based veterinary surgeons. In an attempt to address the continuing inconsistencies in the definition and measurement of resilience as a construct, the study utilised the Bi-directional Framework for Resilience (BDFR; Johnson, 2016). The BDFR recommends that in order to identify factors that confer resilience, three parameters must be measured: 1) adversity or risk variable, 2) proposed resilience variable, and outcome variable. The framework suggests that resilience *buffer* the impact of adversity on the outcome. The selection of variables of interest and psychometric measures used in the study was guided by findings from previous research, whilst ensuring that the three parameters set by the BDFR were also met. The decision to use a survey method was based on the nature of the aim of my research project and important practical limitations, such as limited time to collect data and other concurrent course requirements (e.g. placement & teaching).

2.3. Ethical approval and ethical considerations

Prior to starting the research project, an ethical approval was sought from the University Psychology Ethics Committee. Navigating through the university ethical approval process did not seem as laborious and as time consuming as the NHS ethics application procedure which I had to do for my original research topic. I found the university online ethics application system very user-friendly and uncomplicated. I received the ethical approval for my study within 24-hours of submitting my application.

2.4. Recruitment and data collection

Recruitment and data collection were more straightforward than I anticipated. It took me less than two weeks to complete the minimum number of participants required (*n* = 78) and it took me nine weeks to recruit a total of 404 participants. Without any access to the biggest source of sampling frame for UK-based, practising vets (e.g. Royal College of Veterinary Surgeons & British Veterinary Association; British Veterinary Associations), I was astonished by the positive responses that I received from random individual vets and various veterinary organisations. A number of vets have contacted me stating that my study was a 'much needed' piece of research in their profession. A couple of vets disclosed stories of their personal struggles to me via email, thanking me for taking an interest in something that was important to them and their fellow clinicians. A few vets who were originally based in the UK but are now working overseas also contacted me, asking if they were eligible to take part. One clinician, in particular, contacted me over the phone and spoke at length about stressors vets experience on the whole. All of these individual contacts, along with the

positive interactions I have had with various veterinary organisations, further highlights the vets' growing need to be heard, and more importantly, to feel safe and supported in their job. It also emphasises the importance of scientific research in a real world setting as vehicle for improvement or change.

2.5. Write-up

I personally found the write up phase incredibly challenging as I had to dip in and out of it every so often in order to meet the demands of my placement. For example, I had to take my research leave in between placement days to ensure that I get enough clinical contacts in order satisfy the course requirements. By not having a consistent, blocked schedule for writing, I would often end up re-reading what I had already written before I can recommence writing. With my tendency to edit as I write, writing can be a big challenge for me at times. I noticed that this tends to happen a lot more when I am feeling particularly anxious. To help calm my anxieties, I began to practise a body scan mindfulness exercise prior to doing any writing. This had helped me immensely as was able to focus more and worry less about future tasks. I have also learnt that stepping away briefly from writing can help 'reset' my anxieties back to its reduced level. Allowing myself to have a break every so often helped refresh my mind and recharge my energy level.

3. Dissemination

As a researcher, I feel duty bound to disseminate the findings from this research project. I feel very grateful indeed to those vets who took the time out of their busy schedule in order to take part in my study. With the potential to

contribute to the currently limited resilience literature in veterinary profession, I hope to disseminate the findings more widely by going beyond the purpose of fulfilling the university course requirements. I have learnt from past experiences that finding the time to write post-qualification can be challenging. With the overwhelmingly positive response from the veterinary clinicians, I am mindful that it is my ethical responsibility to disseminate findings to the wider research and veterinary community.

The initial plans for dissemination include feeding back the results of the study to those participants who opted in to receiving a copy of the summary of findings. Results will also be fed back directly to those organisations who helped circulate the recruitment leaflet for the study. I also intend to deliver an oral presentation in one of the bi-annual conferences on veterinary mental health in 2019. I hope that this will help inform the wider veterinary community of the relevant resilience factors in their profession and is possible, adapt interventions or strategies to help boost resilience factors in their clinicians. After submission of my thesis, I plan to submit the systematic review and empirical report in peer reviewed journals. As briefly mentioned earlier, I hope that these will contribute to the literature base, and help inform future studies.

4. Reflections on personal and professional development

Throughout the research process, I have come to recognise some personal and professional developmental learning opportunities. First, I have come to recognise that my tendency for self-criticism can be a gift and a curse. It can be helpful when it motivates me to do well, but it can equally be very unhelpful

when it stops me from focusing on my work. Second, I am now more mindful that my tendency to mask my difficulties and anxieties can be very counter-productive. By masking them, people around me, especially my supervisors and peers, can only assume that I am doing well. For instance, I have learnt that by letting my supervisors at placement know about my difficulties, they were able to support me and find ways on how we can things less difficult and more manageable. Third, I realised that my tendency to withdraw from others and isolate myself when I am not coping well can be very unhelpful. I recognised that this is how I get myself caught in a repeating cycle of *rejecting* and *rejected*. For example, isolating myself from the cohort may have made others feel that I was *choosing* not to socialise with them. As a consequence, others have occasionally overlooked to include me in social gatherings, which left me feeling unsupported and rejected. Finally, and on a positive note, I have learnt that I am *resilient* even though at times it does not feel like I am. For instance, while the idea of changing my topic and starting all over again felt very daunting, I decided to take the risk and changed my research topic on the same month that my thesis was due. Although worried, I felt a sense of relief knowing that I would be more in control of the recruitment and data collection process. Having made the decision to change my topic five months ago and submit before the end of this month (September) not only proved my resilience but my capacity for self-compassion too. Managing placement demands whilst writing my thesis felt particularly challenging but somehow I managed to do both although not as skilfully as I had hoped. Coming to an acceptance that I may not graduate with the rest of my colleagues was difficult but not impossible. I have come to recognise that given the difficulties I have had

throughout the clinical training and research process overall, to be able to see the light at the end of this very long winded tunnel is a big achievement in itself. I could not even count the number of times I thought and *felt* like quitting and yet here I am, still clinging on to idea that I *can* do this.

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Zautra, A. J., Hall, J. S., Murray, K. E., & the Resilience Solutions Group 1. (2008).
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Health Psychology Review, 2(1), 41-64.

Appendices

Appendix A. List of search terms and breakdown of number of articles yielded per database

Database	Search terms		Number of articles
PsycINFO	resilien* **OR** psychological resilien* **OR** psychological wellbeing **OR** emotional wellbeing **OR** mental wellbeing **OR** hardiness **OR** mental health **OR** wellness		
	AND		
	"medical doctor*" **OR** physician* **OR** surgeon* **OR** "medical person*" **OR** "medical residen*" **OR** "health person" **OR** "health profession *" **OR** "healthcare professional*" **OR** "healthcare person *"	Title only	26
		Title only with limiters	15
		Abstracts only	343
		Abstract only with limiters	173
Scopus	resilien* **OR** psychological resilien* **OR** psychological wellbeing **OR** emotional wellbeing **OR** mental wellbeing **OR** hardiness **OR** mental health **OR** wellness		
	AND		
	"medical doctor*" **OR** physician* **OR** surgeon* **OR** "medical person*" **OR** "medical residen*" **OR** "health person" **OR** "health profession *" **OR** "healthcare professional*" **OR** "healthcare person "	Title only	66
		Title only with limiters	37
		Abstracts only	649
		Abstract only with limiters	389
Web of Science	resilien* **OR** psychological resilien* **OR** psychological wellbeing **OR** emotional wellbeing **OR** mental wellbeing **OR** hardiness **OR** mental health **OR** wellness		

PubMed		
AND		
"medical doctor*" **OR** physician* **OR** surgeon* **OR** "medical person*" **OR** "medical residen*" **OR** "health person*" **OR** "health profession*" **OR** "healthcare professional*" **OR** "healthcare person*"	Title only*	57
	Title only with limiters*	55
	Abstracts only*	option unavailable
	Abstract only with limiters*	option unavailable
resilien* **OR** psychological resilien* **OR** psychological wellbeing **OR** emotional wellbeing **OR** mental wellbeing **OR** hardiness **OR** mental health **OR** wellness		
AND		
"medical doctor*" **OR** physician* **OR** surgeon* **OR** "medical person*" **OR** "medical residen*" **OR** "health profession*" **OR** "healthcare professional*" **OR** "healthcare person*"	Title only	57
	Title only with limiters	30
	Abstracts only**	503
	Abstract only with limiters**	339
	Combined title only	206
	Combined title only with limiters	137
	Combined abstracts only**	1495
	Combined abstract only with limiters**	901
	Combined total	1038
	Combined total with duplicates removed	545
	Total identified through other source	2
	Total shortlisted	13

Note: *Limiter 'human' not available; **Abstracts only option not available. Used 'Title/Abstract' option instead

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Appendix B. Data extraction form

Authors	
Title	
Study Location	**Publication Date**
Journal	
Volume, Number, Pages	**Quality Rating**
Keywords	
Aims/Objectives of the study	
Research Design	
Resilience Variables *(including measures)*	
Independent Variables *(including measures)*	
Dependent Variables *(including measures)*	
Statistical procedures *(power calculation & statistical method employed)*	
Sampling and recruitment method *(sampling frame, strategies to address non-responders)*	
Participant demographics & characteristics *(sample size, number of males & females, mean age, & other participant characteristics)*	
Key findings *(including findings on non-responders & reporting of missing data)*	
Conclusions *(including limitations, reliability/validity issues, & clinical implications)*	
Additional comments	

Appendix C. The AXIS tool (Downes et al., 2016) template and synthesis of findings for studies included in the review

Questions	MacFarland et al. (2017)	McCain et al.(2017)	Murray et al. (2017)	Lebares et al. (2017)	Montero-Marin et al. (2015)	Simpkin et al. (2018)	Cooke et al. (2013)	Eley et al. (2013)	Morice-Ramat et al. (2018))	Reed et al. (2018)	Rossouw et al. (2013)	Taku (2013)	Olson et al. (2014)
Introduction													
1. Were the main aims/objectives of the study clear?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Methods													
2. Was the study design appropriate for the stated aim(s)?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3. Was the sample justified?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4. Was the target/reference population clearly defined? (Is it clear who the research was about?)	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y	N	N
5. Was the target frame taken from an appropriate population base so that it closely represented the target/reference population under investigation?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y
6. Was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N
7. Were measures undertaken to address and categorise non-responders?	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N
8. Were the risk factor and outcome variables measured appropriate to the aims of the study?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
9. Were the risk factor and outcome variables measured correctly using instruments/measurements that had been trialled, piloted or published previously?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10. Is it clear what used to determined statistical significance and/or precision estimates? (e.g. p-values, confidence intervals)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
11. Were the methods (including statistical methods) sufficiently described to enable them to be repeated?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Results

Item														
12. Were the basic data adequately described?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
13. Does the response rate raise concerns about non-response bias?**	N	N	N	N	N	N	N	N	N	N	N	N	N	N
14. If appropriate, was information about non-responders described?	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N
15. Were the results internally consistent?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
16. Were the results presented for all the analyses described in the method?	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N

Discussion

Item														
17. Were the author's discussions and conclusions justified by the results?	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
18. Were the limitations of the study discussed?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Other

Item														
19. Were there any funding sources or conflicts of interest that may affect the author's interpretation of the results?**	N	N	N	N	N	N	N	N	N	N	N	N	N	N
20. Was ethical approval or consent of participants obtained?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Total Quality Score	19	19	19	19	18	18	18	17	17	17	17	17	17	14

Note:
Y (Yes) = 1   N (No) = 0
**Items 13 and 17 are reverse coded (no = 1)

Appendix D. Guidelines to authors for journal targeted for literature review

ELSEVIER

CLINICAL PSYCHOLOGY REVIEW

AUTHOR INFORMATION PACK

ISSN: 0272-7358

TABLE OF CONTENTS

DESCRIPTION

Clinical Psychology Review publishes substantive reviews of topics germane to **clinical psychology.** Papers cover diverse issues including: psychopathology, psychotherapy, behavior therapy, cognition and cognitive therapies, behavioral medicine, community mental health, assessment, and child development. Papers should be cutting edge and advance the science and/or practice of clinical psychology.

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PREPARATION

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TIFF (or JPEG): Color or grayscale photographs (halftones), keep to a minimum of 300 dpi.

TIFF (or JPEG): Bitmapped (pure black & white pixels) line drawings, keep to a minimum of 1000 dpi.

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Please do not:

- Supply files that are optimized for screen use (e.g., GIF, BMP, PICT, WPG); these typically have a low number of pixels and limited set of colors;
- Supply files that are too low in resolution;
- Submit graphics that are disproportionately large for the content.

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Figure captions

Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

Tables

Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

References

Citations in the text should follow the referencing style used by the American Psychological Association. You are referred to the Publication Manual of the American Psychological Association, Sixth Edition, ISBN 1-4338-0559-6, copies of which may be ordered from http://books.apa.org/books.cfm?id=4200067 or APA Order Dept., P.O.B. 2710, Hyattsville, MD 20784, USA or APA, 3 Henrietta Street, London, WC2E 8LU, UK. Details concerning this referencing style can also be found at http://humanities.byu.edu/linguistics/Henrichsen/APA/APA01.html

Citation in text

Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

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References should be arranged first alphabetically and then further sorted chronologically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters "a", "b", "c", etc., placed after the year of publication. **References should be formatted with a hanging indent (i.e., the first line of each reference is flush left while the subsequent lines are indented).**

Examples: Reference to a journal publication: Van der Geer, J., Hanraads, J. A. J., & Lupton, R. A. (2000). The art of writing a scientific article. *Journal of Scientific Communications, 163*, 51-59.

Reference to a book: Strunk, W., Jr., &White, E. B. (1979). *The elements of style*, (3rd ed.). New York: Macmillan, (Chapter 4).

Reference to a chapter in an edited book: Mettam, G. R., & Adams, L. B. (1994). How to prepare an electronic version of your article. In B.S. Jones, & R. Z. Smith (Eds.), *Introduction to the electronic age* (pp. 281-304). New York: E-Publishing Inc.

[dataset] Oguro, M., Imahiro, S., Saito, S., Nakashizuka, T. (2015). *Mortality data for Japanese oak wilt disease and surrounding forest compositions*. Mendeley Data, v1. http://dx.doi.org/10.17632/xwj98nb39r.1

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Appendix E. Researcher's epistemological stance

The current review was undertaken from a positivist stance. This seemed to be in line with the aims of the study, which required a structured, quantitative procedure. A systematic approach was employed throughout the research process, from identifying the research topic, developing suitable aims, and through to implementing the methodology (Carson *et al*., 2001). Appropriate statistical procedures, which are crucial to a positivist research, were also employed as a part of this structured methodology. Having utilised a survey method, there was no interaction between the researcher and the participants thus enabling the researcher to keep a neutral and objective stance throughout the research process.

Appendix F. Chronology of the research process

Time	Tasks
March 2018	Exploration of research topic
February 2017 (for the original proposal)	Research proposal submission for internal panel and peer review
April 2018	Literature review on resilience and methodology
July 2018	Preliminary data analysis
April 2018	Ethics application submission Formal peer review
April – June 2018	Participant recruitment and data collection
April 2018	Deciding topic and scoping search for systematic review
May – July 2018	Systematic search and data analysis for systematic review
August 2018	Data analysis for empirical research
August – September 2018	Thesis write-up
November 2018	Research viva
September 2018	Conference presentations
December 2018	Preparation for publication

Appendix G. University ethical approval letter

University Ethics Sub-Committee for Psychology

22/04/2018

Ethics Reference: 16038-dbb5-ls:neuroscience,psychology&behaviour

TO:
Name of Researcher Applicant: Donna Back
Department: Psychology
Research Project Title: Resilience to Depression and Suicidal Ideation in Response to Stress and Burnout in UK Veterinary Surgeons

Dear Donna Back,

RE: Ethics review of Research Study application

The University Ethics Sub-Committee for Psychology has reviewed and discussed the above application.

1.   Ethical opinion

The Sub-Committee grants ethical approval to the above research project on the basis described in the application form and supporting documentation, subject to the conditions specified below.

2.   Summary of ethics review discussion

The Committee noted the following issues:
All potential ethics issues have been addressed.

3.   General conditions of the ethical approval

The ethics approval is subject to the following general conditions being met prior to the start of the project:

As the Principal Investigator, you are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Research Code of Conduct and the University's Research Ethics Policy.

If relevant, management permission or approval (gate keeper role) must be obtained from host organisation prior to the start of the study at the site concerned.

4.   Reporting requirements after ethical approval

You are expected to notify the Sub-Committee about:
- Significant amendments to the project
- Serious breaches of the protocol
- Annual progress reports
- Notifying the end of the study

5.   Use of application information

Details from your ethics application will be stored on the University Ethics Online System. With your permission, the Sub-Committee may wish to use parts of the application in an anonymised format for training or sharing best practice. Please let me know if you do not want the application details to be used in this manner.

Best wishes for the success of this research project.

Yours sincerely,

Prof. ███████████
Chair

Appendix H. Summary of missing data

Age and sex data

		Missing	
	N	Count	Missing
Age	400	4	1.00%
Sex	404	0	0%

Psychometric data

		Missing	
	N	Number of cases with missing values	Total number of values missing
Depression (PHQ)	404	6	6
Burnout (SBM)	404	0	0
Perfectionism (MPS)	404	15	21
Self-compassion (SCF-SF)	404	8	20
Stress (PSS)	404	4	10

Notes: PHQ – Patient Health Questionnaire; SBM – Single-item Burnout Measure; Multi-dimensional Perfectionism Scale; SCS – Self-compassion Scale; PSS – Perceived Stress Scale

Appendix I. Study leaflet

What's keeping you going?

A Study on Resilience Factors in Response to Stress and Burnout
in UK Veterinary Surgeons

We know that psychological stress and burnout are on the rise, affecting both your personal and professional wellbeing.

We also know that the rate of suicide in veterinary surgeons is two times higher than medical doctors, and four times higher than the general population.

Whilst we understand *why* some find it difficult to cope in this physically demanding and emotionally charged profession, we still know very little about *what* enables others to thrive and *how* we can best support those who need help.

By taking part in this study, you are helping us to identify and understand both individual- and context-specific resilience factors to depression and suicidal thinking within the UK Veterinary profession. More importantly, by taking part in this study, you are giving a voice to your need to feel valued and supported at your job.

The survey takes about 12-15 minutes to complete and you have the choice of entering the prize draw to win one of the two £50 Amazon vouchers. Please follow the link below to take part:
https://leicester.onlinesurveys.ac.uk/resiliencefactors-in-ukvetsurgeons

Thank you so much for your interest in the study.

For the paper version of the survey or for more information, please contact the investigator:

Donna Back, PhD, CPsychol

The British Psychological Society

Chartered Psychologist

Leicestershire Partnership NHS NHS Trust

This research was approved by the University of Leicester's Ethics Sub-Committee for Psychology (Ethics Reference: 16038-dbb5-ls:neuroscience,psychology&behaviour)

**Appendix J. Participant information sheet**

PARTICIPANT INFORMATION SHEET
Version 1. 16 April 2018.

Study Title: Resilience to Depression and
Suicidal Ideation in Response to Stress and Burnout in UK Veterinary Surgeons
_____
We are inviting you to take part in a research study. Before you decide whether to take part or not, we want to tell you why the research is being done and what you can expect if you do take part. Please take time to read the following information carefully and discuss it with your family, friends, or colleague if you wish. Ask us if there is anything that is not clear or if you would like more information, our contact details are given at the end of this information sheet.

The purpose of the study
We want to know identify which factors (person- & context-specific) help promote resilience to depression and suicidal ideation in UK Veterinary Surgeons when faced with stress and burnout.

Why have I been chosen?
We are inviting everyone who is working as a qualified Veterinary Surgeon in the UK to take part in this study.

Do I have to take part?
No – it is entirely up to you to decide whether or not you want to take part, but if you do it will be of great help to us.

If you are happy to take part, we will ask you to sign a Consent Form (a written confirmation that says you have understood what the study is all about and you happily agreed to take part). After signing the Consent Form, you are still free to change your mind and stop or leave the study if you wish <u>before</u> you have submitted your completed survey. You do not need to tell us the reason why you want to stop or leave.

What should I do if I want to take part?
First of all, think about all the information on this sheet before deciding whether or not to take part in the study. You will be provided with a web link that will take you to a secure online survey website (British Online Survey) if you wish to take part electronically. If you prefer the paper-based format, you will receive a survey pack to complete at your convenience. A prepaid envelop will be enclosed so you can simply drop your completed survey in a nearby post box at a time that is most convenient for you. Please do not hesitate to ask questions if you are not sure about anything.

Version 1. 16 April 2018.

What would the survey be like and how long will it take?

The survey items include questions about how you deal with difficult situations in general, and the positive and negative aspects of your work environment. The time it takes to complete the survey varies, depending on how much time you spend on each question, but the maximum time you need is about 12 to 15 minutes. If there are questions that you are not happy or comfortable with, you always have a choice not to answer them.

What are the possible disadvantages and risk of taking part?

Apart from the time required to complete the assessment, no known disadvantages or risks are associated in taking part.

What will happen when the research study stops?

This study lasts from 22nd April 2018 until 30th June 2018. The results of the study will be written up from about July 2018 onwards, and you will be able to read findings from this project free of charge by the end of August 2018.

Will my taking part in this study be kept confidential?

All anonymised information collected as part of this research (e.g. survey questionnaires data) will be kept in a locked filing cabinet and secure IT systems in the University of Leicester. All paper and electronic data will be identified using unique study numbers instead of identifiable information (e.g. name, address, etc.). This means that your anonymity will be preserved at all times during and after the study time period.

If you decide to give your email address for the prize draw this will be kept separately to all other data. This research complies with the Data Protection Act and University confidentiality policy.

What will happen to the results of the research study?

The results of this study will be communicated back to Veterinary organisations (e.g. Vet Support NI) who supported the study by way of a written report and verbal presentation. The results of the study may also be written up for publication in Clinical Psychology and Veterinary journals and may be presented at conferences in the UK and abroad, however your identity will be kept anonymous at all times.

Who is organising and funding the research?

The research is organised by the University of Leicester. This project is being funded by the Leicester Partnership Trust.

This research project is being supervised by: Dr ███████████████████

Who has reviewed the study?
This research was approved by the University of Leicester's Ethics Sub-Committee for Psychology (Ethics Reference: 16038-dbb5-ls:neuroscience,psychology&behaviour)

Where can I get more information?
We hope that this Information Sheet has told you what you need to know before deciding whether or not to take part. If you have any questions at all about the study or wish to make a complaint, please contact: Donna Back (Chief Investigator),

If you agree to participate, we will give you a copy of this Information Sheet and a copy the signed consent form to keep.

Thank you for taking the time to read this.

Appendix K. Participant consent form

Participant ID Number: _____

UNIVERSITY OF LEICESTER

PARTICIPANT'S CONSENT FORM
Version 1. 16 April 2018.
Study Title: Resilience to Depression and Suicidal Ideation in Response to Stress and Burnout in UK Veterinary Surgeons

Please tick the box if you agree with the corresponding statement.

1. I confirm that I have read and understood the information sheet dated 16 April 2018 (version 1) for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without my legal rights being affected. ☐

3. I understand that participation in the prize draw is optional. If I wish to partake in the prize draw, then my email address will be kept separately from my data and therefore my data will remain anonymous. ☐

4. I understand that information collected about me during my participation in this study will be stored on a password protected computer and that this information will only be used for the purpose of this study. All files containing any personal data will be made anonymous. ☐

5. I agree to take part in the above study. ☐

_____   _____   _____
Participant's Name (Please print)   Participant's Signature   Date

Declaration by Researcher: I have explained the project to the participant who has signed above, and believe that they understand the purpose, extent and possible risks of their involvement in this project.

_____   _____   _____
Researcher's Name (Please print)   Researcher's Signature   Date

_____   _____   _____
Name of the person taking consent   Signature   Date
(If different from Researcher)

Please note: All parties signing the Consent Form must date their own signature.

Optional Consent

I would like to be included in the £50 prize draw ☐

I would like to receive a copy of the summary of results of the study ☐

Contact email address: _____ (If you ticked one or both of the optional consents above)

Version 1. 16th April 2018

Appendix L. Participant debrief sheet

UNIVERSITY OF LEICESTER

Participant Debrief Sheet

Version 1. 16 April 2018.

Study Title: Resilience to Depression and Suicidal Ideation in Response to Stress and Burnout in UK Veterinary Surgeons

Thank you for taking part in this study. We hope that you have found it interesting and have not been upset by any of the topics discussed. However, if you have found any part of this experience to be distressing and you wish to speak to one of the researchers, please contact:

Dr Donna Back (Chief Investigator)

█████████████████████████
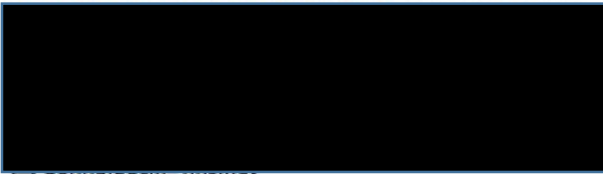
There are also a number of organisations listed below that you can contact.

Vet Support Northern Ireland – a voluntary support network who provides a safe, empathic, non-judgemental listening ear 24/7
☎ 0303 040 2551
✉ info@vetsupportni.co.uk

Vet Life - independent, confidential and free help for everyone in the veterinary community
☎ 0303 040 2551 (24-hour, every day of the year)

Samaritans - confidential support for people experiencing feelings of distress or despair)
☎ 116 123 (24 hours /7 days a week)
www.samaritans.org.uk

Mind – provide advice and support to empower anyone experiencing a mental health problem
☎ 0300 123 3393
Text: 86463
✉ info@mind.org.uk

Again, we thank you for your participation in this study. We greatly appreciate your time and cooperation.

Appendix M. Demographic information form

Page 3: Demographic Information Form

We will not be asking you to provide your name in order to assure anonymity. This information will be used to assist in understanding the psychological, physical, emotional, and social experiences of veterinary surgeons.

Age

Sex

Marital Status

Ethnicity

Do you have children?

  ○ Yes   ○ No

How many and how old? (e.g. two = 4, 7)

Are you employed

Average number of hours per week

What is your role in the clinic (tick all that applies)?

☐ Partner/Owner
☐ Clinical Director
☐ First Opinion Vet
☐ Referral Vet/Specialist
☐ Locum Vet

Approximate no. of days you have missed due to illness over the last 12 months?

8 / 26

145

Appendix N. Single-item Burnout Measure

Page 5: Single Item Burnout Scale (Rohland, Kruse & Rohrer, 2004)

Overall, based on your definition of burnout, how would you rate your level of burnout?

○ I enjoy my work. I have no symptoms of burnout

○ Occasionally I am under stress, and I don't always have as much energy as I once did, but I don't feel burned out

○ I am definitely burning out and have one or more symptoms of burnout, such as physical and emotional exhaustion

○ The symptoms of burnout that I'm experiencing won't go away. I think about frustration at work a lot

○ I feel completely burned out and often wonder if I can go on. I am at the point where I may need some changes or may need to seek some sort of help

Page 6: Perceived Stress Scale (Cohen, Kamark & Mermelstein, 1983)

The following questions ask about your feelings and thoughts during the PAST MONTH. In each question, you will be asked HOW OFTEN you felt or thought in a certain way. Although some of the questions are similar, there are small differences between them and you should treat each one as a separate question. The best approach is to answer it fairly quickly, That is, please do not try to count up the exact number of times you felt a particular way, but tell us the answer that in general seems the best.

For each statement, please tell us if you have had these thoughts or feelings: never, almost never, sometimes, fairly often, or very often. Please read all answer choices each time.

	Answer Choices				
	0 - Never	1 - Almost Never	2 - Sometimes	3 - Fairly Often	4 - Very Often
1. In the past month, how often have you felt unable to control the important things in your life?	○	○	○	○	○
2. In the past month, how often have you felt confident about your ability to handle personal problems?	○	○	○	○	○
3. In the past month, how often have you felt that things were going your way?	○	○	○	○	○
4. In the past month, how often have you felt that difficulties were piling up so high that you could not overcome them?	○	○	○	○	○

Appendix P. Multidimensional Perfectionism Scale

Page 7: Multidimensional Perfectionism Scale (HF-MPS; Hewitt & Flett, 1990)

Listed below are a number of statements concerning personal characteristics and traits. Read each item and decide whether you agree or disagree & to what extent.

Please click on 'view as separate questions instead?' if you are struggling to see the answer options at the top of the questionnaire grid.

	1 - Agree	2	3	4	5	6	7 - Disagree
1. When I am working on something, I cannot relax until it is perfect	○	○	○	○	○	○	○
2. I find it difficult to meet others' expectations of me	○	○	○	○	○	○	○
3. One of my goals is to be perfect in everything I do	○	○	○	○	○	○	○
4. I never aim for perfection on my work	○	○	○	○	○	○	○
5. Those around me readily accept that I can make mistakes too	○	○	○	○	○	○	○
6. The better I do, the better I am expected to do	○	○	○	○	○	○	○
7. I seldom feel the need to be perfect	○	○	○	○	○	○	○
8. Anything that I do that is less than excellent will be seen as poor work by those around me	○	○	○	○	○	○	○
9. I strive to be as perfect as I can be	○	○	○	○	○	○	○
10. It is very important that I am perfect in everything I attempt	○	○	○	○	○	○	○
11. I strive to be the best at everything I do	○	○	○	○	○	○	○

12. The people around me expect me to succeed at everything I do	○	○	○	○	○	○	○
13. I demand nothing less than perfection of myself	○	○	○	○	○	○	○
14. Others will like me even if I don't excel at everything	○	○	○	○	○	○	○
15. It makes me uneasy to see an error in my work	○	○	○	○	○	○	○
16. Success means that I must work even harder to please others	○	○	○	○	○	○	○
17. I am perfectionistic in setting my goals	○	○	○	○	○	○	○
18. Others think I am okay, even when I do not succeed	○	○	○	○	○	○	○
19. I feel that people are too demanding of me	○	○	○	○	○	○	○
20. I must work to my full potential at all times	○	○	○	○	○	○	○
21. Although they may not say it, other people get very upset with me when I slip up	○	○	○	○	○	○	○
22. I do not have to be the best at whatever I am doing	○	○	○	○	○	○	○
23. My family expects me to be perfect	○	○	○	○	○	○	○
24. I do not have very high goals for myself	○	○	○	○	○	○	○
25. My parent rarely expected me to excel in all aspects of my life	○	○	○	○	○	○	○
26. People expect nothing less than perfection from me	○	○	○	○	○	○	○
27. I set very high standards for myself	○	○	○	○	○	○	○

28. People expect more from me than I am capable of giving	○	○	○	○	○	○	○
29. I must always be successful at school or work	○	○	○	○	○	○	○
30. People around me think I am still competent even if I make a mistake	○	○	○	○	○	○	○

Appendix Q. Self-Compassion Scale

Page 10: Self-Compassion Scale – Short Form (SCS–SF; Raes, Pommier, Neff, & Van Gucht, 2011)

HOW I TYPICALLY ACT TOWARDS MYSELF IN DIFFICULT TIMES

Please read each statement carefully before answering. To the left of each item, indicate HOW OFTEN you behave in the stated manner, using the following scale.

Please click on 'view as separate questions instead?' if you are struggling to see the answer options at the top of the questionnaire grid.

	1 - Almost Never	2	3	4	5 - Almost Always
1. When I fail at something important to me I become consumed by feelings of inadequacy.	○	○	○	○	○
2. I try to be understanding and patient towards those aspects of my personality I don't like.	○	○	○	○	○
3. When something painful happens I try to take a balanced view of the situation.	○	○	○	○	○
4. When I'm feeling down, I tend to feel like most other people are probably happier than I am.	○	○	○	○	○
5. I try to see my failings as part of the human condition.	○	○	○	○	○
6. When I'm going through a very hard time, I give myself the caring and tenderness I need.	○	○	○	○	○
7. When something upsets me I try to keep my emotions in balance.	○	○	○	○	○
8. When I fail at something that's important to me, I tend to feel alone in my failure.	○	○	○	○	○
9. When I'm feeling down I tend to obsess and fixate on everything that's wrong.	○	○	○	○	○

10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.	○	○	○	○	○
11. I'm disapproving and judgmental about my own flaws and inadequacies.	○	○	○	○	○
12. I'm intolerant and impatient towards those aspects of my personality I don't like.	○	○	○	○	○

Appendix R. Work Environment Scale

Page 11: Work Environment Scale (Moos, 1974; 2008)

There are 80 statements in this questionnaire. They are statements about the place in which you work. The statements are intended to apply to all work environments. However some words may not be quite suitable for your work environment. For example, the term supervisor is meant to refer to the boss, manager, department head, or the person or persons to whom an employee reports.

You are to decide which of these statements are true of your work environment.

Please click on 'view as separate questions instead?' if you are struggling to see the answer options at the top of the questionnaire grid.

	True	False
1. The work is really challenging.	○	○
2. People go out of their way to help a new employee feel comfortable.	○	○
3. Supervisors tend to talk down to employees.	○	○
4. Few employees have any important responsibilities.	○	○
5. People pay a lot of attention to getting work done.	○	○
6. There is constant pressure to keep working.	○	○
7. Things are sometimes pretty disorganized.	○	○
8. There's a strict emphasis on following policies and regulations.	○	○
9. Doing things in a different way is valued.	○	○
10. It sometimes gets too hot.	○	○
11. There's not much group spirit.	○	○
12. The atmosphere is somewhat impersonal.	○	○
13. Supervisors usually compliment an employee who does something well.	○	○
14. Employees have a great deal of freedom to do as they like.	○	○
15. There's a lot of time wasted because of inefficiencies.	○	○
16. There always seems to be an urgency about everything.	○	○

17. Activities are well-planned.	○	○
18. People can wear wild looking clothing while on the job if they want.	○	○
19. New and different ideas are always being tried out.	○	○
20. The lighting is extremely good.	○	○
21. A lot of people seem to be just putting in time.	○	○
22. People take a personal interest in each other.	○	○
23. Supervisors tend to discourage criticisms from employees.	○	○
24. Employees are encouraged to make their own decisions.	○	○
25. Things rarely get "put off till tomorrow."	○	○
26. People cannot afford to relax.	○	○
27. Rules and regulations are somewhat vague and ambiguous.	○	○
28. People are expected to follow set rules in doing their work.	○	○
29. This place would be one of the first to try out a new idea.	○	○
30. Work space is awfully crowded.	○	○
31. People seem to take pride in the organization.	○	○
32. Employees rarely do things together after work.	○	○
33. Supervisors usually give full credit to ideas contributed by employees.	○	○
34. People can use their own initiative to do things.	○	○
35. This is a highly efficient, work-oriented place.	○	○
36. Nobody works too hard.	○	○
37. The responsibilities of supervisors are clearly defined.	○	○
38. Supervisors keep a rather close watch on employees.	○	○
39. Variety and change are not particularly important.	○	○
40. The place has a stylish and modern appearance.	○	○
41. People put quite a lot of effort into what they do.	○	○
42. People are generally frank about how they feel.	○	○
43. Supervisors often criticize employees over minor things.	○	○

44. Supervisors encourage employees to rely on themselves when a problem arises.	○	○
45. Getting a lot of work done is important to people.	○	○
46. There is no time pressure.	○	○
47. The details of assigned jobs are generally explained to employees.	○	○
48. Rules and regulations are pretty well enforced.	○	○
49. The same methods have been used for quite a long time.	○	○
50. The place could stand some new interior decorations.	○	○
51. Few people ever volunteer.	○	○
52. Employees often eat lunch together.	○	○
53. Employees generally feel free to ask for a raise.	○	○
54. Employees generally do not try to be unique and different.	○	○
55. There's an emphasis on "work before play."	○	○
56. It is very hard to keep up with your work load.	○	○
57. Employees are often confused about exactly what they are supposed to do.	○	○
58. Supervisors are always checking on employees and supervise them very closely.	○	○
59. New approaches to things are rarely tried.	○	○
60. The colors and decorations make the place warm and cheerful to work in.	○	○
61. It is quite a lively place.	○	○
62. Employees who differ greatly from the others in the organization don't get on well.	○	○
63. Supervisors expect far too much from employees.	○	○
64. Employees are encouraged to learn things even if they are not directly related to the job.	○	○
65. Employees work very hard.	○	○
66. You can take it easy and still get your work done.	○	○
67. Fringe benefits are fully explained to employees.	○	○

68. Supervisors do not often give in to employee pressure.	○	○
69. Things tend to stay just about the same.	○	○
70. It is rather drafty at times.	○	○
71. It's hard to get people to do any extra work.	○	○
72. Employees often talk to each other about their personal problems.	○	○
73. Employees discuss their personal problems with supervisors.	○	○
74. Employees function fairly independently of supervisors.	○	○
75. People seem to be quite inefficient.	○	○
76. There are always deadlines to be met.	○	○
77. Rules and policies are constantly changing.	○	○
78. Employees are expected to conform rather strictly to the rules and customs.	○	○
79. There is a fresh, novel atmosphere about the place.	○	○
80. The furniture is usually well-arranged.	○	○
81. The work is usually very interesting.	○	○
82. Often people make trouble by talking behind others' backs.	○	○
83. Supervisors really stand up for their people.	○	○
84. Supervisors meet with employees regularly to discuss their future work goals.	○	○
85. There's a tendency for people to come to work late.	○	○
86. People often have to work overtime to get their work done.	○	○
87. Supervisors encourage employees to be neat and orderly.	○	○
88. If an employee comes in late, he or she can make it up by staying late.	○	○
89. Things always seem to be changing.	○	○
90. The rooms are well ventilated.	○	○

Appendix S. Correlation table for covariates

	1	2	3	4	5	6	7	8
Person-specific covariates								
1. Stress	---							
2. SO Perfectionism	-.242**	---						
3. SP Perfectionism	-.396**	.514**	---					
4. Self-Compassion	-.554**	.391**	.420**	---				
Occupation-specific covariates								
5. Peer Cohesion	-.374**	.149**	.199**	.312**	---			
6. Supervisor Support	-.347**	.140**	.258**	.331**	.531**	---		
7. Work Pressures	.339**	-.206**	-.353**	-.274**	-.245**	-.291**	---	
8. Control	.138**	-.118*	-.100*	-.150**	-.205**	-.245**	.246**	---

Table 3. Correlation of person- and occupation-specific covariates

$**p<.01.$ $*p<.05$