Musculoskeletal Pain Among New Zealand Based Veterinarians: How the Physical Performance of Veterinary Work and Mental Wellbeing Influence this Experience

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Abstract

AIMS: To understand whether the physical performance of veterinary work or poor mental wellbeing is the major determinant of work-related musculoskeletal pain among New Zealand based veterinarians. Thus, providing insights for the future development of occupation specific exercise based interventions.

METHODS: Data was collected by means of a multiple choice online survey. This survey featured the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS), a shortened Alcohol Use Disorders Identification Test (AUDIT-C), and questions relating to the experience of work-related musculoskeletal pain. In addition, semi-structured interviews were conducted with volunteers obtained via the survey and purposely sampled by veterinary subgroup (small, mixed, or large animal) as well as WEMWBS scores (less than, greater than, or equal to the median).

RESULTS: There were 150 total respondents, representing 5.1% of the 2,948 veterinarians registered within New Zealand. The median WEMWBS score for the entire veterinary sample was 50 (IQR=11). There was no statistically significant difference between the WEMWBS scores of small, mixed and large animal practitioners (p=0.302). The rate of "at-risk" alcohol consumption among the veterinarians sampled was 35.0% higher than general public estimates. There was no significant difference between veterinary subgroups in relation to alcohol consumption (p=0.479). Mixed (81.1%; IQR=10; n=43) and large animal practitioners (67.5%; IQR=10; n=27) were the veterinary subgroups found to suffer from the highest rates of work-related musculoskeletal pain. Furthermore, the interview data (n=12) revealed extensive pain and injury histories among mixed and large animal practitioners, but not among the small animal practitioners interviewed.

CONCLUSIONS: The small, mixed or large animal practitioners sampled for this research, as groups, shared a common level of mental wellbeing and alcohol consumption. However, the mixed and large animal practitioners sampled, reported suffering from work-related musculoskeletal pain at the highest rates. The findings suggest that the physical performance of veterinary tasks associated with large animals is the major determinant of the experience of work-related musculoskeletal pain. However, further research is recommended to investigate if, or to which extent, psychological stress modulates the ability for mixed and large animal veterinarians to recover from their physical workloads.

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Clarification Regarding the Formatting and Referencing Style

The formatting and referencing style presented throughout this thesis is as per the requirements of the New Zealand Veterinary Journal (NZVJ), with which publication of this research has been sought. This unique style has been applied to the entirety of this thesis, to satisfy the course requirements set out by Otago Polytechnic for the Master of Applied Science, which specifies that the entire thesis be presented in the style required by the journal with which publication is desired. Therefore, this thesis is presented with specific fonts, spacing, usage of bold and italicised text, and referencing, based on the style of the journal.

The NZVJ instructions for authors regarding formatting and referencing for manuscripts can be found via: https://www.nzva.org.nz/page/nzvjauth

Introduction

Exercise and health science is an emerging field with its own contributions to offer to the prevention and management of work-related musculoskeletal pain. This branch of science specialises in how specific exercise programmes and lifestyle changes may aid in the prevention, management and rehabilitation of chronic conditions and diseases, as well as injuries (Houglum, 2016; Moore, Durstine & Painter, 2016). Exercise and health science is a component of several allied health professions such as clinical exercise physiology, physiotherapy and occupational therapy.

Although work-related musculoskeletal pain or discomfort continues to receive attention worldwide, little is known about its prevalence among certain working populations and occupational groups. Within the general New Zealand working population, the prevalence of work-related musculoskeletal symptoms over a twelve month period was 92%, with exposure to heavy workloads being identified as a contributing factor to this experience (Widanarko, Legg, Stevenson, Devereux, Eng, *et al*, 2011). However, individual professions place stresses on the body in unique, occupational-specific ways. Thus, in order for effective recommendations to be made to improve an individual's experience of musculoskeletal pain, it is imperative to understand how their occupation is affecting their symptoms.

The veterinary profession has been reported to experience widespread work-related injuries and musculoskeletal discomfort (Smith, Leggat, & Speare, 2009; Scuffham, Legg, Firth & Stevenson, 2010), but the requirement to deal with unpredictable animals or perform certain repetitive motions prevents the complete removal of risk. Despite a growing interest abroad there has historically been a lack of New Zealand focused studies looking into veterinarian wellness. Although historically, a variety of overseas veterinarian samples have received attention (Aghazadeh & Nimbarte, 2005; Lessenger, 2006; Kabuusu, Keku, Kiyini, & McCann, 2010; Stoewen, 2015), these findings cannot necessarily be generalised to practitioners working in New Zealand due to potential differences in their working environment, practices, and experiences.

Carefully prescribed exercise interventions can be implemented in order to help treat the experience of pain stemming from musculoskeletal disorders or injuries (Wilson, Gormley & Hussey, 2011). However, whether or not the pain experience among particular professional groups can, to an extent, be avoided in the first place as a result of carefully prescribed exercise programmes is a matter worth investigating. There is potential that preventatively strengthening the bodies of veterinarians could lower the incidence of pain and injury within the profession. However, this is a matter which requires future scientific testing to determine the safety and efficacy of such an approach. Caution should be given to the development of such an intervention, as misunderstanding the true underlying sources of the pain experience could potentially result in the ineffective or even deleterious treatment of veterinary professionals, particularly if their pain is actually a symptom of their mental state. Painful muscle tension is, for example, a common symptom of anxiety (Stein & Sareen, 2015). Historically, work-related psychosocial factors and individual psychological distress have been associated with the subsequent reporting of musculoskeletal pain among employees (Nahit, Hunt, Lunt, Dunn, Silman, & Macfarlane, 2003). In relation to the veterinary industry, the experience of musculoskeletal disorders among veterinarians has historically been correlated with a range of work-related stresses to which they may be exposed, such as: time pressures, and client attitudes (Smith *et al*, 2009). Thus, determining to which extent exercise prescriptions for veterinarians should focus on addressing their mental or musculoskeletal wellness was a matter worth investigating.

The New Zealand developed Te Whare Tapa Whā model of health encapsulates the need for a more holistic view of health and wellness. The model features four interconnected dimensions: Physical Health, Mental Health, Family Health and Spiritual Health. The different parts are symbolically represented by a traditional Māori meeting house with its strong foundations and four equal sides. Should one of the four dimensions be missing or damaged in some way, an individual may become ‘unbalanced’ and subsequently unwell (Durie, 1994). Thus, although the prevalence of musculoskeletal pain experienced by veterinarians could be caused purely by the physical performance of their job, it could alternatively stem from poorer mental wellbeing, which could potentially result from the psychological stresses to which they are exposed. Once one of the four dimensions of Te Whare Tapa Whā becomes damaged, the whole structure begins to suffer imbalance. For example, if sore from work, the mental state of an individual may suffer, negatively impacting their relationship with their family due to being more irritable at home. This could potentially

further damage their overall wellness, promoting even more muscle tension and pain as well as poorer mental wellbeing.

It is plausible that exercise could be used preventatively to reduce the prevalence of musculoskeletal pain and injury among the veterinary industry. For example, Gabel and Gerberich (2002) historically observed decreased injury rates among veterinarians who reported participating in aerobic activities. (RR=0.6, 95% CI = 0.4-0.99). While this observation alluded to the potential efficacy of exercise prescription in reducing veterinary injury rates, the formal prescription and testing of a veterinarian specific exercise intervention has yet to be done. Further to Gabel and Gerberich's (2002) observation, it is uncertain why aerobic exercise participation was associated with a reduced injury rate among veterinary professionals. There is potential that the reduced rate of injury could have stemmed from improvements in physical condition, or the well-established benefits of exercise on psychological health (Bodin and Martinsen, 2004; Broman-Fulks and Storey, 2008; Stanton & Reaburn, 2014; Schuch & Vancampfort, 2016). Although not generalisable to veterinarians, the influence of psychological factors on sports injuries has historically been established based on stress theory or personality-profile approaches (Junge, 2000).

Exercise prescriptions primarily intended to manage musculoskeletal pain or improve mental wellbeing can be quite different in design **(**Wilson, Gormley & Hussey, 2011; Stubbs & Rosenbaum, 2018). The over prescription of strenuous physical activity to individuals already experiencing noteworthy psychological stress is not recommended. When possible, training plans and life stressors should be inversely matched (Kreher, 2016). Thus, obtaining a better understanding of the major determinant of the pain experience among New Zealand based veterinarians was considered worthwhile.

This research was important as it offered a localised focus, specific to New Zealand based veterinarians who had previously only received minor attention. In addition, to advance the state of research regarding the topic of veterinarian wellness, both quantitative and qualitative methods were utilised to allow for the opinions and experiences of New Zealand's veterinarians to be considered in combination with quantitative data. This was an approach that had not been taken previously.

Purpose and Objectives of this Research Thesis

The primary objective of the research this thesis comprises of, was to understand whether the physical performance of veterinary work or poor mental wellbeing is the major determinant of work-related musculoskeletal pain among New Zealand based veterinarians. Thus, aiding exercise and health science professionals in formulating appropriate interventions for this particular professional group.

Furthermore, the alcohol consumption behaviours of New Zealand based veterinarians was investigated as a secondary objective. This secondary objective was decided upon due to New Zealand based veterinarians having been reported to experience noteworthy levels of work-related stress (Gardner & Hini, 2006), and the concern that alcohol can be an attractive substance to abuse in response to work stresses due to its ability to offer effects comparable to pharmacological agents (Frone, 2016). Thus, as achieving the primary goal of this research relied on accurately assessing the mental wellbeing of New Zealand based veterinarians, measuring the consumption of a potentially self-medicative substance among these professionals was considered a prudent addition. Although alcohol consumption was measured, additional factors such as the use of recreational drugs were not investigated due to concerns that an outsider to the veterinary industry asking such questions could have hindered data collection.

Literature Review

The purpose of the following literature review was to understand the current state of research regarding the topic of veterinarian wellness. This process revealed gaps in knowledge as well as any consensuses or inconsistencies within existing literature, which assisted in determining the appropriate parameters and methodology of this research. Furthermore, what had previously been established by existing research was considered in combination with the findings of this study, in the effort to reach an accurate conclusion. Thus, this literature review was a critical component to the bid to clarify how the physical performance of veterinary work and mental wellbeing affect the experience of work-related musculoskeletal pain among New Zealand's veterinarians.

The bulk of the papers assessed pertained to the injury rates, psychological wellness and levels of musculoskeletal pain, discomfort or dysfunction among veterinarians. Ideally, these research papers focused on New Zealand based veterinarians. However, due to a lack of New Zealand focused research, studies involving overseas veterinarians from developed, western nations were also assessed in order to increase the understanding surrounding the aforementioned topics. However, when considering that New Zealand based veterinarians are exposed to their own unique working environment, this should give pause to generalising the findings reported by such studies. Rather, overseas investigations should be seen as offering indications of what may potentially be found to exist within the New Zealand veterinary industry. However, the experiences of veterinarians working within New Zealand may differ depending on a multitude of factors including:

- The efficacy of New Zealand health and safety protocols compared to that of other developed nations.
- Differences in the scale of New Zealand farming (herd sizes, and the seasonality of the work compared to overseas operations).
- Corporate culture and attitudes within New Zealand based companies.
- Potential differences in training compared to overseas counterparts, such as animal handling skills.

Due to the topic of veterinarian wellness not having received a great deal of attention, no publication time frame was placed on the literature in order to capture a greater scope of papers. The following sections will cover the breadth of information obtained via this literature review. Furthermore, a summary of the literature review as a whole is included at the end of this chapter.

Musculoskeletal Discomfort or Dysfunction in Veterinarians

With veterinarians performing a variety of physical tasks which can be quite strenuous in nature, it is understandable why many veterinarians anecdotally complain of experiencing work-related musculoskeletal pain or discomfort, or to suffer from musculoskeletal dysfunctions affecting the performance of usual activities. Veterinarians abroad have received attention with regard to a variety of musculoskeletal related issues. For example, a 2012 American focused study completed by Berry, Susitaival, Ahmadi and Schenker researched the prevalence of cumulative trauma disorders in Californian veterinarians via questionnaire. One quarter of the respondents reported a cumulative trauma disorder during their career that required treatment or restricted their performance of usual activities. Among those reporting cumulative trauma disorders, two thirds reported having chronic or residual problems. The study also highlighted that being in large animal practice increased the cumulative trauma disorder risk regardless of gender, or whether the veterinarian worked full or part-time. The risk of developing cumulative trauma disorders was highest among female veterinarians working full-time and performing 80% rectal palpations. In another questionnaire based study, Kozak, Schedlbauer, Peters and Nienhaus (2014) distributed a self-reported standardised Nordic Questionnaire to German veterinarians regarding musculoskeletal disorders of the neck and distal upper extremities. Of the 3174 responses obtained, musculoskeletal disorders affecting the neck (66.6%), shoulder (60.5%), hand (34.5%), and elbow (24.5%) were reported. Musculoskeletal disorders of the upper body occurred more commonly in large animal practitioners.

When looking closer to New Zealand, data obtained by Australian studies provides some insight regarding common areas of discomfort. For example, in a study using a cohort of Queensland veterinarians, Smith, Leggat, and Speare (2009) mailed an anonymous

questionnaire survey to all veterinarians registered with the Veterinary Surgeons Board of Queensland during the year of 2006. Their study revealed that over a 12 month period nearly two thirds (63%) of respondents had experienced musculoskeletal discomfort of the lower back. Additionally, neck-related (57%), shoulder-related (52%) and upper back-related (34%) musculoskeletal discomfort had been experienced. Their study also revealed that musculoskeletal discomfort was present, in concert with several psychosocial factors. These factors included stress related to career structure, insufficient holidays, time pressures, client attitudes, as well as a lack of recognition by the public or colleagues, or a lack of understanding from family. Overall Smith, *et al* (2009) suggested that the development of musculoskeletal discomfort may have more to do with personal and workplace issues than ergonomic risk factors.

Smith *et al*'s (2009) assertion that the experience of musculoskeletal discomfort in veterinarians may primarily be caused by psychosocial issues, could be an oversimplification and somewhat of a leap from association to causation. The high rates of injury and musculoskeletal discomfort experienced by veterinarians have been well enough established (Phillips, Jeyaretnam & Jones, 2000; Fritschi, Day, Shirangi, Robertson, Lucas, & Vizard, 2006; Smith *et al*, 2009; Lucas, Day, Shirangi & Fritschi, 2009; Scuffham *et al*, 2010) that deducing that psychosocial factors are primarily to blame could be incorrect. Rather, musculoskeletal discomfort may relate to a variety of issues. These issues include: the physical performance of the job itself, acute injuries, chronic overuse injuries, the chronic pain or disability that can result from acute injuries, and the negative impacts of poor psychological wellness. Previous literature has established many physical and psychosocial factors as being associated with the development of musculoskeletal discomfort. These factors include: poor ergonomics; prolonged static postures; performing repetitive tasks; prolonged periods of exposure to a given task; levels of job satisfaction; time and work demands and organisational culture (Scuffham *et al*, 2010). The majority of veterinarians in New Zealand work in clinical practice, undertaking a wide range of tasks which each include multiple of the aforementioned risk factors for musculoskeletal discomfort (Scuffham *et al*, 2010). Therefore, it seems more plausible that the phenomenon of high levels of musculoskeletal discomfort in veterinarians is complex and multi-faceted, affected by a combination of factors.

When comparing findings using Australian and New Zealand based veterinarians, there are similarities that can be noted. Australian and New Zealand based veterinarians both experience noteworthy rates of musculoskeletal discomfort, with the low back region in particular being the most prevalently affected region (Smith *et al*, 2009; Scuffham *et al*, 2010). For example, Scuffham *et al* (2010) completed a cross-sectional study investigating New Zealand veterinarians using a modified Nordic questionnaire and asked 867 veterinarians about the presence or absence of musculoskeletal discomfort. Additionally, the questionnaire asked about psychosocial factors, work load and work activities. The results showed that the overall prevalence of musculoskeletal discomfort was 96%, with 67% experiencing normal activities being negatively affected, and 18% requiring time off work as a result of the musculoskeletal discomfort. The lower back was the body region most reported by respondents to experience musculoskeletal discomfort (73%). Factors associated with increasing the chance of musculoskeletal discomfort resulting in work absenteeism were ten year increases in age (OR 1.26, 95% CI 1.05-1.52), work involving awkward grip and hand movements (OR 12.91, 95% CI 3.46-4.21) and those respondents who felt dissatisfied with the level and difficulty of their work (OR 2.27, 95% CI 1.11-6.56).

Injury Rates in Veterinarians

Beyond chronic overuse injuries or possibly psychosomatic influences, it is plausible that the experience of musculoskeletal pain or discomfort in veterinarians could be a consequence of their acute injury rates. A study completed in 2009 by Lucas, Day, and Fritschi for example described the characteristics of serious injuries and the use of safety precautions at the time of injury. The study had graduates in veterinary medicine from Australian universities complete questionnaires asking about injuries during their career. The questions asked included the type of injury and details of the circumstances under which the injury occurred. Of a total of 2,188 reported injuries, the most frequently sustained occurred on farms (55%), and were associated with undertaking procedural activities (37%) and examining moving animals (37%). The most common site of injury was the hand (33%). Additionally, injuries to the head and face regions accounted for 15% of all injuries. The most frequently sustained were open wounds (36%), fractures and dislocations (27%) and soft tissue bruising (12%). There were 63 intercranial injuries reported as well as 19 traumatic amputations. Animal contact resulting in kicks, bites, strikes, and scratches were the most frequently reported mechanisms of injury. Major factors

associated with injury were cattle (22%), horses (21%), dogs (20%) and cats (8%). An assortment of other animals were also reported including koalas, antelope, sheep, monkeys and wallabies, but these other animals only had a combined injury frequency of 2%. The use of safety precautions at the time of injury was reported by only 55% of veterinarians. Lacking safety precautions and lack of use of protective equipment at work was a concern also reported by Shirangi (2007), as they asserted the need for improved safety planning in veterinary work.

Lucas and Fritschi across two additional studies (2009a, 2013) provided further insight with regard to the injuries to veterinarians associated with cattle and horses. Due to the size and power cattle possess, disability and death resulting from contact with cows and bulls unfortunately does occur. While it may be impossible to quantify the worldwide morbidity and mortality caused by dealing with cattle, veterinarians are a professional group who are identified as being at the higher risk for injury (Watts, Meisel, Densie, 2013). Lucas and Fritschi (2013) provided some clarity relating to injuries sustained undertaking cattle-associated activities in Australia. Among the reported injuries, most (82%) were in stock or handling yards. Pregnancy testing or undertaking examinations accounted for 57% of cattle-related injuries, and nearly 80% of all cattle-associated injuries were sustained as a result of being kicked or struck (49%), or pushed against or stepped on (30%). The upper limbs were most commonly injured, and the use of safety precautions was only reported by 62% of veterinarians reporting injury (Lucas & Fritschi, 2013).

Similar to cattle, most horse-related injuries were sustained in stock or handling yards (Lucas & Fritschi, 2009). A higher injury frequency was associated with activities such as suturing, wound care, tubing, and drenching. The head and face were most commonly injured, as well as the lower extremities. Of these injuries, fractures were the most common form of serious injury. The use of safety precautions was reported by 70% of veterinarians reporting horse-related injuries. Overall, it is clear that large animal veterinarians are exposed to unique risks for musculoskeletal injury compared to their small animal counterparts as they must deal with unpredictable, yet powerful animals such as cattle and horses (Lucas *et al*, 2009a, 2009b, 2013) in farm settings.

Further to Smith *et al*'s (2009) assertion that the experience of musculoskeletal discomfort in veterinarians may stem from psychological rather than ergonomic factors, the psychological wellness of veterinarians has been established as a concern in research published abroad. Higher stress levels or poor psychological wellness could be contributing to more muscle tension or pain. Muscle tension is a common symptom of anxiety disorders for example (Stein & Sareen, 2015). However, it must be considered whether musculoskeletal discomfort could potentially be the trigger for decreased psychological wellness. Regardless, veterinarians abroad have been identified as suffering from poor mental health and wellbeing (Epp & Waldner, 2012, Net *et al*, 2015; Fowler, 2016).

When looking at veterinary wellness abroad, Bartram, Yadegarfar, and Baldwin's (2009) cross-sectional study of mental health and wellbeing revealed a concerning result. The study involved the use of a questionnaire, which was mailed twice to 3,200 veterinary surgeons based in the United Kingdom (UK). Evaluable questionnaires were returned by more than half (56.1%) of participants. The questionnaire consisted of reliable and valid existing instruments as well as a series of questions previously developed through informal focus groups. The questionnaire covered the topics of: anxiety and depressive symptoms; alcohol consumption; suicidal ideation; positive mental wellbeing; perceptions of psychosocial work characteristics; and work-home interaction. Their findings revealed high levels of anxiety and depressive symptoms, as well as a higher prevalence of suicidal thoughts and higher levels of negative work-home interaction. In addition, lower levels of positive mental wellbeing and less favourable psychosocial work characteristics were also reported by questionnaire respondents. Furthermore, the associates of mental wellbeing such as alcohol consumption habits were poorer among respondents compared to the general public. The percentage of 'at-risk' drinkers was higher among veterinarians (62.6%), compared to the general population (47.7%).

Bartram, Yadegarfar, and Baldwin's (2009) findings among UK based veterinary surgeons were not surprising when looking at research concerning UK veterinary undergraduates. Cardwell, Lewis, Smith, Holt, and Baillie *et al's* (2013) cross-sectional study assessed the

wellbeing (positive mental health) and mental ill-health of veterinary students from a single UK based veterinary school. The attitudes of participants towards mental ill-health and suicide were also assessed. Of the total student population (n=1068), 509 (48%) completed a questionnaire. The results revealed that 54% of the respondents had experienced mental ill-health, with the majority reporting an initial occurrence prior to veterinary school. This represented a significantly poorer result compared to general population estimates ($p < 0.0001$). In total, 94% of the student respondents agreed that "Anyone can suffer from mental health problems". However, despite this attitude students were more likely than the general public to indicate that "If I were suffering from mental health problems, I wouldn't want people knowing about it" ($p<0.001$). In addition, students were more likely to have thought about suicide, but less likely to have made an attempt ($p<0.001$; $p=0.005$) than members of the general UK population.

Further to Bartram, Yadegarfar, and Baldwin's (2009) findings, alternative overseas samples of veterinarians have shown signs of poor mental health. For example, in Fowler *et al*'s (2016) survey of Minnesota based veterinary personnel conducted in 2012, recent feelings of depression were reported by 204 (25%) respondents. This is a concerning, and not isolated finding among American veterinarians, as Nett *et al* (2015) revealed prevalent mental health concerns from an American based questionnaire. The results from 11,627 respondents showed that since leaving veterinary school 31% had experienced depressive episodes, and 17% had experienced suicidal ideation, with 1% having attempted suicide. By comparison, among the general population, male and female adults experienced a lower lifetime prevalence of depressive episodes (15.1% and 22.9%, respectively) and suicidal ideation (5.1% and 7.1%) but a higher prevalence of suicide attempts (1.6% and 3.0%). Although Net *et al's* (2015) study revealed a lower suicide rate among veterinarians compared to the general public, the higher rates of depressive episodes and suicide ideation were a concerning finding. Not all studies have found the suicide rate to be lower among veterinarians compared to the general public. Historically, higher suicide rates among American veterinarians have been reported as well as the concern that a failure to acknowledge this risk, as well as the mental health vulnerability of veterinarians could be making the situation worse (Skipper & Williams, 2012).

With regard to these concerns, published abroad, relating to suicide within the veterinary profession, it has been suggested that possessing the knowledge of how to end one's life, as well as access to the required barbiturates to do so, are probably not operating in isolation to increase the suicide risk within the profession (Bartram, Yadegarfar & Baldwin, 2009). The phenomenon of veterinary suicide has been suggested to stem from Perpetration-Induced Traumatic Stress, among other work-related stresses. This condition is a form of Post-Traumatic Stress Disorder caused not by traditionally expected roles, such as being a victim of trauma, but by being an active participant in causing trauma (MacNair, 2002). Perpetration-Induced Traumatic Stress has been identified in individuals who participate in the killing of healthy animals (Whiting & Marion, 2011). Euthanasia has been suggested by Rollin (2011) as a double-edged sword in veterinary medicine. It is a powerful tool in ending animal pain and suffering but causes major moral stress for ethically conscious practitioners.

Rollin (2011) refers to the need for ethically conscious veterinarians to determine the correct path through this ethical minefield. Such a dilemma understandably places strain upon the psychological wellness of veterinary professionals. Whether or not the training on how to handle these ethical challenges is sufficient for New Zealand veterinary graduates is a matter which could potentially influence the level of mental challenge they experience. When looking abroad, preliminary research conducted by Batchelor, Creed and McKeegan (2015) investigated the moral reasoning ability of qualified veterinarians in the UK using a Defining Issues Test. The authors defined "moral reasoning" as the process by which people determine that one course of action is morally right and another course of action is morally wrong when faced with an ethically problematic situation. Their findings revealed a large variation in moral reasoning abilities among qualified veterinarians. Interestingly, the moral reasoning score in veterinarians did not improve with years of experience. These results indicated that despite having a veterinary degree, the moral reasoning skills of practising veterinarians may not be sufficient to handle the demands of their profession. Batchelor, Creed and McKeegan (2015) suggested that this may have implications for both animal welfare and veterinarian wellbeing, and the need for more training in this area to improve the professional coping of veterinarians.

However, whether or not the negative psychological impact on veterinarians from euthanasia relates to total euthanasia or the ethical decision euthanasia administration requires, needs consideration. Rollin's (2011) suggestion that the ethical decision to administer euthanasia itself causes psychological strain appears plausible. However, Tran & Phillips (2014) found as a result of a cross-sectional survey that the average frequency per week of performing euthanasia was a determinant of poor psychological health, rather than the administration of objectionable euthanasia (i.e. euthanasia that the veterinarian disagreed with). Tran & Phillip's (2014) cross-sectional survey sampled 540 Australian registered veterinarians ranging in age from 23 to 74. Overall, objectionable euthanasia was not related to the mental health variables of the study. While in contrast, the overall euthanasia frequency had a weak positive linear relationship with depression. Furthermore, the overall frequency of euthanasia moderated the impact of depression on suicide risk. This suggested that the average weekly frequency of euthanasia administration attenuated the relationship between depressed mood states and suicide risk. This however is a potential phenomenon which warrants further study before conclusions can be drawn.

Within Australasia, findings relating to mental wellbeing have been sources of concern. This concern is well justified as from a total of 404 drug-caused deaths referred to coroners between 2003 to 2013 involving health-care professionals, the mortality rate was highest among the veterinary group (CI=42.21-58.79). Approximately half of these deaths were intentional self-harm (50.25%) (Pilgrim, Dorward & Drummer, 2016). This finding made sense in light of Fritschi, Morrison, Shirangi, and Day's (2009) findings from a large scale questionnaire of Australian veterinarians. The cohort of veterinarians questioned were identified through contact with veterinary schools in Australia. The questionnaire made use of established psychological scales to measure levels of distress, anxiety, and depression in veterinarians and compared these levels between different veterinary subgroups and other professional groups. Approximately one in three of the 2,125 respondents reported poor psychological health. While within the general Australian population, according to the Australian Bureau of Statistics, one in five people report suffering from mood affective disorders including depression and anxiety (Anonymous, 2015c). Locally, the Mental Health Foundation New Zealand reports that one in six members of the general public have been diagnosed with a common mental disorder such as depression or anxiety (Anonymous, 2015d).

The psychological wellness of New Zealand based veterinarians shows several similarities to Australian veterinarians, and veterinarians further abroad. This was demonstrated by the 2006 study completed by Gardner and Hini. Their study made use of a postal survey which was issued to 1,907 veterinarians registered with the New Zealand Veterinary Council, with 927 (48.6%) responding with usable answers. The results revealed noteworthy levels of work-related stress among New Zealand veterinarians. Gardner and Hini's (2006) findings were consistent with Fritschi *et al*'s (2009) in highlighting that males experienced less work-related stress and depression than females, and older veterinarians experienced lower levels of stress than younger ones. Similar to Smith *et al*'s (2009) Australian based study, Gardner and Hini's (2006) research revealed that New Zealand based veterinarians reported client expectations and personal relationships as sources of stress. In addition to these stresses, other sources of stress reported by respondents in Gardner and Hini's (2006) study included: hours worked, unexpected outcomes, the need to keep up their knowledge and technical skills, finances, and expectations of themselves. Later research involving Gardner (Gardner & Rasmussen, 2018) also indicated that workplace bullying could be a widespread issue among the New Zealand veterinary industry. Their research found that 16% of participants had been subjected to this negative behaviour at least twice weekly over the six months prior to their study.

Overall, whether increased psychological stress is a consequence of, or causal factor in the development of, work-related musculoskeletal discomfort or pain among veterinarians is a phenomenon which requires further research. Musculoskeletal discomfort and psychological stress have been correlated to exist in concert among these professionals (Smith *et al*, 2009). However, due to an overall lack of veterinary specific research or consensus regarding how physical and psychological factors interact in the generation of musculoskeletal pain, it is difficult to conclude the underlying cause of the pain experience with certainty. For example, the way in which mental wellbeing may influence the outcome of acute musculoskeletal injuries needs to be considered. Parr, Borsa, Fillingim, Kaiser and Tilman *et al* (2014) investigated how recovery following muscle injury can be influenced by psychological factors. Their study involved subjecting 126 healthy, untrained volunteers to concentric/eccentric isokinetic exercise on their dominant shoulder to induce fatigue. Participants who reported pain greater than 0/10 at 96-hours post-exercise were classified as "not recovered". Individuals experiencing pain at 48 hours post-exercise were more likely to be "not recovered" (O.R.=1.62, $p<0.001$). In addition, individuals with higher scores in pain catastrophising at 48 hours were more likely to experience pain at 96-hours (O.R.=1.06,

$p<0.001$). Pain duration (in days) was associated with pain scores at 48 hours ($\beta=0.385$, $p<0.001$) and baseline anxiety ($\beta=0.220$, $p=0.007$). Furthermore, a fear of movement or re-injury at 96-hours was found to be associated with pain catastrophising at 48 hours ($\beta=0.537$, $p<0.001$) and baseline levels of fear of pain ($\beta=0.217$, $p=0.004$). The authors suggested that these findings provided preliminary evidence that higher pain levels and pain catastrophising following acute muscle injury are associated with poorer recovery, a higher fear of movement/re-injury, and longer pain duration. In addition, research conducted by Stults-Kolehmainen, Bartholomew and Sinha (2014) with the aim to determine whether chronic mental stress moderates recovery of muscular function and somatic sensations, revealed interesting results. Stults-Kolehmainen *et al's* (2014) study involved assessing perceived energy, fatigue, and soreness among a sample of undergraduate students in a four-day period after a bout of strenuous resistance exercise. Prior to completing the resistance training session, study participants completed the Perceived Stress Scale and the Undergraduate Stress Questionnaire, a measure of life event stress. The results revealed that stress, whether assessed as life event stress or perceived stress, moderated the recovery trajectories of muscular function and somatic sensations in a 96-hour period after strenuous resistance exercise. Therefore, under conditions of inordinate stress, individuals may need to be more mindful about observing an appropriate length of recovery. These aforementioned research findings are relevant when considering that veterinarians, particularly those involved in the treatment of large animals, regularly perform physically strenuous and repetitive tasks which may not be too dissimilar to a resistance training session. With New Zealand based veterinarians having been found to experience a variety of work-related stresses (Gardner and Hini, 2006), it is plausible that the ability of psychological stress to modulate muscle recovery or acute injury outcomes (Parr *et al*, 2014; Stults-Kolehmainen *et al*, 2014) could play an important role in the phenomenon of work-related musculoskeletal pain among the veterinary profession. However, this is speculative. It cannot be assumed that the aforementioned research findings (Parr *et al*, 2014; Stults-Kolehmainen *et al*, 2014), which were conducted in very specific and controlled settings, can be generalised to the physical activities of veterinarians.

Summary

Unfortunately, there appeared to be a relative lack of studies focusing on New Zealand based veterinarians compared to the potential scope of the issue of wellness among the profession. Research published overseas cannot be generalised to New Zealand's veterinarians with certainty. Thus, much regarding the experiences of New Zealand based veterinarians is unclear. However, the main consensus among the assessed literature, published abroad, was that the veterinary profession is one which experiences noteworthy occupation-related injury, discomfort and pain in addition to being at risk of poorer psychological health (Fritschi *et al*, 2009; Lucas *et al*, 2009; Kozak *et al*, 2014). There was also a noticeable consensus among the international literature assessed, that veterinarians involved in the treatment of large animals are more likely to experience musculoskeletal issues (Berry *et al*, 2012; Kozak *et al*, 2014).

Previous research, led by Gardner (Gardner & Hini, 2006; Gardner & Rasmussen, 2018), involving New Zealand based veterinarians, revealed that veterinarians within New Zealand are exposed to a variety of work-related psychological stresses. These stresses included: client expectations; personal relationships; hours worked; unexpected outcomes; workplace bullying; and more. Furthermore, among the limited research relating to the wellness of veterinarians working within New Zealand, it has been established that New Zealand based veterinarians suffer from noteworthy rates of musculoskeletal discomfort (96%), with 67% experiencing normal activities being negatively affected (Scuffham *et al*, 2010). However, Smith, *et al's* (2009) assertion that the development of musculoskeletal discomfort among veterinarians may have more to do with personal and workplace issues, rather than ergonomic risk factors, gave rise to the research question of this thesis. This question was whether the experience of work-related musculoskeletal pain among New Zealand based veterinarians primarily relates to their mental wellbeing, or the physical performance of their professional duties.

Despite existing research providing many valuable insights with regard to the specific psychological stresses New Zealand based veterinarians are exposed to, the overall mental wellbeing of veterinarians within New Zealand had not previously been measured. Mental wellbeing is described by the World Health Organisation (Anonymous, 2017a) as "a state of

well-being in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community". Low subjective mental wellbeing can be a predictor of developing increased symptoms of mental health conditions, such as depression, when exposed to noteworthy levels of stress (Grant, Guille & Sen, 2013). Therefore, due to the multiple psychological stressors New Zealand based veterinarians are exposed to (Gardner & Hini, 2006), the measurement of the overall population mental wellbeing, and the experience of work-related musculoskeletal pain among New Zealand's veterinarians seemed a novel approach to answering the research question of this thesis. Making comparisons between small, mixed and large animal practitioners also seemed prudent. For example, if the results found that a common level of mental wellbeing was present among all three of these veterinary subgroups, but different pain experiences were reported, this would be considered indicative that mental wellbeing is not the major determinant of the pain experience among New Zealand's veterinarians.

Further to the research question of this thesis, the literature review revealed that the alcohol consumption behaviours of New Zealand based veterinarians are not currently known. Alcohol consumption has the potential to offer sedative effects comparable to pharmacological agents (Frone, 2016), which could potentially make it an attractive substance for individuals seeking to cope with poorer mental wellbeing. Bartram *et al's* (2009b) research among the UK veterinary population, for example, revealed an overall population mental wellbeing score significantly lower ($p<0.001$), and a rate of "at-risk" alcohol consumption 14.9% higher, than general public estimates. Thus, as correctly answering the research question of this thesis depended on accurately assessing the mental wellbeing of New Zealand based veterinarians, measuring their alcohol consumption appeared prudent, as a way of highlighting a potential indicator of self-medicative behaviour.

Due to a relative lack of New Zealand focused studies, as well as a historical focus on quantitative survey methods (Gardner & Hini, 2006; Scuffham *et al*, 2010), the inclusion of qualitative methods also seemed prudent to the attempt to enhance the state of research regarding veterinarian wellness, as doing so would allow for the opinions and experiences of New Zealand's veterinarians to be considered in combination with quantitative data. Thus,

assisting in the correct prescription of an occupation-specific exercise intervention for veterinarians for future scientific testing.

The chapter that follows will present two individual manuscripts for publication with a peer-reviewed scientific journal, instead of a methods section for this thesis. This was done to satisfy the requirements of Otago Polytechnic's Master of Applied Science programme. Submission of the manuscripts to the New Zealand Veterinary Journal was decided upon, as attempting to answer the research questions of this thesis involved obtaining a variety of data of interest to the veterinary industry. The manuscripts presented in the following chapter specifically pertain to the aspects of this research which were relevant to the veterinary profession, and the scope of the New Zealand Veterinary Journal. After the manuscript chapter, additional methods and results specifically pertaining to this thesis are presented. The concluding chapter of this thesis elaborates on the information presented within the aforementioned manuscripts, and the additional methods and results, in the context of addressing the research question of this thesis.

Scientific Article

Mental Wellbeing and Alcohol Consumption Behaviours Among New Zealand Based Veterinarians

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Abstract

AIMS: To further the state of research with regard to the wellness of New Zealand based veterinarians by measuring their overall population mental wellbeing, and comparing results obtained from small, mixed and large animal practitioners. Alcohol consumption behaviours were also measured in order to highlight a potential sign of self-medication that could impact the accuracy of the mental wellbeing scores obtained.

METHODS: Bartram's 2009a and 2011 measures of overall population mental wellbeing and alcohol consumption behaviours among veterinary surgeons, were replicated using a New Zealand based sample of veterinarians. Data was collected by means of a multiple choice online survey. Participation was open to registered veterinarians currently practicing within New Zealand. The survey featured the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) and a shortened Alcohol Use Disorders Identification Test (AUDIT-C). Survey respondents indicated whether they were primarily small, mixed or large animal practitioners.

RESULTS: There were 150 total respondents, representing 5.1% of the 2,948 veterinarians registered within New Zealand. The median WEMWBS score for the entire veterinary sample

was 50 (IQR=11). There was no statistically significant difference between the WEMWBS (p=0.302) or AUDIT-C (p=0.479) scores of small, mixed and large animal practitioners, as groups. The rate of "at-risk" alcohol consumption among the veterinarians sampled was 35.0% higher than the rate (50.0%) reported among the New Zealand general public. There was a moderate correlation (0.350) between the AUDIT-C and WEMWBS scores.

CONCLUSIONS: The New Zealand based veterinarians surveyed for this research, as groups, shared common levels of mental wellbeing and alcohol consumption, regardless of whether they were small, mixed or large animal practitioners. Overall, the responses obtained indicated a higher rate of "at-risk" alcohol consumption among the surveyed veterinarians compared to the general New Zealand public. However, the sample size obtained was not sufficient for generalisation to the New Zealand veterinary profession as a whole. Replication of the used methodology, with a larger sample size, is recommended to provide greater certainty. In addition, further research is required to compare the mental wellbeing of New Zealand based veterinarians to other New Zealand based professional groups, or to ascertain if their alcohol consumption behaviours are self-medicative in nature.

KEY WORDS: *veterinarian wellness, psychological, mental wellbeing, alcohol*

Introduction

The New Zealand veterinary profession is exposed to a variety of work-related psychological stressors. Previous research, led by Gardner (Gardner & Hini, 2006; Gardner & Rasmussen, 2018), involving New Zealand based veterinarians, established that these stresses include: client expectations; personal relationships; hours worked; unexpected outcomes; workplace bullying; and more. However, despite a growing interest abroad, there have historically been few studies completed focusing on the wellness of New Zealand based veterinarians. Concerns relating to the state of mental health (Fritschi, Morrison, Shirangi & Day, 2009; Whiting & Marion, 2011; Epp & Waldner, 2012) and risk of suicide among the profession have been published abroad (Skipper & Williams, 2012; Net, Witte, Holzbauer, Elchos & Campagnolo *et al*, 2015). However, studies investigating overseas veterinarians cannot be generalised to the New Zealand veterinary profession with any degree of certainty. Thus, much regarding the experiences of New Zealand's veterinarians remains unclear.

Although existing research (Gardner & Hini, 2006; Gardner & Rasmussen, 2018) conducted within New Zealand highlighted many of the specific psychological stresses New Zealand based veterinarians are exposed to, the overall mental wellbeing of veterinarians within New Zealand has not currently been measured. Mental wellbeing is described by the World Health Organisation (Anonymous, 2017a) as "a state of well-being in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community". Low subjective mental wellbeing can be a predictor of developing increased symptoms of mental health conditions, such as depression, when exposed to noteworthy levels of stress (Grant, Guille & Sen, 2013). Thus, with the multiple, previously established, psychological stresses veterinarians working within New Zealand are exposed to, the measurement of the overall mental wellbeing of New Zealand based veterinarians is a worthwhile undertaking.

The Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) offers a simple and effective method of investigating overall population mental wellbeing. Bartram, Yadegarfar, Sinclair and Baldwin (2011) validated this instrument for use with veterinary populations. The WEMWBS was used by Bartram *et al* (2009b) as a component of a larger, cross-sectional study of mental health and wellbeing and their associations in the United Kingdom's veterinary profession. Due to limited literature existing with regard to the psychological health or mental wellness of New Zealand based veterinarians, replicating Bartram's (2011) application of the WEMWBS to a veterinary population within New Zealand, appeared to be a prudent choice to furthering the understanding of the wellness of New Zealand based veterinarians.

In addition to mental wellbeing, the alcohol consumption behaviours of New Zealand based veterinarians are not currently understood. Alcohol consumption can have both medical and occupational implications and may affect fitness to practise among veterinarians (Bartram *et al*, 2009a). Furthermore, alcohol has the potential to offer sedative effects comparable to pharmacological agents (Frone, 2016), which could potentially make it an attractive substance for veterinarians to consume in lieu of seeking formal mental health support if their perception is that mental ill-health is stigmatised within the veterinary profession. Thus, when considering that New Zealand based veterinarians have been reported to experience noteworthy levels of work-related stress (Gardner & Hini, 2006), as well as this study's goal

of accurately measuring the overall mental wellbeing of this professional group, the replication of Bartram, Sinclair and Baldwin's (2009a) assessment of the alcohol consumption behaviours of UK based veterinarians, using a New Zealand based sample of veterinarians, could be a worthwhile endeavour. For example, the attainment of inconsequential mental wellbeing results among veterinarians, but noteworthy rates of alcohol consumption compared to the general public, could be indicative that further research is required with regard to the mental wellbeing of this professional group. Furthermore, the overall mental wellbeing and alcohol consumption of small, mixed and large animal veterinarians, within New Zealand, warrant comparison to determine if any differences are evident between these groups, as it is unclear whether these particular groups share a common level of mental wellbeing, and alcohol consumption, or not.

Materials and Methods

This research was conducted as a component of a master's thesis, in the field of exercise and health science. Ethical approval was obtained prior to recruitment of participants. This ethical approval was completed via Otago Polytechnic's Research Ethics Committee (Dunedin, New Zealand). Part of this process also involved consultation with Otago Polytechnic's Kaitohutohu team to ensure that the study would meet the principles set out in The Treaty of Waitangi. Participation involved voluntary completion of an online survey (see Appendix E). Survey participation was both anonymous and confidential.

The research led by David Bartram (Bartram *et al* 2009a, 2011) completed in the United Kingdom, investigating the mental wellbeing and alcohol consumption behaviours of veterinary surgeons served as the inspiration to this research. Therefore, the survey featured the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) as well as a shortened version of the Alcohol Use Disorders Identification Test (AUDIT-C). Although alcohol consumption was addressed in the survey due to its potential self-medicative use, investigating other potential forms of self-medication such as the use of recreational drugs was decided against. This decision related to concerns that asking questions which have potential to cause career harm may have substantially hindered data collection.

The WEMWBS is a scale of 14 positively worded items for assessing a population's mental wellbeing, which relies on respondents providing answers on a Likert-type scale based on their experiences over the previous two weeks. Examples of items used in the WEMWBS include: “I’ve been dealing with problems well” and “I’ve been feeling close to other people”. Total WEMWBS scores are obtained by summing the score for each of the 14 items, with scores of 1 - 5 being applied to “none of the time” through to “all of the time” answers. WEMWBS scores can range from 14-70 depending on the answers provided. A higher score indicates a higher level of mental wellbeing (Anonymous, 2015b).

The AUDIT-C test is a short tool to assess alcohol consumption, drinking behaviours and alcohol-related problems, featuring three multiple choice questions. Total AUDIT-C scores are obtained by summing the score given to the three questions, with scores of 0 - 4 being applied to answers. This system results in total scores ranging from 0 - 12. Scores of 0 represent no alcohol use. An example of an item used in the AUDIT-C is “how often do you have a drink containing alcohol?”. AUDIT-C scores of 4 or higher were considered to be indicative of potential at-risk drinking behaviour, as per the New Zealand Health Promotion Agency’s AUDIT-C interpretation guidelines (Anonymous, 2015a). These instruments were embedded in a larger survey, which also contained questions relating to the experience of work-related musculoskeletal pain, to satisfy the requirements of a master’s thesis in the field of exercise and health science.

New Zealand based veterinarians currently working within clinical practice were invited to participate in the study. Survey distribution involved contacting each of the veterinary businesses listed on the NZVA “find-a-vet” database via email directly. This directory was used instead of the New Zealand Veterinary Council’s (NZVC) database as, due to the practical time constraints that this research was subject to, there was not sufficient time to negotiate survey distribution with the NZVC. Therefore, the tactic of emailing veterinary businesses for them to distribute the survey to their staff was adopted. In addition to contacting these veterinary businesses directly, the NZVA included details of the study in their “VetNews” publication which was sent to 2,300 email addresses in June 2018.

Upon survey completion, participants were advised of available support options to assist them if needed. These support options were the Veterinary Wellness Programme, which is provided jointly by The Veterinary Council of New Zealand and the New Zealand Veterinary Association. In addition, a list of mental health and alcohol support helplines offered by The Mental Health Foundation of New Zealand was provided. Survey participants also had the option to volunteer contact details if they were interested in potentially completing a phone interview, as part of the larger master's thesis project.

Statistical Analysis

Survey responses were collated via www.surveymonkey.com, with whom the online survey had been hosted. This data was carefully transferred to Excel 2016, for Windows by Microsoft Corporation, to allow for encrypted storage. The following survey data was extracted from each respondent's answers: veterinary subgroup, AUDIT-C and WEMWBS answers. AUDIT-C and WEMWBS scores were calculated as per instrument guidelines (Anonymous, 2015a; Anonymous , 2015b). Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 25 for Windows, from the IBM Corporation.

Non-parametric tests were used for analysis as the survey data consisted of ordinal (WEMWBS and AUDIT-C choices), non-continuous data from an unknown distribution. Thus, a Kruskal-Wallis Test was used to look for statistically significant differences between the distribution of group WEMWBS and AUDIT-C scores. In addition, a two-tailed Spearman Rank Correlation Test was used to measure the degree of association between AUDIT-C and WEMWBS scores. For the aforementioned tests, an alpha level of 0.05 was used as the cut-off for significance.

Results

Across a one-month period (June 2018), 150 survey responses were collected. Due to relying on veterinary businesses to forward the survey to their staff, as well as veterinarians to read the NZVA's "Vet News" publication for the month of June, it was not possible to determine the response rate as it was unknown how many veterinarians received the survey link. The sample obtained represented 5.1% of the 2,948 registered veterinarians reported by the New Zealand Veterinary Council to be practicing within New Zealand at that time (Email communication, 18 June 2018).

From the 150 total responses, 143 had completed the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) answers and 140 had completed the short-form Alcohol Use Disorders Identification Test (AUDIT-C) answers. In total, 136 completed surveys contained both complete WEMWBS and AUDIT-C answers.

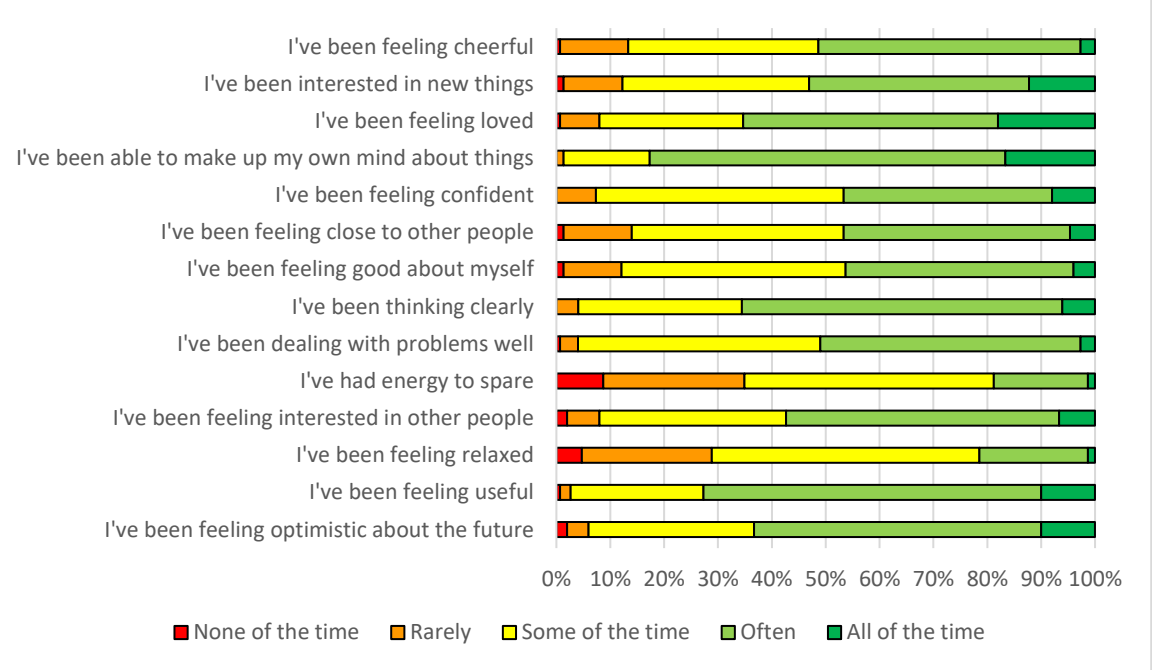

Figure 1: The distribution of WEMWBS answers by survey item.

The overall median WEMWBS score for survey respondents was 50 (IQR=11; n=143). There was no significant difference between the median scores of small (51; IQR=12; n=53), mixed (49; IQR=10; n=51) and large animal (50; IQR=10; n=39) practitioners (p=0.302).

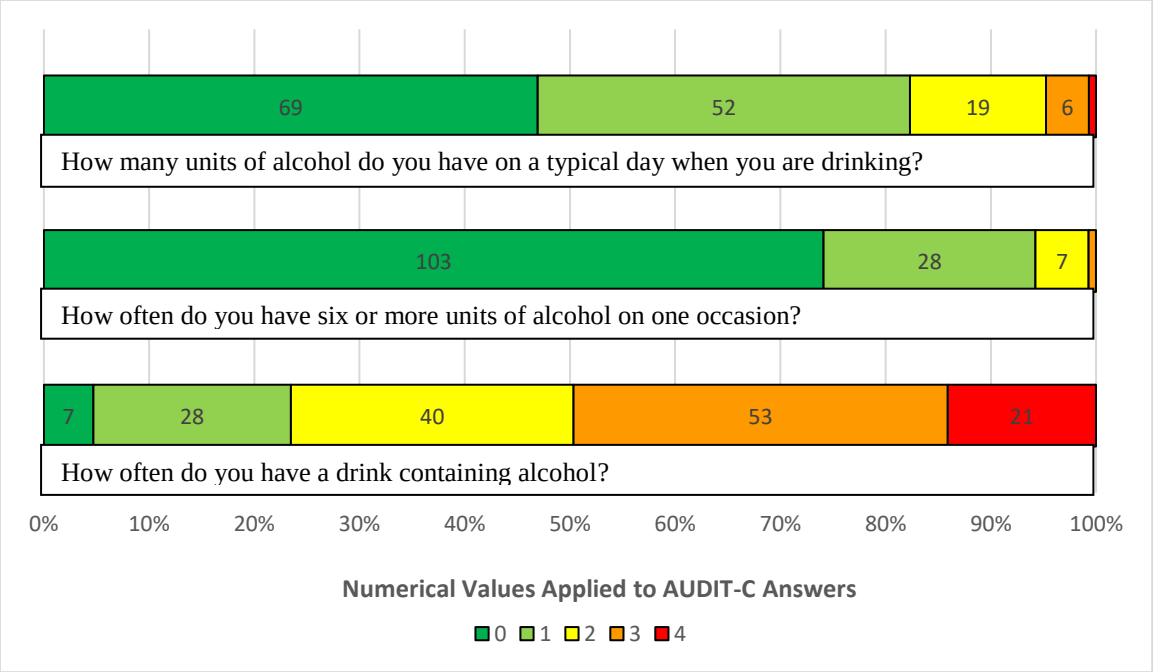

Figure 2: The distribution of scores for each AUDIT-C survey item.

The overall median AUDIT-C score, for the entire sample, was three (IQR=2; n=140), which based on the AUDIT-C scoring criteria is considered "low-risk drinking" within New Zealand (Anonymous, 2015a). However, the individual rate of "at-risk" drinking (total scores of 4 or more) among the sample was 50.0% (n=70). There was no significant difference between small, mixed and large animal practitioners, as groups, with regard to median AUDIT-C scores (p=0.479). Furthermore, there was a moderate correlation (0.350) between the AUDIT-C and WEMWBS scores.

Based on the results obtained (Figure 2), only 4.7% (n=7) of the veterinarians sampled were non-drinkers. The drinking pattern identified involved consuming mostly modest volumes of alcohol, with regular frequency. For example, one or two drinks was the most common volume consumed (74.1%; n=103), and only a small number (5%; n=8) of respondents typically binge drank (consumed six or more standard units) when consuming alcohol. Almost half (49.7%; n=74) of all surveyed veterinarians drank on a regular basis, either two to three times per week (35.6%; n=53) or more than four times (14.1%; n=21) per week.

Binge drinking was a rare occasion among the sample obtained, with less than one in twenty (4.8%; n=7) of respondents binge drinking more than monthly, and nearly half of all respondents (46.9%; n=69) never consuming at this volume.

Discussion

The results obtained from the veterinarians surveyed, indicated that New Zealand based veterinarians could possibly share a common level of mental wellbeing with veterinary surgeons based in the United Kingdom (UK). Bartram, Yadegarfar, Sinclair and Baldwin's (2011) research revealed a mean Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) score of 48.85 (SD=9.06) for their sample, which was significantly lower ($p<0.001$) than the mean representing the general population of Scotland (51.05; n = 973). In comparison, the results obtained by this study revealed a mean WEMWBS score of 48.39 (SD=7.15; n=143). Unfortunately, attempts to contact Bartram were unsuccessful. Therefore, datasets were unable to be obtained for statistical comparison between UK and New Zealand based veterinarians. Furthermore, data to compare the WEMWBS score of New Zealand's veterinarians to the New Zealand general population does not currently exist. Further research is required in order for the mental wellbeing scores of New Zealand based veterinarians and the New Zealand general public, or members of other professional groups to be compared.

With regard to alcohol consumption, the New Zealand veterinarians sampled for this research displayed a pattern of alcohol consumption which involved less binge drinking than the general public, but a higher rate of "at-risk" drinking. The rate of "at-risk" drinking among New Zealand based veterinarians (50.0%; n=70) was 35.0% higher than the rate reported by The New Zealand Health Promotion Agency (Anonymous, 2016) to exist within the general public (15.0%). However, it must be noted that general population estimates are aggregated from data obtained from a whole age, health and ability range. It is currently unclear how the alcohol consumption of New Zealand based veterinarians compares to other professional groups within New Zealand. The level of "at-risk" alcohol consumption reported by the survey sample was achieved by the consumption of low to moderate amounts of alcohol, but at an increased frequency compared to the general public. Bartram *et al* (2009a) also reported a pattern of alcohol consumption among UK veterinarians which involved a lower rate of

binge drinking than a general public estimate, but a higher rate of "at-risk" drinking, achieved by an increased frequency of consumption.

Limitations of this research

There were several limitations to this research which warrant consideration. Firstly, the sample obtained from the survey only represented only 5.1% of the 2,948 veterinarians registered with the New Zealand Veterinary Council. It was not possible to determine the response rate as it was unknown how many veterinarians received the survey link. This poor response rate may have stemmed from the fact that only 7.69% of the veterinary businesses directly contacted in relation to this research agreed to forward the survey to their veterinarians. Although the sample size obtained was adequate for analysis, it is relatively small for generalisation to the profession. Furthermore, cross sectional studies, such as this one, may be prone to non-response bias if participants who consent to take part in the study differ from those who do not (Sedgwick, 2014). Therefore, it is unclear whether the veterinarians who agreed to participate in the survey did so due to experiencing levels of mental wellbeing or alcohol consumption different from the wider veterinary profession. Thus, when appraising the survey results obtained, care must be given to not surmise that the obtained data definitely represented the veterinary industry as a whole.

While cross sectional studies are useful for estimating the prevalence of a particular behaviour or disease among a population, the conclusions drawn from such methods are limited due to the data representing only one specific point in time (Sedgwick, 2014). In addition, the fact that veterinary care within New Zealand, particularly with regard to cattle, can be seasonal work, may further reduce the suitability of cross-sectional methods being used to investigate this particular professional group. For example, the Warwick-Edinburgh Mental Wellbeing Scale asks respondents to answer based on their experiences over the two weeks prior to survey participation (Anonymous, 2015b). With hours worked and the variety of stressors placed upon mixed and large animal veterinarians likely differing throughout the year, the limitations of such a timeframe need to be considered. It is plausible that WEMWBS scores obtained from New Zealand based veterinarians could substantially fluctuate throughout the year.

The form of bias known as the "Healthy Worker Effect" also warrants consideration (Shah, 2009). With regard to this research, survey participation was limited to registered veterinarians, currently practising within New Zealand. However, workers who have suffered from health problems are not typically present among occupation based samples, as they change their job or retire early (Shah, 2009). Therefore, veterinarians whose wellbeing has been more seriously impacted by the demands of veterinary work are not likely to have been sampled due to having left the profession.

In conclusion, the results obtained indicate that small, mixed and large animal veterinarians within New Zealand may share a common level of mental wellbeing and rate of alcohol consumption, despite possible differences in their daily work activities or working environments. However, due to the sample size obtained, as well as the previously discussed limitations of cross-sectional studies (Sedgwick, 2014), further research is required in order to state this with certainty. Further research, sampling New Zealand based veterinarians periodically throughout an entire year would be beneficial to evaluate any potential fluctuations in mental wellbeing that may result from the seasonality of some aspects of veterinary care within New Zealand.

With regard to the alcohol consumption of New Zealand based veterinarians, it has been reported that alcohol has the potential to offer sedative effects comparable to pharmacological agents (Frone, 2016). This can make alcohol an attractive substance to individuals seeking to cope with the negative psychological consequences of work-related stress (Frone, 2016). Thus, the possibility that the higher rate of at-risk alcohol consumption compared to the New Zealand general public stems from purposeful self-medication is not something to overlook. Whether or not the alcohol consumption behaviours of New Zealand based veterinarians are in fact self-medicative in nature, and how this may impact the reliability of their self-reported mental-wellbeing scores, warrants future investigation. Investigating how New Zealand's veterinarians perceive declaring mental ill-health or poor mental wellbeing could prove insightful with regard to this question. Finally, research investigating the mental wellbeing and alcohol consumption behaviours of other professional groups within New Zealand would allow for comparisons to be made to different groups of working aged professionals. Such comparisons could clarify whether the experiences of New Zealand's veterinarians are

specific to the veterinary industry or found among a variety of New Zealand based professional groups.

Acknowledgements

The Warwick-Edinburgh Mental Wellbeing Scale was funded by the Scottish Government National Programme for Improving Mental Health and Wellbeing, commissioned by NHS Scotland, developed by the University of Warwick and the University of Edinburgh, and is jointly owned by NHS Scotland, the University of Warwick, and the University of Edinburgh. The shortened form Alcohol Use Disorders Identification Test (AUDIT-C) used in this study was developed by the World Health Organisation.

The assistance of the New Zealand Veterinary Association in obtaining participants, as well as the support and contributions of Richard Humphrey and Gary Barclay are gratefully acknowledged.

Scientific Article

An Exploratory Descriptive Study of New Zealand Based Veterinarians: Work-Related Musculoskeletal Pain, Psychological Stress, and Wellness Promotion Strategies

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Abstract

AIMS: To provide initial qualitative interview data, investigating New Zealand based small, mixed and large animal veterinary practitioners, due to a historic reliance on quantitative survey methods. This exploratory descriptive analysis was completed with the goal of obtaining new insights which may contribute to the research questions, or methodologies, of future investigations.

METHODS: 12 conversational, semi-structured interviews were conducted. Small, mixed and large animal veterinarians were equally represented. These volunteers were obtained via a multiple choice online survey which was part of a larger master's research project. Participation was open to registered veterinarians practicing within New Zealand. Maximum variance sampling was used to purposely sample interviewees based on individual mental wellbeing scores. This allowed the opinions and experiences of veterinarians with a median level of mental wellbeing, and both extremes of the spectrum of mental wellbeing (present among the survey sample) to be explored.

RESULTS: The performance, and seasonality, of cattle-related veterinary tasks were reported to be the main generators of pain among the interview sample. The primary source of psychological stress reported by interviewees related to high workloads. A variety of personal and workplace wellness promotion strategies were discussed. Overall, the level of workplace support offered was reported to be insufficient. Furthermore, several interviewees discussed their concerns that the requirement to declare mental ill-health when seeking professional registration discourages veterinarians from seeking mental health support, encouraging self-medication.

CONCLUSIONS: It is uncertain whether the opinions and experiences reported by the interviewees were representative of the wider veterinary profession within New Zealand. However, valuable insights worth investigating further were obtained. Proposed future research includes: whether or not New Zealand based veterinarians self-medicate with alcohol in lieu of seeking formal mental health support; and an investigation into the working hours of veterinarians working within New Zealand, and how this affects their mental wellbeing.

KEY WORDS: *veterinarian wellness, psychological, pain, injuries, coping*

Introduction

The New Zealand veterinary profession is understood to be exposed to a variety of work-related psychological stressors, as well as a noteworthy rate of musculoskeletal discomfort (Gardner & Hini, 2006; Scuffham et al, 2010). Despite a growing interest abroad, there has been a noticeable lack of New Zealand based research into the topic of veterinarian wellness, given the potential extent of the issue. Historically, a variety of overseas veterinarian samples have received attention (Fritschi *et al,* 2006, 2009; Bartram, Yadegarfar & Baldwin, 2009; Smith, Leggat, & Speare, 2009). However, these findings cannot necessarily be generalised to practitioners working in New Zealand due to potential differences in their working environment and experiences. Previous research, led by Gardner (Gardner & Hini, 2006; Gardner & Rasmussen, 2018), involving New Zealand based veterinarians, revealed multiple sources of stress among the profession. These sources included: client expectations; personal relationships; hours worked; unexpected outcomes; workplace bullying; and more.

With regard to the experience of musculoskeletal discomfort among the New Zealand veterinary profession, research completed by Scuffham *et al* (2010) revealed an overall prevalence of musculoskeletal discomfort of 96%, with 67% experiencing normal activities being negatively affected, and 18% requiring time off work as a result of their musculoskeletal discomfort. Such findings are concerning and highlight the need for further research involving this particular professional group.

Overall, previous research with regard to the topic of veterinarian wellness, conducted abroad (Kozak, Schedlbauer, Peters & Nienhaus, 2014; Fowler, Holzbauer, Smith & Scheftel, 2016), as well as within New Zealand (Gardner & Hini, 2006; Scuffham *et al*, 2010), has focused on the use of quantitative survey data. While such research provides insight with regard to the prevalence of issues such as musculoskeletal discomfort and the experience of stress, the experiences of New Zealand based veterinarians have yet to be investigated using an in-depth, qualitative approach.

As no previous qualitative research with regard to the topic of wellness among New Zealand based veterinarians currently exists, it appears prudent to conduct an exploratory qualitative investigation of the topics of work-related musculoskeletal pain, and psychological stress among New Zealand based veterinarians, as well as the wellness promotion strategies employed to attempt to manage these issues. It is possible that conducting detailed, qualitative interviews with veterinary professionals within New Zealand may generate research questions for, or guide the methodologies of, future investigations. With little research having been completed specific to New Zealand based veterinarians, the attempt to obtain directions for future research relating to the wellness of this professional group is a worthwhile endeavour.

Methods

This research was conducted as a component of a larger study, to satisfy the research requirements of a master's thesis, in the field of exercise and health science. Ethical approval was obtained prior to the recruitment of participants. This ethical approval was completed via Otago Polytechnic's Research Ethics Committee (Dunedin, New Zealand). Particular

attention was given to ensuring that study participation would be entirely voluntary, and not damaging to the careers or wellbeing of participants. A consultation was also completed with Otago Polytechnic's Kaitohutohu team to ensure that the study would meet the principles set out in The Treaty of Waitangi.

Due to no previous qualitative research pertaining to the wellness of New Zealand based veterinarians existing at the time of this study, a qualitative descriptive approach was decided upon. Qualitative description is a label used for studies which are descriptive in nature, with the goal of providing comprehensive summarisation, in everyday terms, of specific events or phenomena experienced by individuals or a groups of individuals (Lambert & Lambert, 2012; Kim, Sefcik & Bradway, 2017). While, to some researchers, such a qualitative design category does not exist (Lambert & Lambert, 2012), the qualitative descriptive approach is a widely cited research tradition that has been identified as important and appropriate for gaining insights regarding a poorly understood phenomenon (Lambert & Lambert, 2012; Kim, Sefcik & Bradway, 2017). Qualitative description can be described as less theoretical compared to other qualitative approaches (Neergaard, Olesen, Andersen & Sondergaard, 2009; Lambert & Lambert, 2012), facilitating flexibility, as this approach does not need to stay committed to a theory or framework if the investigation leads down another path (Sandelowski, 2010). This flexibility can make qualitative descriptive studies a prudent choice when information is sought to develop and refine future questionnaires or interventions, which was the goal of this study (Kim, Sefcik & Bradway, 2017).

The Participants

Voluntary participants for this study were obtained from a multiple choice online survey, which was a component of the aforementioned master's research project. This survey featured 24 items relating to mental wellbeing, alcohol consumption and the experience of work-related musculoskeletal pain. Survey respondents also indicated whether they were small, mixed or large animal practitioners. The option to register interest in completing an interview was included at the end of the survey. The survey measured the mental wellbeing of survey respondents via the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS), which offered a simple and effective method of investigating overall population mental wellbeing and had

been previously validated for use with veterinary populations (Bartram, Yadegarfar, Sinclair & Baldwin, 2011).

New Zealand based veterinarians working within clinical practice at the time of this study, were invited to participate. Survey distribution involved contacting each of the veterinary businesses listed on the NZVA "find-a-vet" database via email directly. This directory was used instead of the New Zealand Veterinary Council's (NZVC) database as, unfortunately, the NZVC did not respond to initial contact requesting assistance with distributing the survey. Therefore, due to the practical time constraints that this research was subject to, the tactic of emailing veterinary businesses for them to distribute the survey to their staff was adopted. In addition to contacting these veterinary businesses directly, the NZVA included details of the study in their "VetNews" publication which was sent to 2,300 email addresses in June 2018.

With the previously described survey including the Warwick-Edinburgh Mental Wellbeing Scale, purposeful, maximum variance sampling was opportunistically implemented in order to investigate the opinions, behaviours and experiences of veterinarians reporting different levels of mental wellbeing. Thus, from those survey respondents who volunteered for interviews, four interviewees were purposefully sampled for each of the veterinary subgroups. Each veterinary subgroup was represented by one volunteer whose WEMWBS score was the lowest obtainable for interview, two whose scores were consistent with the median for the sample and one whose score was the highest obtainable for interview. The implementation of maximum variance sampling was particularly befitting of the descriptive analysis approach (Kim, Sefcik & Bradway, 2017), allowing for a wider range of opinions and experiences to be captured despite the limited number of interviewees. The total number of interviews was limited to 12 due to the practical time constraints that this study was subject to, as a component of a larger master's project.

The Interviews

A semi-structured, conversational style of interviewing was adopted, to encourage a comfortable, detailed, dialogue with participants (Thomas, Nelson & Silverman, 2015). An interview schedule was used as a reference to ensure that all key topics were covered (Appendix D). Informed consent was obtained prior to interview participation. Participants were allowed to skip any interview questions which they felt uncomfortable answering. Those participants who volunteered via the survey to take part in interviews were advised that once their answers were transcribed they would be provided with a copy to verify the accuracy of the transcription. Participants had a 14-day period from the date they received their transcribed copy of the interview to modify or retract answers they were unhappy with, or to withdraw their participation. Interview participation was confidential and the data was de-personalised to protect the identities of participants. The interviews were conducted via skype and limited to a maximum 45 minute duration. Interview length varied substantially, due to the busy schedules of the participants and varying experiences with the topics in question. The shortest interview was 18 minutes in duration, and the longest was 38 minutes in duration. The mean interview length was 31 minutes. Each interview was recorded to allow for verbatim transcribing. Upon interview completion, participants were advised of an available support option to assist them if needed. This support option was the Veterinary Wellness Programme, which was provided jointly by The Veterinary Council of New Zealand and the New Zealand Veterinary Association.

All interview recordings were destroyed as soon as interview participants verified the accuracy of the transcribed copy of their interview, and the data analysis process was complete. All 12 participants verified the accuracy of their transcribed interview copies. No interviewees decided to withdraw from participating in the study.

Data Analysis

Interview data was analysed using MAXQDA software version 13, for Microsoft Windows, from VERBI GmbH. Initial analysis involved close-reading of the manuscripts, and re-listening to audio recordings to achieve immersion in the data. Notes were made, highlighting

issues of interest. After this, initial codes were developed. Open coding was used, meaning there were no pre-set codes. The codes were instead developed and modified while working through the coding process. This process did not involve coding every piece of text. Instead, coding the experiences, behaviours or opinions of interviewees was the focus.

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The next step of the data analysis involved the coded content being evaluated for recurrent themes. A theme is a pattern that captures something significant or interesting about the data and/or research question (Maguire & Delahunt, 2017). The codes were assessed, and some of them clearly fitted together into a particular theme. Most codes were associated with one theme, although, some were associated with more than one. For example, with regard to topic of personal behaviours to promote mental wellbeing, physical exercise was mentioned by interviewees in relation to both the mood enhancing effects of exercise, as well as the ability to mentally distract themselves from work issues.

Results

The following is a descriptive summary of the informational contents of the data obtained for this research. Emergent themes found within the data are also discussed. As the maximum variance sampling utilised for this research captured the opinions, behaviours and experiences of veterinarians who reported differing levels of mental wellbeing, noticeable differences between these interviewees are described. Thus, providing a breadth of information to assist the development of research questions, or methodologies, for future research regarding the topic of veterinarian wellness.

The experience of work-related musculoskeletal pain

Among the interview sample, there was a clear distinction between the pain experiences of veterinarians who dealt with large animals, and those who exclusively dealt with small animals. Among the small, mixed and large animal practitioners interviewed, multiple comments were made suggesting their expectations that this research would reveal

noteworthy pain and injury experiences, almost exclusively, among large animal veterinarians due to the repetitive, physical nature of their duties. The data obtained did indeed reveal noteworthy histories of musculoskeletal pain, disorders and/or injuries among the exclusively large animal veterinarians, and comparatively inconsequential experiences among the exclusively small animal practitioners. However, both the mixed and large animal practitioners provided quite extensive lists of the numerous issues they had encountered. This was contrary to the common perception of interviewees, that the ability for mixed animal practitioners to "break up their day" by alternating between small and large animal related tasks would mean them reporting less issues than exclusively large animal veterinarians. Instead, the pain experiences of mixed and large animal practitioners were indistinguishable from each other:

"It's been quite a few things. I've hurt my shoulder before. A lot of problems have occurred during calving. During certain seasons things hurt more. So during calving, I've had cows go down on my arm before, and that's caused shoulder problems. When I first started teat sealing, I used to get joint pain. I'd get swollen fingers that couldn't bend due to the repetition of it. Actually, even with teat sealing now it can still happen. You do large numbers all at once, and it's really repetitive, so you get really sore shoulders and a really sore back. Scanning is really bad at making you sore too. I get a lot of neck pain during scanning, and back pain too."

Both the mixed and large animal veterinarians reported the upper body as being primarily affected by work-related musculoskeletal pain. The only lower body issues reported among these two groups were pre-existing knee problems, not incurred in work settings. The most commonly reported regions of pain, resulting from work-related tasks, were: the wrists/hands; shoulders; neck; upper back; and elbows. While, among the small animal practitioners interviewed, individual interviewees reported pain affecting the lower back; upper back; neck; shoulder; and hip/thigh regions.

Sources of pain

There was no discernible theme among the small animal veterinarians interviewed with regard to which activities aggravated work-related musculoskeletal pain. However, among both mixed and large animal practitioners, it was unanimously reported that the performance of veterinary tasks associated with cattle most related to their pain complaints. Cattle related tasks such as pregnancy scanning, disbudding, teat sealing, metrichecking and attending calvings were each listed by the majority of the mixed and large animal veterinarians interviewed. Among these interviewees, another theme related to the experience of pain was that the seasonality of providing veterinary care to cattle in New Zealand is a major factor in the generation, or aggravation, of their musculoskeletal pain issues:

"It's often seasonal. Having to do long stints over and over again for a time period. You can do one thing for let's say, half an hour, and people will find that causes them pain. But sometimes it's the repetitiveness of a certain time. For example, let's say you're teat sealing; I've had to teat seal for 12 hours without a break before. If you're doing constant, repetitive things, for 12 hours without a break that causes a lot of problems. Even with calvings and things like that, I've had calvings that have lasted 6 hours before."

The experience of stress

Among the interview sample, there was a uniformity of opinion that the veterinary profession involves being exposed to a variety of stresses. However, the experience of feeling "stressed" was not unanimously reported by interviewees. While ten of the interviewees shared their experiences of having felt noticeably stressed by their job, two of the interviewees asserted their belief that irrespective of the stresses they are exposed to, they possessed the ability to not let the stress of the job negatively affect them. These particular interviewees postulated that they possessed personality traits which allowed them to deal with stress more effectively than others. Among the interview sample, detailed accounts of the experience of stress were provided, and how the sources of stress change as veterinary careers progress. Thus, insights

were gained with regard to the primary stresses of newly graduated, as well as more experienced, veterinarians.

Stresses affecting newly graduated veterinarians

There was a clear theme with regard to the experience of psychological stress as a newly graduated veterinarian. The primary stress experienced as a newly graduated veterinarian was overwhelmingly reported to relate to decision making on cases. This stress was explained by interviewees to be the result of uncertainty in their professional skills during the early stages of their career. There was no discernible difference between veterinary subgroups in relation to this theme:

"It was just the stress that you didn't know what you were doing. That was quite stressful, having to go out to a call wondering if you made the right decision. Sometimes you would feel that you aren't good enough because if they sent out a more experienced vet, then they would be able to diagnose things a lot better, or maybe make a different diagnosis. There are some things you just aren't sure of, so you second guess yourself a lot, which can be quite stressful."

Beyond this, another discernible theme, as newly graduated veterinarians, was that client relationships caused stress. This was related to the primary theme of decision making, due to concerns that clients might, or did, feel dissatisfied with the clinical decisions or abilities of an inexperienced veterinarian.

Additional stresses reported by interviewees as having affected them as newly graduated veterinarians included: co-worker relationships; animal welfare issues; unexpected outcomes; the experience of being injured; and workplace bullying. However, these particular experiences were only discussed by individual interviewees.

Stresses affecting experienced veterinarians

The experiences of interviewees suggested that as a veterinarian's career progresses, it was less common that they felt much stress in relation to their decision making abilities. Among the interview sample, only two of the interviewees reported having work schedules equal to, or less than, 40 hours per week. These two interviewees were the same ones who reported not feeling particularly stressed by their work. However, the majority of interviewees reported regularly working in excess of 50 hours per week. Thus, the main theme relating to the stresses affecting experienced veterinarians, discernible among the interview sample, related to high workloads:

"As a more experienced vet, whether you know something or not doesn't stress you now. A lot of the stress is trying to fit everything in. You're trying to keep your colleagues happy, you're trying to keep the clients happy, and as a veterinarian we find we spend a lot of time away, or busy throughout the day. With the shortage of veterinarians in New Zealand at the moment, we are overworked at the moment. So there's the stress of trying to keep everybody happy, and then of course you need to still make sure that you go home and spend time with your family as well."

In addition to the theme of high workloads, other sources of stress reported by interviewees related to: co-worker relationships; client relationships; animal welfare issues; insufficient occupational health and safety practices; managing a veterinary clinic; dealing with difficult cases; the experience of being injured; and workplace bullying.

Symptoms of stress

When questioned with regard to how they recognise when they are feeling stressed, a variety of stress-related symptoms were reported by interviewees. The more common symptoms, which were reported by multiple veterinarians, included: muscular tension; anxiety; fatigue; increased irritability; sleep disturbances; and gastric upset. Anxiety, muscular tension, and

fatigue were the most commonly reported symptoms, with half of the twelve interviewees reporting experiencing these:

"Physically, muscle tension around the neck and shoulders. Because you're always sort of tensed up about things. Definitely with the mental side of things: anxiety; and a feeling of always being tired. You basically feel shattered the entire time, which is a big thing."

The management of wellbeing

Personal behaviours to promote physical wellbeing

The performance of physical exercise was the most commonly reported behaviour, and only discernible theme, among the interview sample with regard to ways in which they promote their physical wellbeing. The forms of physical exercise cited by interviewees included yoga, walking/hiking, and more intensive exercise such as running or mountain biking.

Additional behaviours reported by some interviewees as being, in their opinions, beneficial to their physical wellbeing included: eating healthily; regular physiotherapy; stretching routines; taking hot baths; and regular chiropractic care.

Personal behaviours to promote mental wellbeing

With regard to personal behaviours to promote mental wellbeing, there were no noticeable differences between veterinary subgroups. Two themes present among the interview data were seeking the mood enhancing benefits of physical exercise, and participating in mentally distracting activities.

Engaging in exercise was reported by three quarters of the interview sample, and unanimously considered a meaningful addition to the lives of those interviewees. There was noticeable variation with regard to how meaningful exercise was perceived to be. Individual opinions ranged from exercise being a helpful tool to feel a bit more relaxed, to being a necessary addition to each day in response to the stresses of being a veterinarian. A variety of individual, mostly aerobic, exercise pursuits were listed by the interviewees in relation to this effect.

With regard to the theme of mental distraction, this related to interviewees specifically citing the ability of a particular activity or hobby to mentally distract them or "take their mind off work" as being a paramount reason why they engaged in that activity. The most commonly reported activities to achieve this effect were: playing video games; participating in physical exercise; and spending time with family or friends. Additional activities, reported by individual interviewees, to allow them to achieve this effect included: reading books; meditation; horse riding; playing with pets; and playing the piano.

Additional behaviours reported by some interviewees as being, in their opinions, beneficial to their mental wellbeing included: consuming alcohol; taking hot baths; religious prayer; and having a holiday to look forward to.

Workplace support

With regard to whether or not their workplace offered any wellness orientated support (ergonomic or mental health related), the main theme among interviewees was that no formalised support was offered beyond staff being advised of the counselling hotline offered conjointly by the New Zealand Veterinary Council and New Zealand Veterinary Association. Workplace ergonomic support was not commonly reported by participants, except for those participants whose WEMWBS scores represented the highest among the interview sample. Examples of this support included ergonomic surgery tables and chairs and training relating to the safest way to perform large animal related physical tasks. In contrast to this, what could potentially be deemed a relative, or complete, disregard for employment or occupational

health and safety law was reported among interviewees whose WEMWBS scores were among the lowest of the sample obtainable for interview. The concerns of interviewees relating to support ranged from being unable to access toilet facilities or take their entitled breaks, to being unnecessarily exposed to hazardous situations and/or encouraged to ignore correct occupational health and safety practices for the sake of productivity:

"I mean, you work without lunch breaks or even access to toilet facilities. I've even gone out on farm once to jab some cows and noticed that the set up was too dangerous and phoned my boss. I told them "I'm not going to do this call because it's going to be dangerous" and they insulted me and made me feel like I had no choice but to accept the risks."

Feedback with regard to injury prevention or musculoskeletal wellness training that had been offered by their companies was discussed by the interviewees who had received such support. The most common form of support with regard to pain and injury prevention among the interview sample had been advice to use various stretches, body positioning, and rest periods while performing high volume tasks such as scanning and metrichecking. This advice had been delivered by visiting occupational therapists or physiotherapists. It was unanimously reported by these particular interviewees that they found such advice to be unrealistic, as they felt that the pressures of their high workloads did not allow them to adhere to such a scheme.

Additional concerns

Conversation led to additional areas of interest to participants in relation to the state of wellness within the veterinary industry. One third of the interviewees raised their concerns that the requirement to declare being treated for mental ill-health when seeking professional registration is detrimental to the profession, or their own wellbeing. Among the veterinarians who broached this topic, it was unanimously reported that they believed the current system encouraged them, or others, to avoid seeking appropriate help and potentially self-medicate through alternative means such as the consumption of alcohol:

"I realistically know that I should be on medication, but I just have to find other methods of coping and dealing with it [anxiety]. Because if I do go on meds, I'll need to declare it to my employer. I'll also have to declare that when I fill out my registration each year. I mean, [a co-worker] went on medication and disclosed it to management, and then [the manager] thought this was hilarious and went around telling us all about it behind their back . I don't want that to happen to me too. If I have two or three [alcoholic] drinks each night while I watch TV to feel relaxed, at least nobody needs to know that but me."

The use of alcohol for improving mood states was exclusively reported by those veterinarians who represented the lowest WEMWBS scores among the interview sample. Furthermore, a pattern of consumption was described among these individuals. This pattern involved consuming two, at most three, drinks spread across an evening to relax. However due to the requirement to remain professionally capable at all times, binge drinking was reported to be an uncommon occurrence, as even when not on-call, it was explained to be common to regularly receive urgent text or email communications from clients and co-workers which required actioning. Thus, a reasonable level of sobriety was required at most times.

Discussion

The goal of this qualitative descriptive study was to obtain new insights which may contribute to the research questions, or methodologies, of future investigations. The data revealed several findings that were expected, based on the findings of previous literature, as well as some findings which were not anticipated. For example, the data revealed that the veterinarians sampled experienced stress from multiple work-related sources. This was not surprising in light of Gardner and Hini's (2006) historic research, which established New Zealand based veterinarians as being exposed to a variety of work-related psychological stresses. With regard to the experience of work-related musculoskeletal pain, it was also not surprising that the mixed and large animal practitioners interviewed reported extensive musculoskeletal pain and injury histories as a result of their careers, while the small animal veterinarians interviewed did not share in this experience. It has historically been reported that veterinarians involved in the treatment of large animals are more likely to experience musculoskeletal issues (Berry *et al*, 2012; Kozak *et al,* 2014). However, the pain and injury histories reported

by the mixed animal practitioners were indistinguishable from those of the exclusively large animal veterinarians interviewed. This appeared to be a novel finding, worthy of further investigation, particularly as it was the opinion of the interview sample that the ability to switch between both small and large animal related tasks, to an extent, protects the bodies of mixed animal practitioners, due to their days being less physically repetitive.

The interviews conducted for this study provided additional insights with regard to potential issues within the New Zealand veterinary industry. For example, being hesitant to disclose suffering from mental ill-health was a noticeable theme identified among the interviewees. Information obtained from the New Zealand Veterinary Council (Email communication, 9 August 2018) added plausibility to these concerns. The New Zealand Veterinary Council reported that in 2016/2017, 97 of the 2,948 veterinarians registered with them declared suffering from a condition that could affect their practice. It was difficult to know exactly what percentage of the 97 total medical conditions declared in the 2016/2017 annual report were mental health related due to the annual reports only specifying new health conditions. However, the reports from previous years followed a pattern of distribution. Historically, new declarations pertaining to mental health have constituted between approximately one third, to half of new health conditions. Therefore, of the 2,948 registered veterinarians in New Zealand, it could be estimated that as few as one in fifty, or even as few as one in ninety, veterinarians registered with the New Zealand Veterinary Council have officially declared suffering from a mental health condition. According to the Mental Health Foundation New Zealand (Anonymous, 2015d), approximately one in six members of the general public have been diagnosed with a common mental disorder such as depression or anxiety. Thus, there is a noticeable discrepancy between the rate of mental health conditions declared by New Zealand based veterinarians compared to the rate that might be expected, particularly as veterinarians abroad have previously been identified as suffering from poorer mental health compared to general public estimates (Fritschi et al, 2009; Net et al, 2015).

Furthermore, the regular consumption of alcohol in response to the experience of work-related stress was exclusively reported by those interviewees whose WEMWBS scores were among the lowest obtainable for interview. Whether or not this, in addition to the previously discussed fear of disclosing mental ill-health, is representative of the wider New Zealand veterinary profession cannot be assumed based on the data obtained for this research.

However, alcohol has the potential to offer effects comparable to pharmacological agents, making it an attractive substance to individuals seeking to cope with the negative psychological effects of work-related stress (Frone, 2016). Although speculative, it is plausible that if the wider New Zealand veterinary profession shares the same fears regarding the need to declare formally diagnosed mental health conditions on their professional registration, that alcohol could be an attractive substance to self-medicate with.

Interestingly, despite Gardner and Hini's 2006 recommendation that attention be given to the work hours of veterinarians in relation to their experience of psychological stress, among the interview sample, the majority of interviewees reported working in excess of 50 hours per week. Furthermore, stress relating to the number of working hours they were subject to was the primary source of stress reported among the interview sample. However, it was uncertain whether or not the experiences of these interviewees reflected the veterinary profession as a whole. Further research investigating the workloads of New Zealand based veterinarians is recommended to determine if Gardner and Hini's aforementioned (2006) recommendation to the veterinary industry has been ignored.

Finally, another interesting theme discernible from the interview data related to how the occupational health and safety practices of a working environment may influence mental wellbeing among veterinarians. Among the interview sample, a relative disregard for occupational health and safety was discussed by the interviewees who reported WEMWBS scores consistent with the median for the survey sample. Furthermore, a complete disregard for basic health and safety practices was discussed by those veterinarians who reported WEMWBS scores among the lowest for the survey sample, obtainable for interview. In contrast to these findings, those veterinarians interviewed whose WEMWBS scores were among the highest obtainable for interview from the survey sample, almost unanimously, discussed experiencing occupational health and safety support that either met or exceeded expectations. Although relating to ergonomics and physical health and safety, the interview data indicated that a lack of sufficient occupational health and safety protocols may noticeably affect the mental wellbeing of New Zealand based veterinarians. In fact, a lack of support from management in relation to occupational health and safety was cited as a work-related stress among the interview sample. This is a matter deserving of future investigation.

Limitations

There were several limitations to this research which warrant consideration, particularly as a survey was used as a tool for obtaining interview volunteers. The total number of survey respondents (n=150) represented 5.1% of the total 2,948 veterinarians reported by the New Zealand Veterinary Council to be registered and practising within New Zealand at that time. Unfortunately, it was not possible to calculate the response rate of the survey, as it was uncertain how many veterinarians actually received the survey link. From the 150 survey responses obtained, 61 volunteered for interviews. Therefore the pool of interview volunteers represented 2.07% New Zealand based veterinarians. Cross sectional surveys are subject to the limitation of obtained data representing only one specific point in time (Sedgwick, 2014). Thus, it is unclear whether the WEMWBS scores obtained were an accurate gauge of the mental wellbeing of the interview participants selected due to the WEMWBS asking respondents to limit their answers to their experiences over the prior two weeks (Anonymous, 2015b). Furthermore, cross sectional surveys can be prone to non-response bias if the participants who consent to take part in the study differ from those who do not (Sedgwick, 2014). Therefore, it is unclear whether the veterinarians who agreed to participate in the wellness related survey, and were as a result invited to volunteer for interviews, did so due to having had a greater number of negative experiences with regard to the survey topics throughout their careers. Therefore, it is uncertain whether the opinions and experiences expressed by the interviewees were skewed towards having had more negative experiences, regardless of the WEMWBS being used as a tool to rank volunteers to obtain a more diverse set of experiences and opinions.

Furthermore, how the form of bias known as the “Healthy Worker Effect” relates to this research also deserves consideration (Shah, 2009). Participation in this study was limited to registered veterinarians, currently practising within New Zealand. However, workers who have suffered from health problems are not typically present among occupation based samples, as they tend to either change jobs or retire early (Shah, 2009). Therefore, when a sample is limited to individuals currently working within a particular profession, individuals whose wellbeing has been the most seriously impacted through illness or injury are not likely to be sampled due to having left the profession. Finally, it is not reasonable to assume the data obtained from a total of 12 qualitative interviews is representative of the wider New Zealand

veterinary profession with any degree of certainty. Instead, the interview data obtained for this study is intended to be used as a tool to inspire research questions for further investigation.

Conclusions

In conclusion, among the interview sample obtained, the major factor relating to the experience of musculoskeletal pain among the New Zealand veterinary industry appeared to relate to the performance of cattle-related tasks such as teat sealing, disbudding, metrichecking and calvings. The requirement to perform these activities at increased volumes during the months of spring, due to the seasonality of farming within New Zealand, was also asserted to be a major factor in the experience of musculoskeletal pain among the interview sample. The data also indicated that veterinarians within New Zealand are exposed to a variety of work-related stresses and, thus, may experience a variety of stress related symptoms. However, as this study only involved 12 interviewees, further research is recommended to determine whether the opinions expressed by the interview sample represented the views of the wider New Zealand veterinary industry.

The goal of this exploratory qualitative investigation, which was to obtain valuable insights to guide future research, was achieved. Several future studies are recommended, these include: whether or not New Zealand based veterinarians self-medicate with alcohol in lieu of seeking formal mental-health support; how the presence, or lack, of adequate health and safety protocols affects the mental wellbeing of New Zealand's veterinarians; and an investigation into the working hours of veterinarians within New Zealand, and how this affects their mental wellbeing.

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The shortened form Alcohol Use Disorders Identification Test (AUDIT-C) used in this study was developed by the World Health Organisation.

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Additional Methods and Results

The following chapter presents the additional methods and results that the research for this thesis comprised of, but were omitted from the NZVJ manuscripts. In the concluding chapter of this thesis, these additional results will be considered in combination with those presented in the previous manuscript chapters.

Additional Methods

In addition to the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) and shortened Alcohol Use Disorders Identification Test (AUDIT-C), the online survey conducted for this thesis also included the following nominal yes/no questions. These questions were formulated specifically for this study. The questions mostly kept to the specified two week timeframe of the WEMWBS:

- Have you ever required time off work due to work-related musculoskeletal pain?
- Do you often feel increased muscle tension or pain when under stress at work?
- In the past two weeks have you experienced work-related musculoskeletal pain?
- Throughout the past two weeks have you felt overworked physically?
- Throughout the past two weeks has your job felt physically repetitive?
- Throughout the past two weeks has your job felt physically strenuous?

The nominal yes/no nature of these questions was the result of feedback from multiple veterinary businesses, suggesting that the completion time for the survey be kept as brief as possible in order to foster the cooperation of veterinary managers in filtering the survey to appropriate staff. Cooperation from veterinary businesses in providing this assistance was essential as the New Zealand Veterinary Council did not respond to requests that they distribute the survey via email to their database of registered veterinarians. Thus, due to the practical time constraints of this research, the tactic of contacting each of the veterinary businesses listed in the New Zealand Veterinary Association's "find-a-vet" database was

adopted. Therefore, feedback from businesses regarding matters such as survey length and required completion time was treated with attentiveness. It is due to concerns regarding completion times that alternative measures such as Modified Nordic Musculoskeletal Questionnaire, as used by Scuffham *et al* (2010), was not included. Thus, although rudimentary in nature, the intention behind the included nominal yes/no questions was to obtain additional insights specific to the research question of this thesis, while adding little to the required completion time of the survey.

Additional Data Analysis

Non-parametric tests were used for analysis of the additional survey data, as it comprised of nominal yes/no answers. Thus, Chi-Square Tests were used to determine if there was homogeneity in the distribution of yes/no answers between veterinary subgroups or not. For the aforementioned tests, an alpha level of 0.05 was used as the cut-off for significance.

Additional Survey Results

Work-related musculoskeletal pain had resulted in absenteeism throughout the careers of 49.6% (n=74) of surveyed veterinarians. There was not a statistically significant difference in the distribution of yes/no answers between small (44.4%; n=24), mixed (51.8%; n=28) and large (53.6%; n=22) animal practitioners (p=0.560).

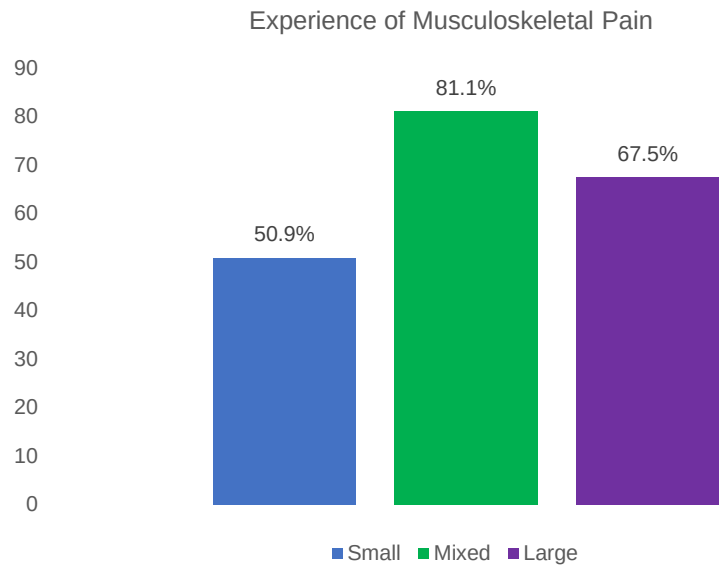

Figure 3. Percentages of those survey respondents, by veterinary subgroup, who answered "yes" they had experienced work-related musculoskeletal pain over the two weeks prior to survey participation

From the answers obtained, 66.2% (n=98) of survey respondents reported having experienced work-related musculoskeletal pain in the two weeks prior to participating in the survey. As can be seen (Figure 3), mixed animal practitioners (n=43) reported the highest rate of work-related musculoskeletal pain compared to large animal (n=27) and small animal (n=28) practitioners (p=0.004).

In total, 31.1% (n=46) of survey respondents reported having felt overworked physically across the prior two weeks. This experience was reported by mixed animal practitioners (43.4%; n=23) at a rate nearly twice that of small (24.4%; n=13), and large (25%; n=10) animal practitioners. However, it should be noted that the differences between groups in the distribution of yes/no answers was not statistically significant (p=0.059).

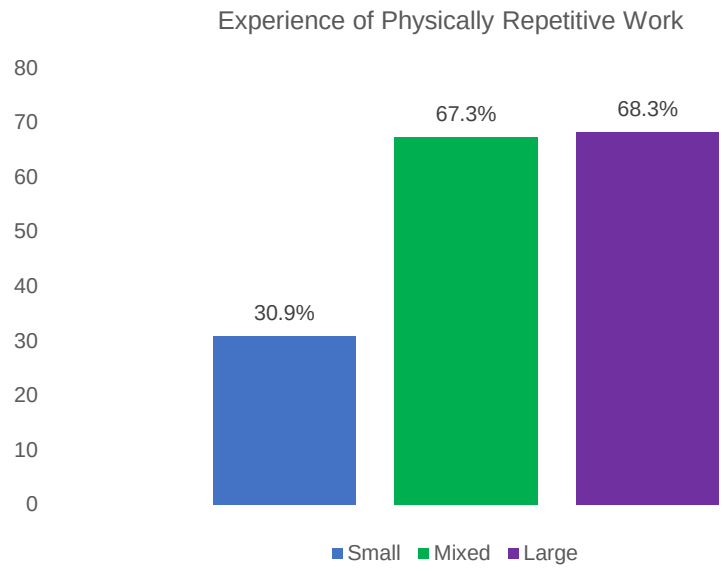

Figure 4. Percentages of those survey respondents, by veterinary subgroup, who answered "yes" they had felt their work was physically repetitive over the two weeks prior to survey participation

The results revealed that 53.7% (n=80) of respondents reported feeling that their job had been physically repetitive over the prior two weeks. Mixed (n=35) and large animal practitioners (n=28) reported this experience more than twice as much (Figure 4) as small animal (n=17) practitioners ($p < 0.001$).

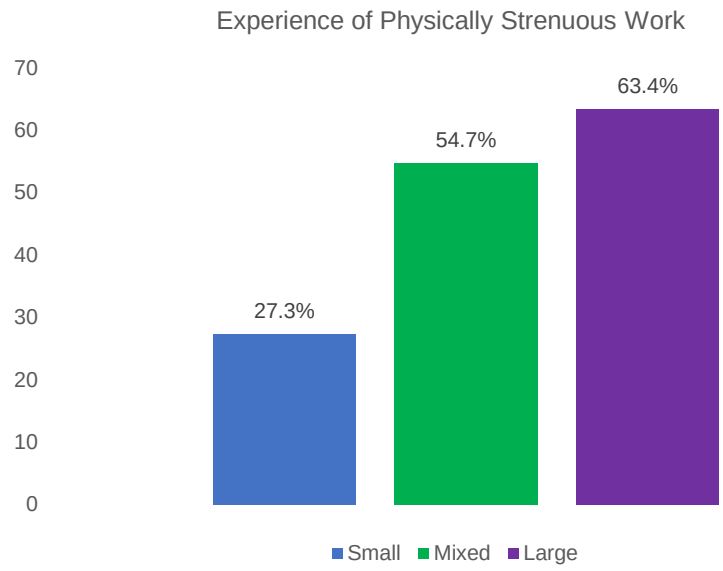

Figure 5. Percentages of those survey respondents, by veterinary subgroup, who answered "yes" they had felt their work was physically strenuous over the two weeks prior to survey participation

The feeling that their work had been physically strenuous over the previous two weeks was indicated by 47% (n=70) of survey respondents. Large animal practitioners (n=26) reported this experience at the highest rate (Figure 5) compared to mixed (n=29) and small (n=15) animal practitioners ($p<0.001$).

Finally, more than half of respondents (65.1%; n=97) reported feeling increased muscle tension when under stress at work. This experience was reported at the highest rate among mixed animal practitioners (71.7%; n=38) compared to small (66.6%; n=36) and large animal (56.1%; n=23) practitioners ($p=0.281$).

Discussion

The following chapter will reiterate and, at points, elaborate on the discussions presented within the manuscript chapter. Later in this chapter, the findings of this research will be discussed in the context of their implications for a potential exercise and lifestyle based intervention. This focus was omitted from the manuscripts submitted for publication with the New Zealand Veterinary Journal due to the professional scope of the journal.

The research question identified at the outset of this study was whether the experience of work-related musculoskeletal pain among New Zealand based veterinarians primarily relates to their mental wellbeing, or the physical performance of their professional duties. Exercise recommendations can be different in nature and outcome depending on their primary focus (Stubbs & Rosenbaum, 2018 ;Wilson, Gormley & Hussey, 2011). Thus, ascertaining the primary determinant of musculoskeletal pain among New Zealand based veterinarians was considered pivotal, in order for exercise based recommendations for these professionals to accurately reflect their most important need. Overall, through assessing both the quantitative survey and qualitative interview data in combination, the findings suggest that the major determinant of work-related musculoskeletal pain among New Zealand based veterinarians is the physical tasks associated with veterinary work. In particular, veterinary tasks pertaining to the treatment of large animals such as cattle. While it is plausible that psychological stress may exert an influence on the severity of, or likelihood of developing, work-related musculoskeletal pain (Parr *et al*, 2014; Stults-Kolehmainen *et al*, 2014; Stein & Sareen, 2015), the findings obtained for this research do not suggest it is the major determinant of the pain experience.

The aforementioned assertion is based on the data revealing that work-related musculoskeletal pain was experienced at the highest frequency percentage distributions among the mixed (81.1%; n=43) and large animal (67.5%; n=27) veterinarians surveyed, yet a common level of mental wellbeing existed between all three veterinary subgroups (p=0.302). Furthermore, the mixed and large animal veterinarians interviewed all reported extensive pain and injury histories, and unanimously explained that the performance of cattle-related veterinary tasks was the source of their pain. In comparison, the small animal interviewees sampled reported

inconsequential pain and injury histories, mostly featuring mild musculoskeletal discomfort compared to the mixed and large animal veterinarians. The noticeable differences between veterinary subgroups, in the survey, with regard to the frequency percentage distribution of having felt that their job was physically repetitive or strenuous, offers a likely explanation for the differences in the experience of pain between veterinarians involved in treating large animals, and those who do not. The aforementioned findings contradict the assertion made by Smith, *et al* (2009), that the development of musculoskeletal discomfort among veterinarians may have more to do with personal and workplace issues than ergonomic risk factors, as the levels of pain among each veterinary subgroup differed despite sharing a common level of mental wellbeing. If Smith *et al's* (2009) suggestion was correct, it was expected that the data obtained for this research would instead have revealed lower mental wellbeing scores among the groups reporting the highest rates of work-related musculoskeletal pain.

With regard to the mental wellbeing of New Zealand based veterinarians, the results obtained from the veterinarians surveyed, indicated that New Zealand based veterinarians may share a common level of mental wellbeing with veterinary surgeons based in the United Kingdom (UK). Bartram, Yadegarfar, Sinclair and Baldwin's (2011) research revealed a mean Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) score of 48.85 (SD=9.06) for their sample, which was significantly lower ($p<0.001$) than a mean representing the general population of Scotland (51.05; n = 973). In comparison, the results obtained by this study revealed a mean WEMWBS score of 48.39 (SD=7.15; n=143). Unfortunately, attempts to contact Bartram were unsuccessful. Therefore, datasets were unable to be obtained for statistical comparison between UK and New Zealand based veterinarians. Furthermore, data to compare the WEMWBS score of New Zealand's veterinarians to the New Zealand general population does not currently exist.

Further research is required in order for the mental wellbeing scores of New Zealand based veterinarians and the New Zealand general public, or members of other professional groups to be compared. If the data obtained for this study is a representation of the wider New Zealand veterinary profession, it is possible that the attainment of such data could reveal that New Zealand based veterinarians display a lower rate of mental wellbeing compared to the general public. This suggestion is based on the fact that, as previously discussed, the mean WEMWBS score (48.85; SD=9.06) obtained by Bartram *et al* (2009b) using a UK based

veterinary sample, closely matched the mean obtained for this research (48.39; SD=7.15). However, Bartram *et al* (2009b) found their mean WEMWBS score of 48.85 to be significantly lower ($p<0.001$) than a general public estimate. Furthermore, there is potential that future research into the experience of mental illness among New Zealand based veterinarians could reveal a concerning result, as Bartram *et al* (2009b) reported higher rates of anxiety and depression, as well as suicidal ideation, compared to general public estimates, among a sample reporting such a similar mean WEMWBS score to the New Zealand veterinarians sampled. In addition, more than half of the twelve veterinarians interviewed suffered from regular anxiety related symptoms in response to the work-related stresses that they were exposed to. This was not an experience isolated to the veterinarians who reported the lowest WEMWBS scores. Even interviewees among the highest scoring for WEMWBS answers reported experiencing regular anxiety related symptoms. However, the qualitative data represented only 12 of the 2,948 veterinarians registered and working within New Zealand at that time. Thus, future research, with a larger sample, is required to provide any degree of certainty regarding this matter.

The Possibility of Self-medication Among Veterinarians

The secondary objective of this research was to ascertain the alcohol consumption level of New Zealand based veterinarians and characterise any distinct patterns of consumption. The rate of "at-risk" alcohol consumption reported among survey respondents was 35.0% higher than the rate reported by the New Zealand Health Promotion Agency to exist within the general public (Anonymous, 2016). The alcohol consumption behaviours found among the sample obtained for this research showed similarities to those obtained by Bartram *et al* (2009a, 2009b). Unfortunately, as previous discussed, attempts to contact Bartram were unsuccessful. Therefore, datasets were not available in order to perform statistical comparison between the alcohol consumption behaviours of these two veterinary populations. Therefore, the comparison between New Zealand and UK based veterinarians was limited to qualitatively assessing similarities in the descriptions of their drinking patterns (Bartram *et al*, 2009a, 2009b).

While there is no current evidence that the group WEMWBS scores obtained via the survey are lower than the New Zealand general public or members of other professions, the opinions expressed through the qualitative interviews suggested that the experience of mental ill-health may be under-reported among New Zealand based veterinarians for fear of stigmatisation. The possibility that the higher rate of at-risk alcohol consumption compared to New Zealand's general public stems from the use of alcohol for self-medicative purposes is not something to overlook. While it cannot be stated with any certainty whether New Zealand's veterinarians consume alcohol at higher rates for self-medicative purposes, it has been reported that alcohol has the potential to offer sedative effects comparable to pharmacological agents (Frone, 2016). This can make alcohol an attractive substance to individuals seeking to cope with the negative psychological consequences of work-related stress (Frone, 2016). The fact that several interviewees shared experiences consistent with such an explanation, indicates that future research with regard to this potential phenomenon could be worth completing.

Among the interview sample, multiple participants reported a fear of declaring mental ill-health when seeking professional registration. Furthermore, the use of alcohol as a primary method of relaxing or improving their mood states in response to work stresses was exclusively reported by those interviewees whose WEMWBS scores were among the lowest of the sample obtainable for interview. The qualitative interview data suggested a potential, but currently speculative, explanation for the veterinary drinking pattern that was revealed by the survey data, which featured a higher rate of "at-risk" drinking, achieved by the consumption of low to moderate amounts of alcohol at an increased frequency. It was reported among interviewees that even when not on-call, it was common to receive urgent calls, texts, or emails from clients or co-workers in the evening which required immediate action. Thus, requiring an acceptable level of sobriety at all times.

It has been suggested that regular workday consumption of alcohol can result from individuals seeking the medicative effects of alcohol in response to exposure to work-related stresses. Alcohol has the potential to offer effects comparable to pharmacological agents. Although alcohol is primarily classified as a central nervous system depressant, having sedative/anxiolytic effects, it can have stimulatory effects as well (Frone, 2016). Research shows that the effects of alcohol can differ depending on whether blood alcohol levels are rising or falling. For example, alcohol has a mostly stimulatory effect as blood alcohol levels

rise, and a sedative/anxiolytic effect as blood alcohol levels descend towards baseline. According to Frone (2016), while it is widely understood that the sedative effects of alcohol make it an attractive and readily accessible option for individuals seeking to sedate themselves to counter work-related anxiety, the stimulatory effects of alcohol consumption should not be overlooked in regard to work-related fatigue (Frone, 2016). Both of these potential uses are relevant in light of the data obtained by this research, as the qualitative interviews did reveal that anxiety related symptoms, and work-related fatigue were reported by multiple interviewees. Furthermore, among WEMWBS responses (Figure 1), approximately one in five (21.47%) veterinarians responded to the WEMWBS question "I've been feeling relaxed" with an answer greater than "some of the time" (i.e. often/all of the time). Furthermore, less than one in five (18.79%) of respondents answered the question "I've had energy to spare" with an answer greater than "some of the time". In fact, these two questions had the highest percentage frequency distribution among "None of the time", "Rarely" and "Some of the time" answers out of the entirety of WEMWBS answers obtained. Thus, the majority of veterinarians sampled suffer with regularly poor energy levels and an inability to relax. Therefore, it is conceivable that alcohol could be an attractive substance to them.

Being hesitant to disclose suffering from mental ill-health was a strong theme identified among the interview sample obtained for this research. While it cannot be stated with certainty, based on the data obtained, that New Zealand based veterinarians fail to disclose the experience of mental ill-health when applying for professional registration, information obtained from the New Zealand Veterinary Council (Email communication, 9 August 2018) did add plausibility to the concerns reported by interviewees. The New Zealand Veterinary Council reported that in 2016/2017, 97 of the 2,948 veterinarians registered with them declared suffering from a condition that could affect their practice. While it was difficult to determine exactly what percentage of the 97 total medical conditions declared in the 2016/17 annual report were mental health related due to the annual reports only specifying new health conditions, historically, new declarations pertaining to mental health have constituted between approximately one third, to half of new health conditions. Therefore, it can be estimated that as few as one in fifty, or even as few as one in ninety, veterinarians registered with the New Zealand Veterinary Council have officially declared suffering from a mental health condition. According to the Mental Health Foundation New Zealand (Anonymous, 2015d), approximately one in six members of the general public have been diagnosed with a common

mental disorder such as depression or anxiety. Thus, there was a noticeable discrepancy between the rate of mental health conditions declared by New Zealand based veterinarians compared to the rate that might be expected.

Limitations of this Research

There were several limitations to this research which warrant consideration. Firstly, the sample obtained from the survey only represented 5.1% of the 2,948 veterinarians reported by the New Zealand Veterinary Council to be registered and practising within New Zealand at that time. It was not possible to determine the survey response rate as it was unknown how many veterinarians received the survey link. While the sample size obtained was adequate for analysis, it was relatively small for generalisation to the profession. The level of support from veterinary businesses was poorer than expected, with only 7.69% agreeing to forward the wellness survey to their veterinarians. Among veterinary businesses who replied to decline forwarding the survey to their staff, non-participation bias was clearly present among many of these businesses, with them citing specific reasons for non-participation such as:

- Not wanting staff to answer mental wellness related questions
- Displeasure that alcohol consumption-related questions were included
- Not wanting staff to answer questions relating to musculoskeletal pain
- Not seeing the point in the study, as they personally hadn't experienced pain
- Not wanting staff members to take the time away from work-related tasks to complete the survey

Cross sectional surveys, like the one used for this research, may be prone to non-response bias if participants who consent to take part in the study differ from those who do not (Fowler, 2013; Sedgwick, 2014). Therefore, it is unclear whether the veterinarians who agreed to participate in the survey did so due to experiencing levels of mental wellbeing, work-related musculoskeletal pain, or alcohol consumption different from the wider veterinary profession. Thus, when appraising the survey results obtained, care must be given to not surmise that the obtained data definitely represents the veterinary industry as a whole, particularly considering

the small sample size obtained. Any potential non-response bias could also extend to the interview data obtained. If the survey sample obtained was, for example, skewed towards having had more negative experiences in relation to the survey topics, this could also provide a biased group of interview volunteers, despite the WEMWBS being used as a tool to rank volunteers to obtain a more diverse set of experiences and opinions.

While cross sectional studies are useful for estimating the prevalence of a particular behaviour or disease among a population, the conclusions drawn from such methods are limited due to the data representing only one specific point in time (Sedgwick, 2014). Although previously validated as an overall indicator of population mental health and wellbeing among veterinary populations (Bartram *et al*, 2011), the specified timeframe the WEMWBS relies on may lower its accuracy when assessing a New Zealand based veterinary population. Veterinary care within New Zealand, particularly with regard to cattle related duties can, to an extent, be seasonal work. The Warwick-Edinburgh Mental Wellbeing Scale asks respondents to base their answers on their experiences over the two weeks prior to survey participation (Anonymous, 2015b). For this reason, most of the additional questions included in the survey relating to the physical performance of veterinary work or experience of work-related pain were limited to this time period as well. Thus, all survey data except for the AUDIT-C results were limited to a two week snapshot of veterinarian wellness throughout one specific time of the year. Data was collected throughout June, which is understood to be a quieter time for mixed and large animal veterinarians, due to the practical time constraints that this research was subject to. Therefore, it is plausible that WEMWBS scores obtained from New Zealand based veterinarians could greatly fluctuate throughout an entire year.

The form of bias known as the "Healthy Worker Effect" also warrants consideration (Shah, 2009). With regard to this research, workers who do not have strong motivation to work due to suffering from health problems do not typically present themselves for employment (self-selection). Instead, they change their job or retire early. According to Shah (2009) the effect is reduced after 15 years of entry to an industry. As an occupational sample, answers obtained from veterinarians currently registered and working within New Zealand's veterinary industry could mostly comprise of those individuals who possess the health and resilience to remain employed. Thus, in contrast to the previously discussed concerns that non-response bias could obtain a survey sample skewed towards having had more negative experiences in relation to

the survey topics, those veterinarians whose wellbeing has been more seriously impacted by the demands of the profession might no longer be available for survey or interview due to having left the profession.

Finally, the New Zealand Veterinary Council did not respond to requests to assist with survey distribution. This lack of assistance had a negative impact on the research. Unfortunately, due to the practical time constraints of master's level research, there was not sufficient time to individually email each of the veterinarians registered with the NZVC. Thus, the tactic of contacting each of the veterinary businesses listed in the New Zealand Veterinary Association's "find-a-vet" database was adopted. These businesses were contacted, in the hope that they would forward the survey to the veterinarians working for them. Thus, the cooperation of veterinary businesses was considered essential to obtaining a sufficient number of participants. For this reason, respecting feedback from veterinary businesses regarding matters such as survey length was considered important. Unfortunately, the need to limit the survey length was reported by multiple businesses. Thus, previously validated measures of musculoskeletal pain or discomfort such as the Modified Nordic Musculoskeletal Questionnaire, which was used by Scuffham et al (2010), were not included as doing so would have substantially lengthened the survey. Instead, questions relating to issues such as the experience of work-related musculoskeletal pain, and how strenuous, and repetitive, participants had found their work to be were developed (Appendix B, survey questions 2 - 7). These questions were rudimentary in nature, only asking for nominal yes/no answers, in the attempt to keep the completion time of the survey as short as possible. In hindsight, some of the wording of the nominal yes/no questions was subjective. These questions could have benefited from including clear descriptions of terms such as: "musculoskeletal pain"; "stress"; "strenuous"; "repetitive"; and "overworked". Furthermore, the reliance on yes/no answers limited the sensitivity of these questions. Adaptation to a Likert style scale, similar to the WEMWBS and AUDIT-C may have provided additional insights.

Conclusions and Recommendations

The New Zealand based veterinarians who participated in this research experienced noteworthy rates of work-related musculoskeletal pain. The experience of pain was highest among mixed and large animal veterinarians. Through assessing both the quantitative and qualitative data obtained, it appears more likely that the performance of large animal related veterinary tasks is the major determinant of the pain experience among New Zealand's veterinarians, rather than mental wellbeing levels. This assertion stems from it being the consensus of the mixed and large animal veterinarians interviewed that cattle related tasks such as scanning, disbudding, metrichecking and teat sealing were the activities most related to the development of their pain. Furthermore, the small animal practitioners interviewed did not report extensive pain and injury histories like the mixed and large animal practitioners did. Finally, despite all three veterinary subgroups sharing a common level of mental wellbeing, the mixed and large animal practitioners surveyed reported experiencing the highest rates of work-related musculoskeletal pain over the specified survey time period. However, the sample size obtained for this research was relatively small. Therefore, it is not entirely certain that the findings of this research accurately represented the New Zealand veterinary profession as a whole.

Beyond providing a degree of clarity towards what the major determinant of work-related musculoskeletal pain is among New Zealand based veterinarians, the results of this study were important in additional ways. For example, the survey results provided tentative evidence that New Zealand based veterinarians may display similar levels of mental-wellbeing and drinking behaviours to UK based veterinary surgeons (Bartram *et al*, 2009a, 2011). The attainment of this data also provided the first measure of the level of alcohol consumption, as well as the first description of a distinct pattern of consumption, among a sample of New Zealand based veterinarians.

Finally, the findings of this study also provided tentative evidence that mixed animal practitioners may potentially be the veterinary subgroup exposed to higher rates of work-related musculoskeletal pain. The survey results revealed work-related musculoskeletal pain was experienced at the highest frequency percentage distribution among the mixed animal

(81.1%; n=43) practitioners sampled, rather than the large animal (67.5%; n=27) practitioners. Furthermore, despite the expectations of the interview sample that large animal veterinarians would report more noteworthy pain and injury histories compared mixed animal practitioners, the histories reported by the mixed and large animal practitioners interviewed were indistinguishable from each other. Interviewees believed that the ability for mixed animal practitioners to alternate between small and large animal tasks offers substantial protection from the pain and injury experience. Thus, the aforementioned findings were surprising, and warrant further investigation. Whether or not the dual-focus of mixed animal practitioners actually makes them more susceptible to being assigned consistently high workloads throughout the year, negatively impacting their experience of work-related musculoskeletal pain, could be a research question worth investigating.

Potential Exercise-Based Applications of the Research Findings

The data obtained for this research indicated that exercise and health science based initiatives to combat the incidence of work-related musculoskeletal pain should prioritise addressing the needs of mixed and large animal veterinarians. It appears plausible that an intervention designed to improve the musculoskeletal strength and function of these particular veterinary subgroups may be an effective strategy to reduce the incidence rate of work-related musculoskeletal pain within New Zealand's veterinary industry. The following ideas are speculative and inspired by the findings of this research. Further testing via quantitative research is required to gauge the outcome of such interventions. Thus, caution is given to anyone seeking to implement these changes in advance of the application of rigorous scientific testing to ascertain both the safety and efficacy of prescribing exercise-based interventions to veterinarians.

With regard to formulating an intervention for veterinarian wellness, opinions expressed by interview participants revealed negative feedback surrounding recommendations from allied health professionals relating to on-site musculoskeletal management or injury prevention. Although not necessarily representative of veterinarians throughout the New Zealand veterinary industry as a whole, this feedback is worth considering in the attempt to formulate fresh approaches for dealing with this particular professional group. Previously, more than

one veterinarian interviewed had been provided advice to use various stretches, body positioning, and rest periods, on-farm, while performing high volume tasks such as scanning and metrichecking. These particular veterinarians found such advice to be unrealistic, as they felt that the pressures of their high workloads did not allow them to adhere to such a scheme. These particular individuals suggested that they would find it more beneficial to be shown what to do in terms of strengthening their bodies to better cope with the demands of their job, as well as avoid the development of musculoskeletal disorders.

With the aforementioned information in mind, a novel approach to addressing the experience of work-related musculoskeletal pain among veterinarians could involve preventatively strengthening and conditioning their bodies to better cope with the physical requirements of their job. An ideal situation may potentially be that veterinarians have access to a basic assortment of exercise equipment at their clinic, with which they can adhere to specialised exercise prescriptions, developed with the physical requirements of veterinary work in mind. The efficacy of such a collaboration between the veterinary industry and exercise and health professionals is of course, yet to be ascertained via formal, scientific testing.

Training Periodisation for Veterinarians

Throughout the world, sport scientists generally accept the concept of periodisation to be a foundational practice when developing athletes (Jeffreys & Moody, 2016; Bompa & Buzzichelli, 2018). Periodisation is ultimately, a comprehensive theoretical and practical paradigm in which performance is elevated at appropriate time points through the systematic management of workloads imposed upon athletes during the training process (Jeffreys & Moody, 2016). Essentially, the aim of periodisation is to reach the best possible performance in the most important competition of the year. Practically, it involves progressively cycling through various aspects of a training programme during specific periods. Conditioning programmes for athletes based on the concept of periodisation often break up the training programme into off-season, pre-season, in-season, and post-season periods. This structure divides year-round conditioning programmes into phases of training which focus on different goals. The in-season period often sees a complete removal of training stimulus, as athletes focus on the physical strains of competition (Jeffreys & Moody, 2016).

Generally speaking, when non-athletic individuals engage in their own fitness regimes, they may decide to utilise a form of linear periodisation, attempting to improve physical ability on a weekly basis throughout the year, with little regard to the additional stimuli affecting them outside of their training sessions. This is considered a violation of the tenets of the concept of periodisation (Jeffreys & Moody, 2016). When considering veterinarians, if the seasonality of their job is instead treated like an athletic feat, this kind of training periodisation is not optimal and potentially detrimental (Kreher & Schwartz, 2012; Kreher, 2016). Although a novel concept, consideration needs to be given to viewing the repetitive and strenuous activities performed by mixed and large animal veterinarians in high volume throughout the months of spring in New Zealand as similar to the competitive season of an athlete.

The mixed and large animal veterinarians interviewed for this research reported that during the months of spring they experience increased workloads, with longer hours, performing more physically repetitive and strenuous tasks. Thus, the primary psychological stress identified among the interview sample (high workloads) also compounds with this experience. Therefore, the suitability of veterinarians performing additional exercise during these months needs to be considered. The spring months in New Zealand for mixed and large animal veterinarians could be thought of as their "in-season" period. It is plausible that an exercise-based intervention focusing on the goal of developing the musculoskeletal strength and function of veterinarians in advance of the spring "in-season" months could prove an efficient strategy. Such a strategy would see a complete removal of training during spring, as the veterinarians instead focus on recovering from the intensive occupation-specific workload. The efficacy of such an intervention is of course, yet to be determined via future research.

The data obtained by this research adds further considerations to the periodisation of an exercise-based intervention for veterinarians. Although, as previously discussed, the "in-season" months of spring could benefit from a complete removal of training to focus on the performance of veterinary tasks, the appropriate training load during the other periods of the year should be factored in. The mixed and large animal veterinarians surveyed for this study suffered from noteworthy rates of work-related musculoskeletal pain. This data was obtained during the month of June, which is not their busiest time of year. While the potential to ameliorate this pain via the prescription of appropriate, preventative and rehabilitative exercise is desirable, the possibility of over-prescription of exercise is something to consider.

Due to the chronic physicality of their work, it is plausible that mixed and large animal veterinarians could be at risk of developing what is described among athletic populations as "overtraining syndrome" if their training load were to be prescribed thoughtlessly (Kreher & Schwartz, 2012; Carfagno & Hendrix, 2014; Bompa & Buzzichelli, 2018). Overtraining syndrome can be defined as stemming from an accumulation of stress, due to the physical stress of training and additional life stressors. The syndrome can result in perturbations of multiple body systems (neurologic, endocrinologic, immunologic) coupled with mood changes (Kreher & Schwartz, 2012; Carfagno & Hendrix, 2014; Kreher, 2016). Overtraining syndrome can result in deleterious physiological symptoms such as: chronic fatigue; heavy, stiff and sore muscles; tachycardia; hypertension; and multiple other, often perplexing symptoms. The ability for overtraining syndrome to result in negative mood states is of particular concern. It is unclear from the current study whether or not the mental wellbeing of New Zealand based veterinarians is, in fact, lower than the general public. Thus, caution regarding the negative mood states associated with overtraining syndrome is warranted, especially if such an occurrence would push individuals into the spectrum of mental ill-health. Depending on the severity of overtraining, these potential mood changes can range from: depression; anxiety; agitation or irritability; loss of motivation; and even a lowered ability to concentrate (Kreher & Schwartz, 2012; Kreher, 2016). Unfortunately, no single test exists to diagnose overtraining syndrome and, therefore, exact measures for the prevention of this condition are unknown (Kreher, 2016). However, there are a several considerations which can be given to exercise prescriptions, with the intention to reduce the risk of developing this condition.

The risk of adding additional physiological stress to individuals already reporting the feeling of being physically overworked and experiencing noteworthy levels of psychological stress needs to be considered (Kreher & Schwartz, 2012; Kreher, 2016; Bompa & Buzzichelli, 2018). With regard to avoiding the development of overtraining syndrome, it has been suggested that when possible, training plans and life stressors should be inversely matched, as the psychological state of an individual can be affected by their physiological status (Kreher 2016, Bompa & Buzzichelli, 2018). If experiencing high levels of physiological stress or fatigue from physical exertion, this accumulated stress may negatively affect psychological status (Bompa & Buzzichelli, 2018). New Zealand based veterinarians, as discussed in the literature review of this thesis, are exposed to a variety of work-related psychological stresses (Gardner & Hini, 2006). In addition, the veterinarians interviewed for this research commonly

reported the experience of stress in relation to their job. Furthermore, approximately one third (31.1%; n=46) of the veterinarians surveyed for this study reported having felt overworked physically across the timeframe specified by the survey, and approximately half of all respondents had found their work to be physically strenuous (47.0%; n=70) and/or repetitive (53.7%; n=80). Thus, prescribing strenuous and/or high volumes of exercise to veterinarians would appear to be irresponsible if doing so potentially risks these individuals developing overtraining syndrome and, thus, negatively impacting their mental wellbeing.

The data from the WEMWBS results obtained highlighted that veterinarians may commonly have little energy to spare, despite the survey data being collected during the winter month of June, which is not their busiest time of year. Thus, the energy levels required for veterinarians to participate in any intervention needs to be considered, even during the post-season, off-season and pre-season periods (Bompa & Buzzichelli, 2018). During the periods where physical exercise will be encouraged, appropriate exercise prescription may be best to focus on low intensity exercise and stretching, with the goal of restoring the appropriate range of motion to areas tightened by repetitive veterinary tasks, while also supporting overall health and stress management. Relaxation techniques could also be included to further encourage stress management (Bompa & Buzzichelli, 2018). Additionally, higher intensity, occupation specific strengthening movements should be included. However, these higher intensity exercises should be prescribed at a volume or frequency which is appropriate, given the previously discussed concerns of adding noteworthy physiological stress to veterinarians.

Recommendations for Future Research

With regard to recommendations for future research, due to the seasonality of veterinary work pertaining to large animals such as cattle within New Zealand, it is plausible that the experiences relating to work-related musculoskeletal pain and mental wellbeing could vary greatly throughout the year. Unfortunately, due to the practical time constraints of master's level research, the survey data collected for this study was obtained during June, as opposed to the months of spring. Spring is a time which was reported by the mixed and large animal veterinarians interviewed to be the most stressful for them, both physically and psychologically. Therefore, re-sampling throughout the months of spring may show

significantly higher rates of work-related musculoskeletal pain and lower mental wellbeing scores compared to the data obtained for this study. Ideally, research could be undertaken which involves tracking small, mixed and large animal veterinarians throughout an entire year, measuring the determinants of work-related musculoskeletal pain and mental-wellbeing at monthly intervals. If this is done, insights may be obtained into precisely when fluctuations in work-load occur, and how this impacts the mental wellbeing and experience of musculoskeletal pain among these specific veterinary subgroups. The attainment of such insights could prove highly beneficial in formulating appropriately periodised exercise programmes for veterinarians. Furthermore, the attainment of such insights may be of benefit to the veterinary industry with regard to implementing protocol changes in relation to how the workloads of veterinarians are managed, in order to promote optimal mental and musculoskeletal wellbeing.

In addition, the interview data obtained for this study provided additional insights worth considering for future investigation. For example, a noteworthy theme was discernible with regard to how the occupational health and safety practices of a working environment may influence mental wellbeing among veterinarians. Among the veterinarians sampled for interview, a relative or complete disregard for basic health and safety practices was reported among those veterinarians whose WEMWBS scores were consistent with, or lower than, the median reported by the survey sample. In fact, a lack of support from management in relation to occupational health and safety was cited as a work-related stress among multiple interviewees. In contrast to this, the interviewees that were purposely sampled due to reporting the highest WEMWBS scores among the survey sample, almost unanimously reported experiencing occupational health and safety support that either met or exceeded expectations. How the level of occupational health and safety support affects the mental wellbeing of New Zealand based veterinarians, and whether or not the experiences of the veterinarians sampled for this research reflected the New Zealand veterinary industry as a whole, could be research questions worth investigating further.

With the Warwick-Edinburgh Mental Wellbeing Scale having been used by this research to measure the overall population mental wellbeing of New Zealand based veterinarians, additional research using the WEMWBS is recommended. The application of the WEMWBS to other professional groups within New Zealand, as well as working age members of the

general public, would provide clarity with regard to the state of mental wellbeing among New Zealand based veterinarians.

Finally, some research discussed in the literature review (Parr *et al*, 2014; Stults-Kolehmainen *et al*, 2014) suggested that psychological stress may affect the experience of musculoskeletal pain by lowering the ability for muscles to recover from strenuous activities or by causing poorer outcomes to acute injuries. However, it is currently unclear whether these findings can be generalised to the physical activities of veterinarians. Research specific to veterinary tasks would be necessary to provide certainty regarding this possible effect. Such research would be worthwhile in light of the interview data obtained for this study, as this data revealed that the main stresses reported by experienced veterinarians related to high workloads. Thus, due to the seasonality of treating cattle in New Zealand, the most physically repetitive and strenuous times of the year cluster with the primary source of work-related stress reported among the mixed and large animal veterinarians interviewed. The possibility that the stress experienced during the months of spring could stifle the ability to adequately recover from the higher volumes of tasks such as metrichecking, calvings and disbudding performed during these months is concerning. Future advances in the understanding of this concept would be of great benefit to exercise and health science professionals seeking to assist veterinary professionals.

Glossary of Terms

Calvings: The attendance of a veterinarian to the birthing of a cow, assisting the animal as needed to get the calf out. This can involve physical manipulation by the veterinarian to get the calf out whole, caesarean section, or removal of parts of the calf to get it out.

Disbudding: This procedure is used to prevent cows from developing their horns. Cows need to be hornless on dairy farms for both human and animal safety. The procedure involves the cauterisation of the horn buds. This destroys the horn buds before they can develop into horns.

Musculoskeletal Discomfort: In the context of this thesis, "musculoskeletal discomfort" is synonymous with "musculoskeletal pain", however it refers to slight, more mild form of the pain experience, i.e. the experience of mild soreness, tenderness, irritation or aching within the musculoskeletal system.

Teat Sealing: The application of a sealant, to provide a physical barrier to the teats of cows, to help prevent the development of infections such as mastitis during the dry season when they are not milking.

Metrichecking: The procedure that is used to diagnose an infection called endometritis in cows. Endometritis can prevent cows from conceiving. Metrichecking is performed by inserting a device called a "metrichecker" into the vagina of a cow to look for the presence of pus. This term is also used synonymously by veterinarians to refer to the follow-on treatment, if endometritis is detected.

Musculoskeletal Pain: In the context of this thesis, “musculoskeletal pain” refers to a more pronounced and unpleasant form of musculoskeletal discomfort, i.e. the experience of moderate to severe soreness, tenderness, irritation or aching within the musculoskeletal system.

Rectal Palpations: Involves the veterinarian inserting their arm into the rectum of a cow, usually, in order to palpate the uterus for the presence of the signs of pregnancy.

Scanning: The pregnancy scanning of cows using an ultrasound device, to determine whether or not the cow has successfully been inseminated. Dairy cows ideally give birth to a calf annually to stimulate milk production.

Stress: In the context of this thesis, the term “stress” refers to a state of mental or emotional strain which may result from adverse or demanding circumstances.

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Appendices

Appendix A

The following pages contain the results from the tests completed using SPSS software

Kruskal-Wallis Test for Group Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) scores

As can be seen below, the Kruskal-Wallis Test to compare group WEMWBS scores found no statistically significant difference between groups. The significance was .302

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The medians of Rank of WEMWBS by Subgroup are the same across categories of Subgroup.	Independent-Samples Median Test	.302	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Kruskal-Wallis Test for Group Shortened Form Alcohol Use Disorders Identification Test (AUDIT-C) Scores

As can be seen below, the Kruskal-Wallis Test to compare group AUDIT-C scores found no statistically significant difference between groups. The significance was .479

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Rank of AUDITC is the same across categories of Subgroup.	Independent-Samples Kruskal-Wallis Test	.479	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Spearman's Rank Correlation Test (AUDIT-C versus WEMWBS)

A Spearman Rank Correlation Test was used to compare overall AUDIT-C versus WEMWBS scores. As can be seen below, the results revealed a moderate correlation of .350.

Correlations

			Rank of AUDITC	Rank of WEMWBS
Spearman's rho	Rank of AUDITC	Correlation Coefficient	1.000	.081
		Sig. (2-tailed)	.	.350
		N	136	136
	Rank of WEMWBS	Correlation Coefficient	.081	1.000
		Sig. (2-tailed)	.350	.
		N	136	136

Chi-Square Tests

The following Chi-Squares were completed to test for statistically significant differences in the distribution of nominal yes/no answers between veterinary subgroups (small, mixed and large animal practitioners).

Question 2 of the survey was "Have you ever required time off work due to work-related musculoskeletal pain?". As can be seen below, there was no statistically significant difference between groups with regard to the distribution of yes/no answers (p=0.560).

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SubGroup * Answer	150	100.0%	0	0.0%	150	100.0%

SubGroup * Answer Crosstabulation

			Answer		
			No	Yes	Total
SubGroup	Large	Count	19	22	41
		Expected Count	20.8	20.2	41.0
	Mixed	Count	26	28	54
		Expected Count	27.4	26.6	54.0
	Small	Count	31	24	55
		Expected Count	27.9	27.1	55.0
Total		Count	76	74	150
		Expected Count	76.0	74.0	150.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.158[a]	2	.560
Likelihood Ratio	1.160	2	.560
N of Valid Cases	150		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 20.23.

Question 3 of the survey was “In the past 2 weeks have you experienced work-related musculoskeletal pain?” As can be seen below, there was a statistically significant difference between groups with regard to the distribution of yes/no answers (p=0.004).

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SubGroup * Answer	148	100.0%	0	0.0%	148	100.0%

SubGroup * Answer Crosstabulation

			Answer		
			No	Yes	Total
SubGroup	Large	Count	13	27	40
		Expected Count	13.5	26.5	40.0
	Mixed	Count	10	43	53
		Expected Count	17.9	35.1	53.0
	Small	Count	27	28	55
		Expected Count	18.6	36.4	55.0
Total		Count	50	98	148
		Expected Count	50.0	98.0	148.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.061[a]	2	.004
Likelihood Ratio	11.308	2	.004
N of Valid Cases	148		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.51.

Question 4 of the survey was “Throughout the past 2 weeks have you felt overworked physically?”. As can be seen below, there was no statistically significant difference between groups with regard to the distribution of yes/no answers (p=0.059).

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SubGroup * Answer	147	100.0%	0	0.0%	147	100.0%

SubGroup * Answer Crosstabulation

			Answer		
			No	Yes	Total
SubGroup	Large	Count	30	10	40
		Expected Count	27.5	12.5	40.0
	Mixed	Count	30	23	53
		Expected Count	36.4	16.6	53.0
	Small	Count	41	13	54
		Expected Count	37.1	16.9	54.0
Total		Count	101	46	147
		Expected Count	101.0	46.0	147.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.657[a]	2	.059
Likelihood Ratio	5.556	2	.062
N of Valid Cases	147		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.52.

Question 5 of the survey was “Throughout the past 2 weeks has your job felt physically repetitive?”. As can be seen below, there was a statistically significant difference between groups with regard to the distribution of yes/no answers ($p<0.001$).

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SubGroup * Answer	148	100.0%	0	0.0%	148	100.0%

SubGroup * Answer Crosstabulation

			Answer		
			No	Yes	Total
SubGroup	Large	Count	13	28	41
		Expected Count	18.8	22.2	41.0
	Mixed	Count	17	35	52
		Expected Count	23.9	28.1	52.0
	Small	Count	38	17	55
		Expected Count	25.3	29.7	55.0
Total		Count	68	80	148
		Expected Count	68.0	80.0	148.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.888[a]	2	.000
Likelihood Ratio	19.230	2	.000
N of Valid Cases	148		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 18.84.

Question 6 of the survey was “Throughout the past 2 weeks has your job felt physically strenuous?”. As can be seen below, there was a statistically significant difference between groups with regard to the distribution of yes/no answers ($p<0.001$).

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SubGroup * Answer	149	100.0%	0	0.0%	149	100.0%

SubGroup * Answer Crosstabulation

			Answer		
			No	Yes	Total
SubGroup	Large	Count	15	26	41
		Expected Count	21.7	19.3	41.0
	Mixed	Count	24	29	53
		Expected Count	28.1	24.9	53.0
	Small	Count	40	15	55
		Expected Count	29.2	25.8	55.0
Total		Count	79	70	149
		Expected Count	79.0	70.0	149.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14.295[a]	2	.001
Likelihood Ratio	14.708	2	.001
N of Valid Cases	149		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 19.26.

Question 7 of the survey was “Do you often feel increased muscle tension or pain when under stress at work?”. As can be seen below, there was a statistically significant difference between groups with regard to the distribution of yes/no answers (p=0.281).

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SubGroup * Answer	148	100.0%	0	0.0%	148	100.0%

SubGroup * Answer Crosstabulation

			Answer		
			No	Yes	Total
SubGroup	Large	Count	18	23	41
		Expected Count	14.1	26.9	41.0
	Mixed	Count	15	38	53
		Expected Count	18.3	34.7	53.0
	Small	Count	18	36	54
		Expected Count	18.6	35.4	54.0
Total		Count	51	97	148
		Expected Count	51.0	97.0	148.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.539[a]	2	.281
Likelihood Ratio	2.511	2	.285
N of Valid Cases	148		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.13.

Appendix B

The Experience of Musculoskeletal Pain Among New Zealand Based Veterinarians: How the Physical Performance of Veterinary Work and Mental Wellbeing Influence this Phenomenon

Information regarding this survey

My name is David Waugh and I am a master's student studying at Otago Polytechnic. I would like to investigate how the physical performance of veterinary work and mental wellbeing interact in the experience of work-related musculoskeletal pain among veterinarians.

You are being invited to participate in this research because you are a registered veterinarian, practising in New Zealand.

Your participation is entirely voluntary. However, if you decide to participate please complete the following online survey. **The survey will take you about 5-7 minutes to complete**. The questions are intended to ascertain your experience of work-related musculoskeletal pain, overall mental wellbeing and alcohol consumption behaviours.

Results of this study may be published, but any data included will in no way be linked to any specific participant or veterinary practice.

The data collected will be securely stored in such a way that only I (David Waugh, the lead researcher) will have access to it. At the end of the project, any personal information will be destroyed for any raw data on which the results are based.

If you decide to participate, you will be invited at the end of the survey to indicate if you could also be interested in being interviewed via telephone. Interviews will take no longer than 45 minutes, and will be completed throughout July at times convenient to participants. The questions will relate to your experience of work-related musculoskeletal pain and psychological stress. The identity of participants and veterinary practices will not be disclosed. You have the option to decline this, and only participate in the survey if you prefer.

If you have any questions about the project, please feel free to contact me via the following email address: waugdj1@student.op.ac.nz

If you have any concerns about this research, please feel free to contact my primary academic supervisor via the following email address: Richard.Humphrey@op.ac.nz

If you complete the following survey questions you are giving consent to the above terms. Please only proceed if you have read and agree to these

1. Which type of veterinary medicine do you primarily practice?

- Small animal
- Large animal
- Mixed practice (both small and large animal)

2. Have you ever required time off work due to work-related musculoskeletal pain?

- Yes
- No

3. In the past 2 weeks have you experienced work-related musculoskeletal pain?

- Yes
- No

4. Throughout the past 2 weeks have you felt overworked physically?

- Yes
- No

5. Throughout the past 2 weeks has your job felt physically repetitive?

- Yes
- No

6. Throughout the past 2 weeks has your job felt physically strenuous?

- Yes
- No

7. Do you often feel increased muscle tension or pain when under stress at work?

- Yes
- No

8. How often do you have a drink containing alcohol?

- Never
- Monthly or less
- 2-4 times a month
- 2-3 times a week
- >4 times a week

9. How many units of alcohol do you have on a typical day when you are drinking?

- 1-2
- 3-4
- 5-6
- 7-9
- >10

10. How often do you have six or more units of alcohol on one occasion?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

The following questions are statements about feelings and thoughts. Please select the answer that best describes your experience of each over the past 2 weeks

11. I've been feeling optimistic about the future

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

12. I've been feeling useful

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

13. I've been feeling relaxed

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

14. I've been feeling interested in other people

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

15. I've had energy to spare

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

16. I've been dealing with problems well

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

17. I've been thinking clearly

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

18. I've been feeling good about myself

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

19. I've been feeling close to other people

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

20. I've been feeling confident

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

21. I've been able to make up my own mind about things

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

22. I've been feeling loved

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

23. I've been interested in new things

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

24. I've been feeling cheerful

- None of the time
- Rarely
- Some of the time
- Often
- All of the time

Thank you for completing this survey. If you are interested in potentially being interviewed as part of this study, please provide contact information in the comment box below

25. Your contact details

Just as veterinarians encourage their clients to seek help early, we would like to encourage you to seek help if you are struggling or are in distress.

To ensure the wellbeing of veterinarians, the Veterinary Council of New Zealand (VCNZ), together with the New Zealand Veterinary Association (NZVA) offer a Veterinary Wellness programme.

The programme is designed to help identify and manage stress in the workplace. Available to all veterinarians, this programme offers a confidential counselling service and a 24-hour phone service that's open seven days a week. This service also includes up to three fully funded (by the scheme) face to face sessions with a trained psychologist.

Counselling is offered through Vitae, a national provider of workplace wellbeing services. For further information on this service, please **click here**.

Your individual employer may also have wellness programmes in place to offer you additional support.

Alternatively, for support relating to your mental wellbeing or alcohol consumption behaviours please **click here** for a list of nationally available helplines offered by the Mental Health Foundation of New Zealand.

Appendix C

Forth Street,
Private bag 1910
Dunedin 9054, New Zealand
Ph: 0800 762 786
Web: https://www.op.ac.nz/

The Experience of Musculoskeletal Pain Among New Zealand Based Veterinarians: How the Physical Performance of Veterinary Work and Mental Wellbeing Influence this Phenomenon

My name is David Waugh and I am an exercise and health researcher investigating how the physical performance of veterinary work, and mental wellbeing influence the experience of work-related musculoskeletal pain.

This study is being conducted as part of my Master of Applied Science. Beyond assessment for my master's qualification, there is potential that the study will be published in a peer reviewed journal.

You are being invited to participate in this research because you are a veterinarian, working within New Zealand, who previously completed the survey component of this study and registered their interest in potentially taking part in an interview.

If you agree to participate in an interview, this will be conducted via telephone and last no longer than 45 minutes. The questions will relate to your experience of work-related musculoskeletal pain, psychological stress, and how these factors potentially interact with each other. The interview will be recorded (if you agree to this) in order for accurate transcribing. This recording will be deleted as soon as your answers have accurately been transcribed, and you verify that this transcription is true and accurate.

In order for you to participate in the study, you are also agreeing for the information you provide to be stored on a computer. All information you provide will be de-personalised so that only I (David Waugh) will know your identity. However, disclosure to senior staff may be required in the event that you disclose sensitive information, such as the intent to harm yourself or others.

I am asking you to share some very personal and confidential information. You do not have to take part in the study if you do not wish to.

If you do participate in an interview, I will contact you post-interview with a transcribed copy of your answers for you to verify. After receiving this transcribed copy, you will have 14 days to modify or retract your answers, or withdraw from the interview component altogether.

After this 14 day period, you will forgo the ability to withdraw your answers. All information provided by you will be de-personalised with the aim to protect your identity.

As a participant, you have no ownership over the study itself. Your relationship to the study is purely as a voluntary subject. You will not be provided any financial incentive to take part in the research. However, your participation is valued and may lead to improved understanding that could allow for future improvements in veterinarian wellness.

Thank you for your interest in participating

Please contact me (David Waugh at waugdj1@student.op.ac.nz) if you wish to participate in this study. I am also happy to answer any questions you may have regarding the study prior to you deciding whether to participate or not.

If at any time you have any concerns regarding the study please contact Richard Humphrey the research supervisor (Richard.Humphrey@op.ac.nz or call 0800 762 786).

Consent Form

The Experience of Musculoskeletal Pain Among New Zealand Based Veterinarians: How the Physical Performance of Veterinary Work and Mental Wellbeing Influence this Phenomenon

Dear Participant,

Please tick those boxes that you agree with:-

I confirm that I have read and understand the attached information sheet for the study..... ☐

I agree to take part in an interview lasting no more than 45 minutes..... ☐

If yes

- I agree to the interview being recorded..... ☐
- I understand my participation is voluntary and that I am free to withdraw at any time prior to completion of the interview, or up to 14 days after receiving a transcribed copy of my interview……..…….. ☐
- I agree that if my name is removed, my answers can be used in reports and publications..... ☐
- I understand that confidentiality is assured as long as I do not reveal information that requires disclosure (e.g. intent to harm self or another) ..... ☐

Participant: Date: Signature:

Researcher: Date: Signature:

Appendix D

The Experience of Musculoskeletal Pain Among New Zealand Based Veterinarians: How the Physical Performance of Veterinary Work and Mental Wellbeing Influence this Phenomenon

Interview schedule

Interviewees will be :

- Reminded of their right to withdraw or to decline answering questions
- Have the 14-day post interview transcript withdrawal period explained
- Reminded of that their responses will be de-personalised
- Reminded that confidentiality may not be possible on disclosure of self-harm or harm to others
- Asked if they agree to the interview being recorded (if not, notes will be taken).

Interview questions

Icebreaker questions will be asked (how they are getting on, where they are from etc) to put the participant at their ease prior to the interview questions.

1. **What has been your experience of work-related pain as a veterinarian?**

Prompts: What kind of injuries or pain have you experienced? How did that feel in your body, and what activities were affected by it? Why do you think the injury or symptoms occurred at that time of your life? What was going on in your mind at that point in time?

2. **What has been your experience of stress as a veterinarian?**

Prompts: Which stresses in particular have affected you? How do you recognize when you're stressed, are there any particular stress-related symptoms you experience? Why do you think the stress related symptoms occurred at that point in your life? How did you physically feel when this was going on?

3. **How do you attempt to manage your physical and mental wellbeing as a veterinarian?**

Prompts: Are there any specific behaviours or methods you use, to promote your physical or mental wellbeing? Does your workplace offer any specific, wellness oriented training or support? How effective do you feel that these personal behaviours, and/or workplace support are in promoting your physical and mental wellness?

The interview will conclude and the participant will be thanked for giving their time + provided links to NZVA support service in case discussing these topics caused any distress

Appendix E

1 June 2018

David Waugh
79 Hull Street
South Hill
Oamaru 9400

Dear David

Ethics: The Experience of Musculoskeletal Pain Among New Zealand Based Veterinarians: How Occupation Specific Physical Demands and Mental Anguish Influence this Phenomenon

Thank you for your application.

We agree that you have addressed all of the issues we had concerns around and have approval to proceed with your research.

We wish you well with your study and remind you that at the conclusion of your research you should send a brief report with findings/conclusions to the Research Ethics Committee.

Sincerely,

Megan Gibbons
Head of School