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Veterinary and medical undergraduate attitudes to pain in animals and non-verbal humans

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PhD

The University of Edinburgh

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Declaration

I confirm that this thesis presented for the degree of Doctor of Philosophy, has
i) been composed entirely by myself ii) been solely the result of my own work
iii) not been submitted for any other degree or professional qualification

Date: 01/10/2019

Abstract

Attitudes have the potential to influence future behaviour and may affect how people respond to pain in animals and non-verbal humans. The attitudes of veterinary and medical students towards pain are unknown. In order to develop future teaching methods which promote patient beneficial attitudes to pain in future veterinary and medical clinicians, it is essential that we have an understanding of the baseline attitudes students hold when entering University; what influences these attitudes and if these change during the course of training.

A mixed methods study, using both quantitative and qualitative approaches, was used to study veterinary and medical undergraduates' attitudes to pain and the factors associated with these attitudes. Undergraduates were studied from entry to Edinburgh University's College of Medicine and Veterinary Medicine, to final year of training. Data collection comprised of 3 techniques: 1) Questionnaires distributed to students in their first year to gather quantitative data on student characteristics, prior experience and attitude to pain in various animal species (*Chimpanzee; Dog; Cat; Horse; Rabbit; Pig; Cow; Rat; Bird; Snake; Fish; Insect*) and non-verbal humans (*Foetus; Learning difficulties; Dementia; Coma; Anaesthetized*) as measured by the *Expectation of Pain (EP)* attitudinal scale. The *EP* questionnaire was repeated when the students were in third and final year to investigate changes in attitude as students progressed through their training. 2) Interviews at the start of second year and final year were used to gather qualitative data on factors which influenced attitude to pain in animals and non-verbal humans. 3) Empathy and pain assessment scoring to determine the influence of student empathy, as measured by the previously validated Empathy Quotient (EQ), on attitude to pain in animals and non-verbal humans.

Initially 280 veterinary and 216 medical students completed the *EP* questionnaire when entering University. The *EP* completion rate reduced in third year (55 veterinary and 23 medical) and final year (14 veterinary and 10 medical). In the animal species *EP* was rated lowest in *Snake, Fish* and *Insect*;

and highest in *Chimpanzee*. For the non-verbal humans *EP* was lowest in *Anaesthetized*, *Coma* and *Foetus*; and highest in *Learning difficulties*. Veterinary students rated *EP* higher than medical students in 10 of the 12 animal species, and also in *Anaesthetized*. There was no difference in veterinary and medical student *EP* ratings for the remaining non-verbal humans, or *Horse* and *Cow*. Attitudes did not change significantly during training, but differences emerged in how students perceived clinical versus non-clinical learning had influenced their attitudes. Eight students participated in initial interviews, with Empathy; Education and Personal-social factors identified as influences on the development of student attitude to pain. Although students discussed empathy as an influence in their attitude development was not associated with attitude to pain in animals and non-verbal humans in the 176 students who completed the EQ.

The lack of overall change in attitudes of students towards pain in animals and non-verbal humans during University training, also means a potential lack of improvement in attitudes in those students who entered University with less caring attitudes to pain in some animal species and non-verbal humans. Many of the factors identified as influencing student attitude to pain are beyond the control of the educational setting – these include student gender, prior experience, and observation of animals and people in pain. The student experience of clinical role models and clinical culture is an area which potentially can be influenced by clinical educators.

In order to promote patient beneficial attitudes to pain in animals and non-verbal humans, efforts should concentrate on improvement of the clinical training experience. Clinical role models who convey positive attitudes to patient pain and contribute to improving the hidden curriculum regarding pain are essential to improving the attitude of future veterinary and medical clinicians to pain in animals and non-verbal humans.

Lay Summary

Veterinary and medical clinician attitude to pain can influence their decision about pain management in patients. It is particularly important that the people caring for patients who cannot speak have attitudes to pain which motivate them to alleviate pain. In order to develop attitudes to pain in veterinary and medical students which would benefit future patients, it is important that veterinary and medical teachers understand current student attitudes and what may influence them. There have been no previous publications investigating the current attitudes students hold when entering University, what influences these attitudes and if these change as students' progress through University.

We used two different methods to gather data: statistical analysis of questionnaire data and thematic analysis of student interview data. Students were studied from entry to Edinburgh University's College of Medicine and Veterinary Medicine until final year of training. Questionnaires were given to students in their first year to gather data on student characteristics, previous experience and attitude to pain in various animal species (*Chimpanzee; Dog; Cat; Horse; Rabbit; Pig; Cow; Rat; Bird; Snake; Fish; Insect*) and non-verbal humans (*Foetus; Learning difficulties; Dementia; Coma; Anaesthetized*) as measured by a scale we created to measure attitude to pain, called the *Expectation of Pain (EP)* attitudinal scale. The *EP* questionnaire was repeated when the students were in third and final year to investigate changes in attitude during training. Interviews at the start of the students second year and final year of training were used to find out which factors influenced attitude to pain in animals and non-verbal humans. Finally, the relationship between student empathy and attitude to pain in animals and non-verbal humans was investigated when the students were in third year.

Initially 280 veterinary and 216 medical students completed the questionnaire when entering University. The number of students who completed the questionnaire was less in third year (55 veterinary and 23 medical) and final year (14 veterinary and 10 medical). Students arrived at University with differences in attitude to pain, which varied depending on animal or non-verbal

human type. Fewer students reported that snakes, fish and insects were able to experience pain compared to chimpanzees. Fewer students reported that people who are anaesthetized, in a coma, or babies before birth able to feel pain, compared to people with learning difficulties. From the interviews it appeared that Empathy; Education and Personal-social factors had an influence on student attitude to pain. Although students discussed empathy as an influence in the interviews, student empathy was not associated with attitude to pain in animals and non-verbal humans when tested. Attitudes did not change much during training, but there were differences in how students thought learning whilst working on clinics and learning from lectures had influenced their attitudes.

There is a potential that University training does not help students who start training with attitudes to pain that don't motivate them to help patients. The learning that occurs when students are on clinics is important, particularly learning from experienced staff and the general approach of the practice or clinic. This learning on clinics is an area which potentially can be influenced by educators. Clinical staff who act as role models and convey helpful attitudes to patient pain are essential to improving the attitude of future veterinary and medical clinicians to pain in animals and non-verbal humans.

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Chapter 1 Introduction

1.1 Overview

Veterinary and medical undergraduates represent the next generations of veterinary and medical clinicians, and so their attitudes to pain will potentially impact on the adequacy of pain management for future patients. For this reason it is important that veterinary and medical students graduate with attitudes towards pain that benefit patients, particularly for those patients that are unable to communicate their own pain experience and rely on clinical staff to recognise and interpret their pain experience. Pain assessment in humans generally relies on patients self-reporting their own pain experience. However, for animals and a sub-section of human patients who are unable to self-report their own pain experience, pain assessment depends on clinical staff recognising and interpreting physiological and behavioural signs of pain.

There is a plethora of tools available for assessing pain in animals and non-verbal humans (Breau et al., 2002, Chang et al., 2015, Cong et al., 2013, Hadjistavropoulos et al., 2001, Hall and Anand, 2014, Kain et al., 2002, Keck et al., 1996, Merkel et al., 1997, Polkki et al., 2014, Schade et al., 1996, Stevens et al., 1996, Ashley et al., 2005, Brondani et al., 2013, Brown et al., 2013a, Brown et al., 2013b, de Oliveira et al., 2014, Firth and Haldane, 1999, Grandemange et al., 2013, Hellyer et al., 2006c, Hielm-Bjorkman et al., 2011, Holden et al., 2014, Holton et al., 2001, Molsa et al., 2013, Reid et al., 2013, Wiseman-Orr et al., 2004, Chanques et al., 2010, Collignon and Giusiano, 2001, Feldt, 2000, Gelinas et al., 2006, Jensen et al., 1986, Odhner et al., 2003, Payen et al., 2001, Sheu et al., 2011, Voepel-Lewis et al., 2010). Despite the numerous assessment tools available there continues to be development of further tools to compensate for the inadequacy of the existing tools. However, clinical pain assessment is rarely based solely on pain intensity ratings from assessment tools and has been described as 'social transaction between patient and clinician' (Voepel-Lewis et al., 2012). This

means assessment is a more complex communication process between the patient and clinician composed of various interpersonal and intrapersonal aspects that interact and affect each other, such as the clinician's attitude to pain (Gordon, 2015).

This chapter provides a synopsis of the background and context for the work on veterinary and medical student attitude to pain in animals and non-verbal humans described in this thesis. The research problem is identified, leading to a description of the purpose and aims of the work. Lastly, a self –reflective section on researcher motivation and anticipated audience concludes the chapter.

1.2 Attitudes of undergraduate veterinary and medical students towards pain

As veterinary and medical students represent the next generation of practicing veterinarians and medics, their attitudes towards pain in animals and non-verbal humans will impact on the quality of pain management that these types of patients receive in the future. Despite numerous studies investigating the attitude of qualified veterinarians towards pain, there have been no studies investigating the attitude of veterinary students in the United Kingdom to pain in animals. Similarly, the attitude of medical students towards pain in non-verbal humans has also not been studied, despite evidence to suggest that non-verbal human pain is an area of the undergraduate curriculum that is lacking (Briggs et al., 2011, Chang et al., 2000). A study from the United States of America compared the undergraduate curriculums of veterinary and medical schools and concluded that overall veterinary students received more teaching in pain than medical students (Cox, 2010). Importantly, there is no information on the baseline attitudes towards pain of veterinary or medical students when entering University, which makes assessment of attitude change during training difficult.

1.3 Pain in animals

The Greek philosopher Plato believed that pain is an emotion that dwells in the brain (Plato, circa 375 BC). As such, pain must be subjective and unique to the individual. This characteristic of pain makes the perception of pain in others difficult as a stimulus that is excruciating for one individual, may only cause discomfort in another.

There has been discussion on whether animals experience pain and if so how much pain they are capable of experiencing for over a century. For example,

There is no fundamental difference between man and the higher animals in their mental faculties.... The lower animals, like man, manifestly feel pleasure and pain, happiness, and misery.” (Charles Darwin, In ‘The expression of emotion in man and animals’ 1872)

However, the belief that all living things are capable of experiencing pain is not universally accepted and has changed significantly over time (Rodkey and Pillai Riddell, 2013). Recently the definition of pain has been updated as;

Pain is a distressing experience associated with actual or potential tissue damage with sensory, emotional, cognitive, and social components. (Williams and Craig, 2016)

As such it follows that in order to experience pain an animal must have phenomenal consciousness (also described as qualia or sentience). There is still debate within the scientific community about whether animals have phenomenal consciousness and therefore would be able to experience the complexities of human emotion, including that of pain (Burkart et al., 2017, Shettleworth, 2009). In fact the ability of animals to experience pain has been discussed and debated for hundreds of years. The French philosopher Rene Descartes argued that animals were unable to experience pain in the same manner as humans because of a lack of consciousness,

But the greatest of all the prejudices we have retained from infancy is that of believing that brutes think. (Descartes, 1649/1993)

Historically the vocalisation and struggling seen after surgical procedures on animals were interpreted as being autonomic nervous responses or uncontrolled muscular reflexes. This combined with the belief that animals lacked phenomenal consciousness, convinced scientists that animals were incapable of suffering. It is only in the last few decades that a greater understanding of pain physiology has supported the idea that most animals can experience pain, with increasing evidence that even animals lower on the phylogenetic tree can also experience pain (Machin, 2001, Sneddon, 2004).

However, this knowledge is still not applied in a consistent fashion, for example, surgical interventions in production animals, such as beak trimming in chicks, and tail docking and/or castration in lambs are still performed without anaesthesia or analgesia (Graham et al., 2002, Kuenzel, 2007). Yet, in the United Kingdom tail docking in puppies has been banned since 2007 (Diesel et al., 2010, Lederer et al., 2014). These inconsistencies may indicate a variation in attitude towards inflicting surgical pain in animals, depending on the purpose of the species involved. There is evidence that attitudes towards welfare in animals varies depending on whether the animal involved is a pet or production animal and this may also be true when considering attitudes to pain in animals (Taylor and Signal, 2009).

Another argument that is often used to justify performing surgical procedures in animals without the use of anaesthetics or analgesics is that the surgeries tend to be minor, for example tail docking, and performed shortly after birth. Previously there was a widely held belief that the nervous system was not fully developed in the neonatal animals, thereby preventing the perception of stimuli that would otherwise cause pain (McGraw, 1941, Sherman and Sherman,

1925). This belief may still influence the attitude of veterinarians performing surgical procedures on very young animals, as research has shown that less than 20% of piglets and calves under the age of 6 months receive any analgesia for castration procedures (Hewson et al., 2007a).

Pain remains a welfare problem in animals, especially as animals have many different purposes in society – production, research, leisure and companions (Beauchamp and Morton, 2015, Denaburski and Tworkowska, 2009). The link between attitude to pain and propensity for veterinary professionals to administer analgesics has previously been investigated, although no distinction was made between different animal species (Hellyer et al., 1999). Differences in attitude to pain for different species and/or animals which serve different purposes may lead to variation in how clinicians approach pain management for these species.

1.4 Pain in Non-Verbal Humans

Non-verbal humans are those who are unable to communicate through verbal language, but may have other means of communication such as changes in behaviour (Turk and Melzack, 2001). There are a number of conditions that can result in humans being classed as non-verbal, resulting in a reduced capacity to verbally communicate about their pain experience (Table 1-1).

Categories of non-verbal humans	examples
central nervous system (CNS) immaturity	Foetus in utero Premature babies Infants, toddlers and pre-school children
CNS abnormalities and/or permanent damage	Developmental/intellectual disabilities Acquired brain damage Brain diseases (e.g. Alzheimer's) Language or speech impairment Neuromuscular disorders (e.g. cerebral palsy)
temporary CNS impairment	General anaesthesia Toxic delirium CNS depressants (e.g. sedatives) 'Recreational' drugs (e.g. alcohol) Muscle paralyzing agents
psychosocial conditions	Inability to speak the language Speech disorders Voluntary mutism Voluntary exaggeration or suppression of reports Behaviour disorders Motivational deficits

Table 1-1 Categories of non-verbal humans and *examples*. Adapted from 'Pain assessment in persons with limited ability to communicate' (Hadjistavropoulos et al., 2001).

Neonates and infants are classed as non-verbal humans as they are unable to verbally communicate with care givers. Historically, scientists believed that human infants were incapable of suffering because of a belief that the nervous system was not fully developed at birth, and infants had limited memory capacity (Rodkey and Pillai Riddell, 2013). As a result, pain management in these patients was often inadequate.

In the 1970s and early 1980s, the belief that neonates were less able to experience pain resulted in pre-term and full-term babies undergoing invasive surgical procedures without any anaesthesia or pain relief (Schechter NL, 1986). This practice was widespread with many authors of surgical text advising that major procedures, such as open heart surgery could be safely achieved with only oxygen and a neuromuscular blocker (paralysing agent), for example, Wesson *et al.* (Wesson, 1982). An example of this practice

involved Jeffery Lawson, who died in infancy sometime after undergoing open heart surgery without anaesthesia or analgesia. Following the death of her son Jill Lawson wrote to the New England Journal of Medicine questioning how the medical profession could believe that infants were unable to experience pain,

If I had been told by a physician, no matter how senior, that infants don't feel pain, I would never have believed it. What constitutes the difference between my reaction and that of thousands of physicians who did believe it?
(Lawson, 1988)

Research has since indicated that even very young human babies can experience pain, and effective pain management can improve acute and long-term outcomes in paediatric patients (Anand KJS, 1987, Bellieni and Buonocore, 2012, Hatfield, 2014). Despite the importance of pain management in this group of patients, neonates and infants are still at increased risk of experiencing moderate to severe pain due to inadequate pain management whilst in hospital (Stevens et al., 2012). This raises the question of whether medical education itself or other factors contribute to sub-optimal attitudes towards paediatric pain within the medical profession.

Assessment of pain in non-verbal humans relies on interpretation of patient behaviour and/or physiological indicators of pain. Attitude towards pain in non-verbal humans may therefore influence recognition of pain in these patients, who are unable to verbally communicate the extent of the pain they are experiencing to others, and a previous study has found a link between attitude to pain and propensity for medical professionals to administer analgesics in human paediatric patients (Mathew et al., 2011).

1.5 Empathy and assessment of pain in others

A potential influence on a person's ability to perceive pain in others is their capacity to experience empathy. This is an area of research which is currently

expanding in relation to human subjects. Many of these studies have used validated empathy scoring systems, such as the Davies Empathy Scale, to assess how much empathy a person is capable of experiencing and then relate this to their ability to perceive pain in other humans (Green et al., 2009, Passik et al., 2007). To date there have been no studies to investigate the influence of empathy on the ability of humans to perceive pain in animals.

Modern veterinary medicine and medicine place an emphasis on clinical competencies, analytical thinking and on teaching of skills to undergraduates that can be assessed. However, in a letter to the editor of *Pain*, Lynch and Clark (2005) extolled the benefits of clinicians being empathetic with patients suffering with pain, instead of relying on a purely analytical approach.

Although empathy is less tangible and therefore harder to teach and assess, it is accepted that increased doctor-patient empathy leads to improved patient satisfaction and reduced litigation when dealing with human patients (Batt-Rawden et al., 2013). The Royal College of Veterinary Surgeons have also identified sympathy and empathy as an essential competency for new veterinary graduates and include the following description under general professional skills and attributes competencies that a new graduate should be able to do;

Listen effectively and respond sympathetically to clients and others (RCVS, 2011)

Empathy is a complex multidimensional construct, which has been identified as important in providing good patient care in humans. A recent review identified empathy in medical education as an important theme and highlighted the need to nurture empathy in medical students (Roche and Harmon, 2017). There has been interest in medical student empathy (Neumann et al., 2011, Handford et al., 2013, Hojat et al., 2009, Hojat et al., 2004, Newton et al., 2000, Chen et al., 2007, Stratton et al., 2008, Quince et al., 2016b) and also an interest in the influence of empathy on pain perception, with neural correlates of 'empathy for pain' being suggestive of an association between empathy and

the ability to recognise pain in others (Passik et al., 2007, Preis and Kroener-Herwig, 2012, Craig et al., 2010, Roche and Harmon, 2017).

Non-verbal humans, such as young children or those with cognitive impairment, are a group of vulnerable patients encountered in numerous branches of medicine including general practice, surgery and emergency medicine. Despite this, there is no information on whether empathy influences veterinary and medical student attitude to pain in animals and non-verbal humans and how that may affect the training of veterinary and medical students to assess pain.

1.6 Background summary

The development of attitudes towards pain during the undergraduate training of veterinary and medical students has also not been investigated. In particular, there has been no research into baseline attitudes towards pain and whether undergraduate training influences or contributes to further development of attitudes towards pain. There have also been no studies investigating how these factors may influence veterinary and medical undergraduate attitudes towards pain in animals and non-verbal humans.

There is a lack of evidence on whether attitudes towards pain in animals differs depending on species. Similarly, there has been little research into attitudes to pain in different types of non-verbal humans, for example paediatrics, cognitively impaired patients and critically ill patients. Previous studies have investigated which factors may influence our attitude towards pain in verbal humans, including the influence of gender (Robinson and Wise, 2003), ethnicity (Trawalter et al., 2012) and previous pain experience (Robinson and Wise, 2004), but the influence of these factors on attitudes towards pain in animals and non-verbal humans has not been fully investigated.

Lastly, there have been no studies investigating whether empathy influences attitudes towards pain, particularly in animals and non-verbal humans where, because of the patient's inability to verbally communicate, observer empathy may be of greater importance in assessment of pain.

1.7 The research problem

1.7.1 Veterinary student attitude to pain in animals and non-verbal humans

A survey of first opinion veterinary practitioners in the United Kingdom demonstrated that recognition of pain is the only skill considered essential across all species (Duncan et al., 2015). The species included in the Duncan et al. (2015) study included companion animals (e.g. dog; cat; horse), farm animals, rabbits and exotic animals (e.g. birds and reptiles) and suggested that qualified veterinary practitioners across the UK appreciated that these animals are capable of experiencing pain and they considered pain recognition as an essential skill for working with these species.

Previous studies have reported that attitudes of qualified veterinary practitioners towards pain in animals can influence approach to pain management in their patients (Becker et al., 2014, Bell et al., 2014, Weber et al., 2012, Perret-Gentil et al., 2014). However recent initiatives aimed at improving pain management in animals have focused on methods to quantify pain in animals and the development of a multitude of pain scoring tools, which have done little to address any variation in inherent attitudes towards pain in veterinary species. It is suggested that clinical pain assessment is complex and in reality often evokes interpersonal aspects, such as attitude to pain, rather than relying entirely on a pain score derived from an assessment tool (Gordon, 2015).

Anecdotally in the clinical setting many veterinary anaesthetists have encountered cases where the derived high pain score has been ignored because the person responsible for administering analgesia did not 'believe' the animal to be in as much pain as the score suggested.

There have been numerous studies investigating veterinary practitioner attitude to pain in individual animal species and /or in veterinary practitioners in particular Countries (Becker et al., 2013, Bell et al., 2014, Dohoo and Dohoo, 1998, Dujardin and van Loon, 2011, Hewson et al., 2006a, Hewson et al., 2007b, Hugonnard et al., 2004, Huxley and Whay, 2006, Lascelles et al., 1999,

Lim et al., 2014, Lorena et al., 2013, Perret-Gentil et al., 2014, Price et al., 2002, Waran et al., 2010, Weber et al., 2012). However, previous studies on veterinary student attitude towards pain has focused on assessment of pain education interventions (Mich et al., 2010), and so there is no information on the attitudes towards pain in various animal species of those training to become veterinary practitioners.

1.7.2 Medical student attitude to pain in animals and non-verbal humans

Medical graduates can often be involved in experimental animal work, including design of experiments which involve levels of harm. In the UK anyone working with experimental animals must have training on the 3 R's, which include the concept of refinement of experiments to obtain useful data with minimum amount of suffering (Franco et al., 2018). Animal species commonly used as experimental animals include rats, mice and fish (Home Office, 2018). As attitudes affect behaviour and decision making (Kraus, 1995), it is important that medical undergraduates who go on to work with experimental animals have attitudes to pain which are beneficial in these species. There has been no research into the attitudes of medical undergraduates towards pain in any animal species.

Doctors' appreciation of pain in others is influenced by their attitudes as well as psychosocial factors (Anderson et al., 2000). This has major implications on the quality of pain management delivered to human patients who are unable to communicate their own pain verbally - and who, therefore, are likely to receive inadequate pain management, e.g. those with cognitive impairment (Feldt et al., 1998) profound learning difficulties (McKay and Clarke, 2012), or paediatric patients (Taylor et al., 2008, Shrestha-Ranjit and Manias, 2010, Plummer et al., 2016).

In human medicine it has been shown that attitudes can influence professional behaviour (Turner and Weiner, 2002) and a major goal of medical education besides teaching knowledge and skills, is to promote attitudes which benefit patients (Schreiner et al., 2011), but there is evidence that training in non-

verbal human pain is lacking in medics (Poyhia et al., 2005, Cohen and Bennett, 2006, Saroyan et al., 2008, Watt-Watson et al., 2009).

1.8 Purpose of this research

Recent research on veterinary and medical students supports the concept that attitudes towards pain can be changed during undergraduate training (Lim et al., 2014, Mich et al., 2010). This potential to influence the attitudes towards pain of future generations of doctors and veterinary clinicians in a way which would benefit their non-verbal patients is compelling and could enhance pain education.

To understand how attitudes are influenced by different aspects of training, it is imperative that we appreciate what attitudes veterinary students and medical students hold on entering University and the influences which may have contributed to formation of these attitudes. There is no previous information available on student attitudes to pain and what factors have influenced those attitudes when starting their clinical degrees at University.

This research sought to explore the attitudes of undergraduate veterinary and medical students in The University of Edinburgh towards pain in animals and non-verbal humans (for example, neonates, paediatrics, cognitively impaired patients and anaesthetised patients).

Additionally, the study aimed to investigate what factors, if any, have an influence on the development of student attitudes towards pain in different animal species and non-verbal humans. Results from previous research indicate that gender (Robinson and Wise, 2003, Wise et al., 2002), age (Torres et al., 2013) and year of study (Weinstein et al., 2000) may have an influence on student attitude towards pain. It was hypothesized that other factors such as previous experiences and student empathy would also influence their attitude towards pain in animals and non-verbal humans.

1.9 Aims of this research

The aims of this study are to investigate veterinary and medical undergraduate student's attitudes to pain in both animals and non-verbal humans. Additionally, the study aimed to investigate which factors, if any, influence attitudes towards pain in animals and non-verbal humans. Specifically the three research questions of the study were:

RQ1. What are the attitudes of veterinary and medical students entering University towards pain in animals and non-verbal humans, and what factors influence development of these attitudes?

RQ2. Is there an association between veterinary and medical students' empathy and their attitude towards pain in animal and non-verbal humans?

RQ3. Do attitudes of veterinary and medical undergraduates towards pain in animals and non-verbal humans change during training, and what influencing factors are they exposed to during training?

1.10 Researcher motivation

Over the last 16 years I have observed students and staff who have attitudes to pain in animals that do not motivate them to alleviate pain. For example, many clinicians will not administer analgesia to a crying greyhound saying "greyhounds are wimpy". I have always wondered where this attitude originated from. In addition, I have anecdotally noted that whilst clinicians appear to understand the principles of pain assessment and using pain assessment tools, often the results of a pain score are ignored because either the animal is "a wimp" or the clinician doesn't believe the animal could be in the level of pain suggested by the scoring tool. To me it appears that the attitudes of clinicians towards pain overrides the use of pain scoring tools. Whilst this may not be true for every clinician, I observed that those clinicians with strong attitudes are more difficult to persuade that an animal is in pain.

This led me to be interested in how attitudes to pain develop, what influences these attitudes and whether training has any influence.

1.11 Audience for this research

The primary audience for this research is those with any responsibility for pain education in future veterinary surgeons and/ or medical practitioners. As pain is an interdisciplinary subject and is encountered in numerous specialities, for example medicine, surgery and oncology, the results of this research may be of interest to a wide range of healthcare professionals teaching pain-related subjects.

Non-verbal patients, such as young children or those with cognitive impairment, are encountered in numerous branches of medicine including general practice, surgery and emergency medicine, yet the topic remains largely unaddressed in medical undergraduate curricula with many doctors graduating with little training in the pain experience of those with no 'voice' of their own.

Previous studies have reported that attitudes of qualified veterinary clinicians towards pain in animals can influence approach to pain management in their patients (Becker et al., 2014, Bell et al., 2014, Weber et al., 2012, Perret-Gentil et al., 2014). However recent initiatives aimed at improving pain management in animals have focused on the development of a multitude of pain scoring tools, yet little time devoted to researching how personal characteristics may influence attitude to pain, which in turn affects pain management decisions. The information contained within this thesis may encourage self-reflection of healthcare professionals own attitude towards pain in animals and non-verbal human patients.

1.12 Structure

In this chapter the research problem, aims and purpose of the research has been described. Additionally the motivation and proposed audience for the research has been discussed.

Chapter 2 presents the process and results of the literature review relating to veterinary and medical students attitudes to pain. This chapter also contains an overview of the term ‘attitude’, and clarification of its use in the context of this research. The gaps in literature are identified.

Chapter 3 presents the rationale behind the choice of mixed method research (MMR) techniques for this research, as well as providing a brief overview of the characteristics of MMR. The specific methodologies used in this research are identified, followed by detailed descriptions of the various phases of methodology.

Chapter 4 presents the quantitative (QUANT) data on veterinary and medical undergraduate attitudes to pain in animals and non-verbal humans (NVH) on entering University.

Chapter 5 presents the qualitative (QUAL) data from interviews conducted at the start of second year with a selection of veterinary and medical students.

Chapter 6 presents the QUANT data on veterinary and medical undergraduate’s empathy, and data on whether student empathy is associated with ability to perceive pain in animals and non-verbal humans.

Chapter 7 presents the QUANT data on attitudes towards pain in various animal species and non-verbal humans from questionnaires completed half-way and the end of training, along with the QUAL data on influencing factors from interviews conducted at the end of training.

Chapter 8 presents a discussion, interpretation and critique of the results of data collection, relating to the gaps in literature identified in chapter 2. Importantly this chapter integrates the findings from the QUAN and QUAL data collection phases of the project. It critically reflects on the methodology used and the limitations of this research, as well as discussing the contribution this thesis makes to knowledge and the literature.

Chapter 2 Literature review

2.1 Introduction to literature review

Attitudes have the potential to influence future clinical behaviour (Rodkey and Pillai Riddell, 2013, Darlow et al., 2012, Schechter and Allen, 1986, Hellyer et al., 1999, Becker et al., 2013, Becker et al., 2014, Bell et al., 2014, Capner et al., 1999, Coleman and Slingsby, 2007, Dohoo and Dohoo, 1996, Hewson et al., 2006, Hewson et al., 2007b, Hugonnard et al., 2004, Huxley and Whay, 2006, Ison and Rutherford, 2014, Keown et al., 2011, Lascelles et al., 1999, Lim et al., 2014, Lorena et al., 2013, Lorena et al., 2014). Therefore promoting attitudes in veterinary and medical students which are beneficial towards future patient pain management is desirable. Attitudes which promote optimum pain management are described as *patient beneficial* attitudes throughout this thesis.

Pain in animals and non-verbal humans represents a welfare concern and affects quality of life (Turk and Melzack, 2001, Toates and Davey, 2007). As such much time has been devoted to studying pain and the literature is vast, including many facets – for example management, education, neurobiology, psychology, physiology, pharmacology and assessment. Despite recognition that pain is detrimental to quality of life and an array of publications, there is still evidence that pain management is inadequate, particularly for those unable to communicate their own pain – such as animals and non-verbal humans (Harrison et al., 2014, Curtiss, 2010, Proctor, 2012, Perry et al., 2018, Reavey et al., 2014, Walker, 2014)}. The purposes of this literature review is to identify literature relevant to the research questions of this study (section 1.5) and identify gaps in the current literature.

2.2 Overview of chapter

This chapter documents the process by which the literature review was undertaken and clearly identifies the scope and limitations of the search. The search terms and synonyms are reported, as well as the databases utilized. The chapter reports the results of the search and also a detailed review of relevant literature. The chapter concludes with a summary and by identifying the gaps in the literature.

The chapter includes the following

1. Description of literature search approach including search dates, search terms, inclusion and exclusion criteria.
2. Summary of results including number of publications included in review.
3. Detailed review of literature on the following;
 - The psychology of attitude
 - Veterinary and medical students attitude to pain
 - Influence of patient characteristics on observer attitude towards pain
 - Influence of observer characteristics on attitude to pain
 - Influence of empathy on attitude to pain
 - Influence of education on attitude to pain
 - Hidden curriculum in veterinary and medical education
4. Summary of literature
5. Gaps in the literature

2.3 Search Aim

The search question was developed through review of the broader project aims to investigate veterinary and medical student attitudes to pain in Non-Verbal subjects. A broad search questions was developed, namely;

What are veterinary and medical student attitudes towards pain in non-verbal subjects and what factors influence them?

2.4 Databases included in online search

The databases recommended by Edinburgh University Library as being most relevant for searching veterinary medicine and medicine were used (Institute for Academic Development University of Edinburgh, 2013) these included Google scholar, Web of science, Medline, VetMed resource, CAB abstracts and Biomed Central.

2.5 Essential concepts and key words

The essential concepts identified for inclusion in the literature search were Pain; NVH; and students (veterinary and medical). These three concepts formed the 'backbone' of the literature review. Expansion of these essential concepts generated further key word search terms (Figure 2-1), for example, non-verbal subjects could be categorized as either human or animal subjects, and further expansion allowed non-verbal human subjects to be categorized as either babies or children; humans with communication difficulties or humans with impairment of cognitive function.

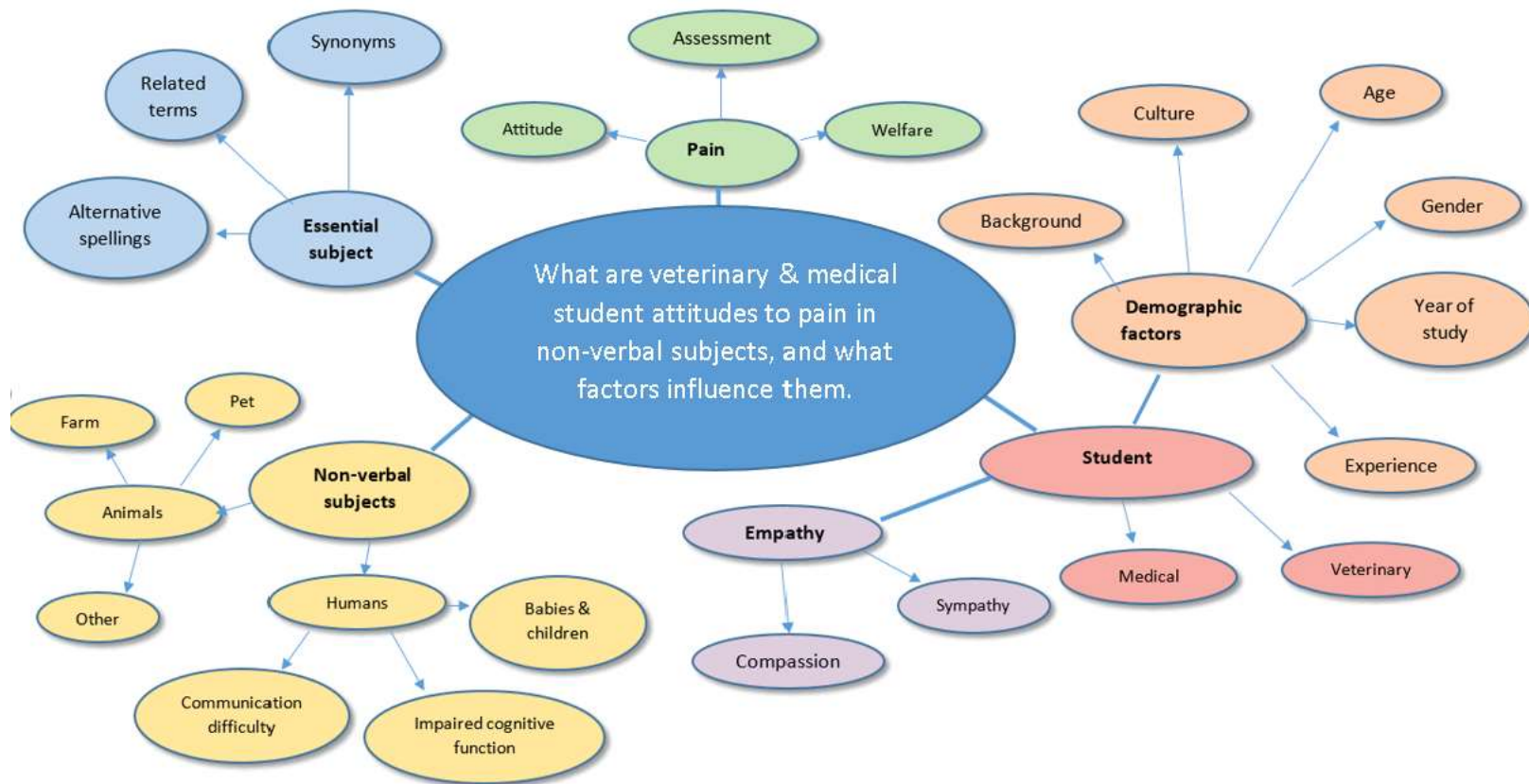


Figure 2-1. Mind map illustrating essential concepts (Pain; non-verbal subjects; student) and derivative terms used during literature search. Essential subjects included alternative spelling for terms, synonyms and related terms.

The 'student' concept was expanded to include veterinary and medical student, and also demographic factors, such as age and gender. Empathy was incorporated as a concept within 'student' as a potential influencing factor. In addition, alternative spellings and synonyms for the essential concepts and expanded search terms were incorporated into the search (Haig and Dozier (2003)). Related terms such as 'pain scoring' and 'attitude to pain' were also included in the literature search and framework. These concepts and their corresponding expanded terms were also included in the literature search terms.

The National Library of Medicine indexers use Medical Subject Headings to describe subject content of journal articles. There are over 26,000 Medical Subject Headings heading (main headings) which represent concepts found in the biomedical literature and enable literature searches to be conducted in a systematic fashion (Table 2-1).

Essential concepts	Medline MeSH terms	Key Words
Pain	Pain	Pain; chronic pain; acute pain; pain assessment; uncomfortable; sore(ness),
Nonverbal subject	Non-verbal human	Non-verbal; adult, non-verbal; child, non-verbal; paediatric, paediatric, non-verbal; communication difficulty, non-verbal; mental impairment, non-verbal;
	Animal	Animal(s), dog, canine, horse, equine, cat, feline, bovine, cow, cattle, sheep, farm animal(s), pets, fish, invertebrates, vertebrates.
Student	Student	Medical student; medicine student(s); medical undergraduate; medical trainee; veterinary student(s); veterinary undergraduate; veterinary trainee.
	Demographic characteristics	Age, gender, experience, year of study/training
	Empathy	Empathy; empathic concern; sympathy; compassion

Table 2-1. Essential concepts with corresponding Medical subject heading (MeSH) terms used for Medline searches and keywords.

For literature searches within Medline, Medical Subject Headings (MeSH) heading terms were used as the search criteria in the first instance, followed by subject headings and 'all fields' if no appropriate articles were returned with previous searches. For searches within other databases key words were used.

When reading the papers returned from the initial search it became apparent that other potentially relevant citations had not been identified by the electronic searches of the online databases. This may have been due to inappropriate 'tagging' or labelling key words by authors, thereby reducing the likelihood of finding a paper through electronic searches. As a result the literature review developed in a broader direction and became a combination of systematic review and inclusion of papers found by in depth reading of the literature or personal recommendation. Any potentially relevant references cited in the body of the text that had not been discovered through the online literature searches were obtained through Edinburgh University and inter-library loans.

2.5.1 Additional literature search

A further *post hoc* literature review of publications on 'the hidden curriculum' was carried out after reviewing the results of the qualitative data analysis. A literature review of the hidden curriculum had not been included in the primary literature review. During the course of the data analysis it became apparent that the hidden curriculum was an important topic and as such a literature review of publications relating to the hidden curriculum in veterinary and medical students was conducted. The additional search of the literature on the 'hidden curriculum' in veterinary and medical training was carried out in June 2019 and used key words veterinary OR medical AND hidden curriculum.

2.5.2 Inclusion/exclusion criteria

Literature on pain is extensive and encompasses physiology, pharmacology, neurobiology, psychology, pain management and assessment. For this reason exclusion criteria included studies where students were used as

observers in development of and/or testing of pain assessment tools; studies where the aim was to assess analgesic drug efficacy or pain physiology; and studies investigating pain in verbal adult humans. Comparative analgesic studies in animals which were carried out secondary to veterinary student surgery practical classes were not included.

Studies were included in the literature review if the aim, content or findings was relevant to the essential concepts (section 2.4). Only publications written in English were included, unless translation was readily available online. Studies included in the literature review were from peer reviewed journals, but included veterinary, medical and non-medical publications, and had to be in publication or previously published at time of review. In addition, references from grey literature and web pages, such as the Royal College of Veterinary Surgeons Newsletter, were included where relevant.

2.5.3 Literature search dates

No date restrictions were incorporated into the literature database searches. If publications were of sufficient age that electronic copies were unavailable, then hard copies were requested from University of Edinburgh library or inter-library loans where possible. An initial literature search was conducted in 2012, with periodic top-up searches of the databases repeated on a yearly bases. An alert for publications which matched key words was also used. A final top-up search of the databases was conducted during 2019 pre-thesis preparation to ensure capture of recently published articles.

2.6 Overview of literature search results

An initial search using the essential concepts as MeSH Terms revealed no matching journal articles. Using 'key words' and including all synonyms and alternative spellings was more successful and identified over five hundred thousand articles with 'pain' as a key word, over two hundred thousand articles with 'student' as a key word and over 7 million articles with 'non-verbal' as a key word (Figure 2-2) .

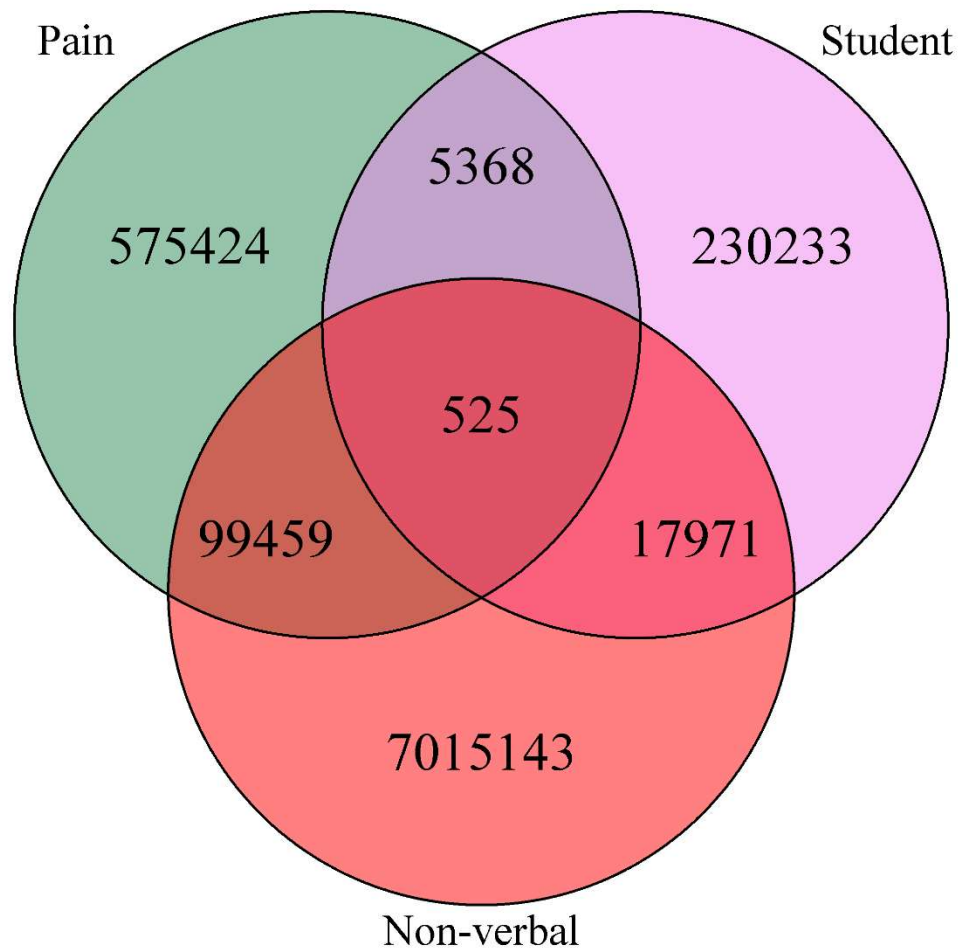


Figure 2-2. Venn diagram to illustrate 'pain' key word search results

The number of articles with 'non-verbal' as a key word was so large due to all permeations of non-verbal subjects being included in the search i.e. animals, paediatrics, neonates, cognitively impaired people etc. Articles which included all three essential search terms i.e. pain AND student AND non-verbal, or their synonyms, numbered 525. These articles along with an additional 227 on the hidden curriculum in medical and veterinary education, were included in the review (Figure 2-3).

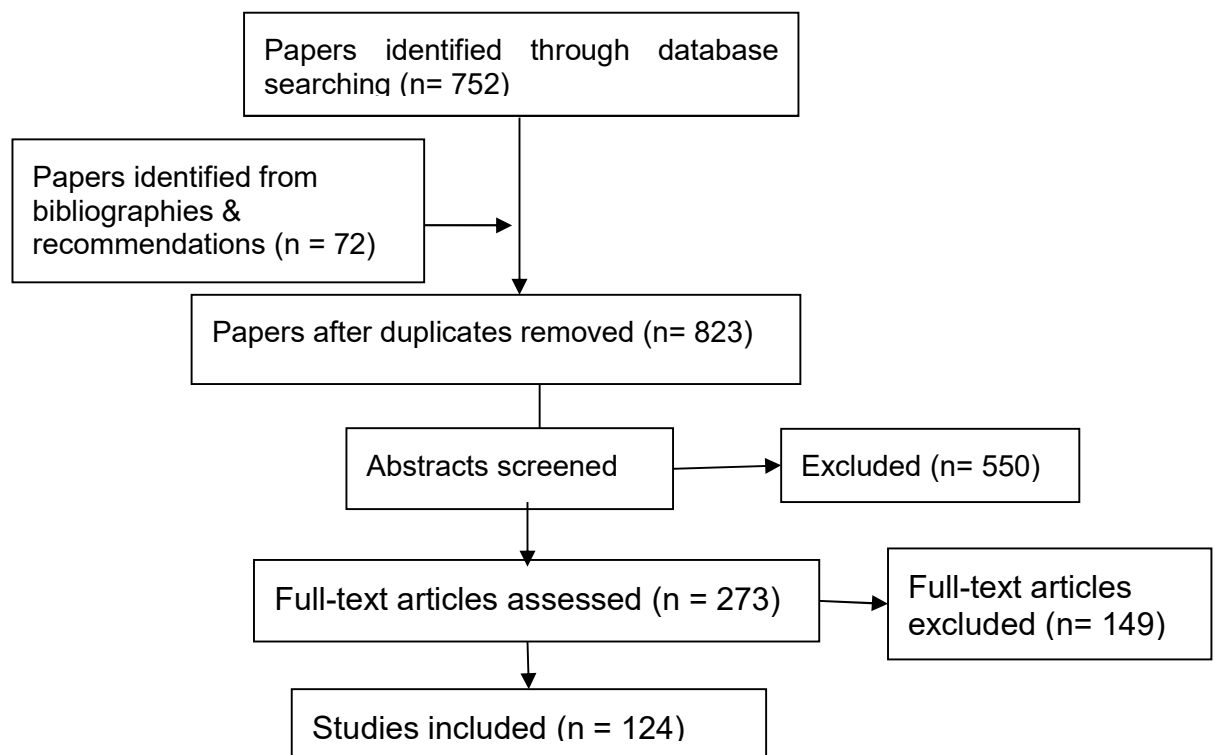


Figure 2-3. Flow chart depicting process of assessing papers for inclusion in literature review. 550 abstracts were excluded as content not relevant to research questions. For example, studies using medical or veterinary students to validate pain assessment tools were excluded.

An additional 72 potentially relevant articles were found through in depth reading of the literature and/or personal recommendation. The abstracts for these papers were reviewed and 550 papers were excluded because the content was not relevant to the research questions. The full text of the remaining papers were reviewed, after which an additional 149 papers were excluded due to the content not being relevant to search aims of this literature review. Ultimately, 124 papers were included in the literature review.

2.7 The psychology of ‘attitude’

Attitudes towards pain are of interest to veterinary and medical professionals because attitudes are able to shape clinicians behaviour towards pain management in their patients (Strong J., 2002, Jones, 2005). Attitudes can be defined as a learned tendency to evaluate things in a certain way, differing in strength and direction (Eagley et al., 1993).

There is no gold standard for assessing attitudes and although the term ‘attitude’ is widely used, implying that there is general agreement in its meaning, there is actually no formal definition and the difference between the terms attitude, belief and perception is unclear (Ung et al., 2016, Jones, 2005). There is debate over the structure of the attitude construct with two main schools of thought: one being attitude is a singular construct, and the other being attitude is a multidimensional construct made of feelings (affective component), beliefs (cognitive component) and subsequent behaviour (behavioural component) (Franzoi, 2000, Eagley et al., 1993). The synonyms commonly used for attitude include, beliefs, knowledge, values and opinions. For the purposes of this literature review the term ‘attitude’ has been used, and throughout this thesis.

The psychology literature concerned with attitude change is vast and beyond the scope of this review, but a brief overview relevant to this thesis is provided here. Evidence suggests that a process of communicating persuasive messages can change attitudes (Eagley et al., 1993, Franzoi, 2000) with persuasion defined as,

The process of consciously attempting to change attitudes through the transmission of some message.
(Franzoi, 2000)

There are many theories about how attitudes can change, which have led to development of theoretical models. For example the two models which dominate the literature are Petty and Cacioppo’s Elaboration Likelihood Model (ELM) and Chaiken et al’s Heuristic-Systematic Model (HSM) (Eagley et al.,

1993), which focus on the way people process information. However, there are many other factors which influence how an individual takes on information and whether they allow the information to alter their own attitudes. These variables include source factors (characteristics of the message deliverer); message factors (the way in which information is framed); and recipient factors (characteristics of the message recipient) (Shaver, 1987).

The intelligence and self-esteem of the recipient is associated with how susceptible they may be to persuasive messages, with those of greater intelligence and self-esteem being less open to attitude change (Petty, (1997)). Research has found that when a persuasive message is similar to the attitudes already held by a recipient, those attitudes are re-enforced. However, when a persuasive message conflicts with a recipients attitudes, they become more resistant to attitude change (Petty, (1997)). In terms of educating veterinary and medical students, this would suggest that undergraduates who do not have established attitudes would be more easily influenced than those with deeply embedded less appropriate attitudes, and students with attitudes in agreement with the taught messages about pain would have their attitudes strengthened, although there are no previous publications investigating this.

Age is another recipient factor which has been suggested to influence how easily attitudes can be changed, although there is conflicting evidence. As people get older, their attitudes become less malleable and more resistant to change (Krosnick and Alwin, 1989), whereas people are most susceptible to attitude change during adolescence and early adulthood (Franzoi, 2000). However, other research has found little difference in attitude change between age groups (Tyler and Schuller, 1991); they suggesting personal experiences, as much as age, are important (Jones, 2005).

The extent to which the persuasive message agrees or disagrees with the recipients own attitudes is the focus of cognitive dissonance theory (Shaver, 1987). The basic principle of cognitive dissonance theory is that people are motivated to be consistent in their attitudes, thoughts (cognitive elements) and behaviour (Jones, 2005). If a person experiences conflict between two

cognitive elements, or between a cognitive element and a behaviour, they will feel extreme emotional discomfort, and be motivated to alter their thinking to avoid the negative effect of the emotional discomfort (Shaver, 1987 , Wood, 2000). In the case of pain management in clinical cases an example of cognitive dissonance could be;

Thought 1: A good clinician should be able to solve problematic pain and make their patients comfortable.

Thought 2: The source of some patient's pain cannot be identified, and/or I am unable to make the patient comfortable.

Dissonance reduction: The patient is exaggerating their pain and/or the patient should not be experience pain from that condition/procedure.

For the purpose of this thesis, it was not considered necessary to explore cognitive dissonance more deeply, but it is important to be aware of its existence as a potential influence on attitude change. The literature on recipient factors (demographic factors and students characteristics) which could influence attitude towards pain in animals and non-verbal humans has been included in this review (section 2.9).

2.8 Attitude towards pain in animals

2.8.1 Veterinary students

There has been very little research into veterinary student attitude towards pain in animals as most publications have focused on attitudes of qualified vets and assessment of pain in specific disease processes, injuries or post-surgery (Becker et al., Bell et al., 2012, Brearley, 2014, Capner et al., 1999, Dohoo and Dohoo, 1998, Hewson et al., 2006b, Hugonnard et al., 2004, Huxley and Whay, 2006, Keown et al., 2011, Lorena et al., 2013, Perret-Gentil et al., 2014, Raekallio et al., 2003, Weber et al., 2012).

A questionnaire based study on post-operative pain in cats reported that the majority of Malaysian veterinary students agreed that “cats can react to pain

as humans do”, with eighty nine per cent of students agreeing pain management in cats should be given the same considerations as in humans (Lim et al., 2014). However, the main aim of the study was to evaluate the effect of training on student attitude (section 2.4.1). There is one study that specifically investigated veterinary student attitude to pain in animals (Hellyer et al., 1999). Veterinary students at Colorado State University Veterinary Hospital were asked general questions about their attitude to pain in animals, but there were no specific questions about individual species. They found there was general agreement amongst respondents regarding the importance of pain in animals with 96.7% of students indicating that “animals experience pain much the same way as humans do”, but it was evident that as veterinary undergraduates progressed through their training they were more reluctant to advocate analgesic administration for painful conditions. The authors suggested this variation in willingness to administer analgesics may be due to students being exposed to differing approaches to pain management in the teaching hospital. A limitation of cross-sectional studies is the inability to make a direct comparison of the same student’s attitudes as they progress through training. A longitudinal study would allow comparison of the same group of students and more robust assessment of change in attitude over time.

2.8.2 Medical students

Despite the use of animals in medical experimental research, there are no previous publications which have reported medical student attitude to pain in animals.

2.9 Attitude towards pain in non-verbal humans

2.9.1 Veterinary students

There are no previous publications reported veterinary students attitude to pain in non-verbal humans.

2.9.2 Medical students

There is an extensive literature on attitude to pain in neonatal and paediatric patients, and patients with cognitive impairment (Harrison et al., 2014, Hatfield, 2014, Hatfield and Ely, 2015, Mazur et al., 2013, McGraw, 1941, McPherson and Grunau, 2014, Motta Gde et al., 2015, Perry et al., 2018, Ranger and Grunau, 2014, Reavey et al., 2014, Walker, 2014, Alexander and Manno, 2003, Margolius et al., 1995, Shrestha-Ranjit and Manias, 2010, Chatelle et al., 2014, Curtiss, 2010, Feldt et al., 1998, Massaro et al., 2013, McJunkins et al., 2010). Studies on medical student attitude to pain have investigated attitude to specific types of pain, for example focused on chronic pain; back pain; or surgical pain. However, there are no studies on medical student's attitude towards pain in non-verbal patients specifically.

A review of publications on medical student's attitude towards general pain management found a heterogeneous approach to the study of attitudes towards pain (Ung et al., 2016). The review highlighted the difficulty in comparing previous literature on medical student's attitudes towards pain as the majority of studies investigating medical student attitude towards pain have focused on a subset of pain, for example cancer pain or back pain and studies rely upon quantitative methods, which does not allow an in depth understanding of attitude.

However a qualitative study design was used by Corrigan et al (2011) to determine first year medical students attitude to pain. Forty-four medical students from University of Washington completed twice weekly reflective journals about their experience of pain when on a month long summer elective before starting second year. The students were working alongside primary care physicians (general practitioners) in predominately rural areas. Seventy-five per cent of students reported negative feelings towards their encounters of patients in pain, for example, frustration at not being able to help; scepticism about whether to trust patients; and student discomfort at the way the general practitioners managed patients in pain. Analyses of the reflective journals also revealed that students had concerns over whether they would be manipulated

and lied to by patients who were addicted to drugs, rather than being in genuine pain. Whilst negative themes predominated, students did report positively about being able to help patients in pain. The authors highlighted the need for undergraduate curricula to address the socio-emotional aspects of pain in the curriculum.

One of the first studies investigating medical student attitudes to pain was carried out at the University of Kentucky (Wilson et al., 1992). Wilson et al (1992) attempted to compare attitudes of first year medical students towards pain, before and after a six hour seminar on pain. They developed a questionnaire with demographic questions, including being asked to describe the worst pain they had experienced, and an eight-item section on attitude to pain, including "What percentage of infants experience pain from surgical procedures such as circumcision". The questionnaire also included two open ended questions, for example "people in pain are". Thirty five students completed the initial questionnaire, the six hour seminar and then five months later completed a follow up questionnaire. Analyses of the answers to the open ended question "people in pain are..." from the initial questionnaire revealed predominately negative themes, that is "people in pain are..", negative mood states (miserable, unhappy); negative characteristics (selfish, wimpy); and needy. The students had experienced a variety of pain themselves with 28% experiencing athletic injuries, 16% non-dental pain and 12% dental pain. Less than 10% of students had any previous experience of pain due to a non-dental procedure.

The attitude towards pain in infants did improve slightly after training, with students thinking a higher percentage of infants experience pain due to surgical procedures. However, this is difficult to interpret as the authors did not report the range of percentage allocated by students. The authors conclude by suggesting that while factual learning is an integral component of medical pain teaching, the attitudinal dimension is essential if factual knowledge about pain is to be translated into clinical action.

This literature search did not find any publications relating to medical students and pain in animals. However, the journal *Theoretical Medicine* published a discussion on the morality of using animals in medical education which discussed the range of views held on animals – ranging from animals are property and as such have no rights, to animal activists believing no animals should be used for either research or training purposes (Cheong, 1989). The discussion concludes by suggesting that whilst animals are not people and therefore are not subject to the same moral rights, use of animals in medical education should be rationally justifiable.

2.10 Animal characteristics as influencing factor on attitude to pain

The literature on pain in animals and non-verbal humans is substantial with huge numbers of papers describing broad aspects of pain in these patient types. The aim of this section and the next (see section 2.11) is to provide an overview of the impact of patient type, specifically for the different animal species and non-verbal humans (people with CNS immaturity/CNS abnormalities/temporary CNS impairment/ psychosocial conditions), on observer attitude to pain.

All animals are classed as non-verbal patients as they are unable to communicate their own pain experience. Most studies investigating attitudes towards pain in animals have concentrated on either small animals [dogs and cats] or horses or farm animals [cattle/sheep/pigs] or reptiles or fish/amphibians (Vaisanen et al., 2008, Bradbury et al., 2016, Machin, 2001, Becker et al., 2013, Becker et al., 2014, Bell et al., 2014, Capner et al., 1999, Dohoo and Dohoo, 1998, Dujardin and van Loon, 2011, Flaherty, 2012, Hewson et al., 2006, Hewson et al., 2007b, Hugonnard et al., 2004, Ison and Rutherford, 2014, Lascelles et al., 1999, Lorena et al., 2013, Perret-Gentil et al., 2014, Price et al., 2002, Raekallio et al., 2003), and have largely investigated the attitudes and pain management recommendations of qualified

veterinarians toward acute surgical or chronic (orthopaedic/oncological) pain, but have not investigated the influence of species on attitude to pain.

The influence of species on attitude to welfare was investigated by Taylor and Signal (2009). Australian consumers were asked to rate the willingness to pay to maintain good welfare in different animals species and found that attitude differed depending whether the consumer viewed the animal as a 'pet', 'pest' or 'production' animal. People were less willing to pay to maintain welfare in animals whose purpose was perceived as 'production' or 'pest'. In another study the attitude to welfare in different types of farmed animals was investigated. It was reported that people rated salmon lower on their mental capabilities and ability to experience pain, compared to other farmed animals (Kupsala et al., 2013). The survey results indicated that younger people and those from an urban background had more negative attitudes towards pain in farmed fish, but no difference in attitude was evident between male and female respondents.

There is a link between the levels of sentience veterinary students perceive an animal to have and the welfare attitudes they have to that animal (Paul and Podberscek, 2000). As students progressed through training they rated sentience lower in animals than they had at the beginning of training and had lower welfare expectations for these animals (see section 2.14.1). This concurs with other previous research which suggests that how sentient an animal is perceived to be influences people's attitude to welfare (Kupsala et al., 2013, Mather, 2011, Singer, 2009, Proctor, 2012).

2.11 Non-verbal human patient characteristics as influencing factor on attitude to pain

Passik *et al.* discuss 'unconscious bias' as an important barrier to the treatment of pain, particularly the 'observer – subject' bias i.e. when someone is asked to observe another and make a judgement on the other person's behaviour

they tend to posit internal attributes for the behaviour, whereas when asked why they themselves are behaving that way they posit external attributes as an explanation for the behaviour. For example people tend to believe other people behave a certain way because they are motivated by internal factors, such as attitudes. Whereas when justifying their own behaviour people tend to identify external factors as their motivation. Passik et al. (2007) suggests it would be better to acknowledge that clinicians are “human and prone to inherent automatic thoughts and feelings that might impact the delivery of care”.

Citing others, such as Grossman et al. (1991) and Fisch et al. (2003) who have identified discrepancies between clinician assessment and patients’ self-reporting of pain and quality life, Passik *et al.* suggest that often clinicians rely on a prototype of average pain experienced by that type of patient and fail to consider how much pain the patient in front of them is actually experiencing – indicating a breakdown in the empathetic relationship between patient and clinician (Passik et al., 2007).

Previous studies have indicated that an observer’s perception of another person’s pain is influenced by the observed person’s gender, race, age and pain expressions (Robinson and Wise, 2003, Hirsh et al., 2009, Campbell et al., 2005, Baker and Green, 2005, Anderson et al., 2000, Chodosh et al., 2004).

Attempting to explain the discrepancy between pain management in adults and children, Schechter and Allen (1986) investigated the attitude of paediatricians, general practitioners and surgeons working in Connecticut. They found a significant difference between paediatricians and surgeons attitude to analgesic administration for young children, with 80% of paediatrician recommending post-operative opioid analgesia for children of 2 years or more, compared with only 49% of surgeons. Only three quarters of respondents reported believing that children experience adult-like pain by the age of 2 years old with the majority of respondent not believing this to be true for children under the age of 2. It has also been shown that an observer’s perception of

how much pain an observed child is experiencing differs depending on the age the observer is given for the child (Pillai Riddell and Craig, 2007). The study suggested that interpretation of pain in children and administration of analgesics is more cautious, which may be due to “reliance on traditionally taught approaches” to procedures in these patients. This agrees with findings from a more recent study where 50% of paediatric nurses believed that infants felt less pain than adults (Mathew et al., 2011), but contrasts with older work which demonstrated no difference in attitude of paediatric nurses towards pain in young children and adults (McGrath et al., 1984). It is unclear whether these difference in previous findings are due to attitude change over time.

Wandner *et al.* used a computer generated virtual human (VH) to assess whether undergraduate students studying a medical type degree, that is physiotherapy, medicine, nursing or dentistry, perceived pain in patients differently to undergraduates studying a non-medical degree (Wandner et al., 2010). They were particularly interested in how patient demographic factors such as age, gender and race might affect how students perceived pain. One hundred and seven students studying a medical type degree and seventy five non-medical degree students were recruited to the study. After reading a short vignette on either back or abdominal pain for each VH, the students were asked to rate the pain for a Virtual Human using a Visual Analogue Scale (VAS). The group created a Virtual Human and manipulated four characteristics, i.e. gender, race, age and pain expression. The pain expression for each Virtual Human was coded using the Facial Action Coding System (Figure 2-4).



Figure 2-4. Image of Virtual Human. Reprinted from Wandner et al (2010) J Pain Res, 3, 241-7, with permission from Dove Medical Press Ltd.

There was a statistically significant difference between how medical and non-medical students rated pain for older Virtual Humans and African American Virtual Humans, with medical students rating pain less than non-medical students. It was also noted, that although not statistically significant, non-medical students rated pain higher for all the Virtual Humans. It was suggested that students on a medical type degree may rate pain less as they are a self-selected group that are less sensitive, but may also be acclimatised to observing pain as they encounter pain more frequently. The mean age of the two groups was slightly different which may also have an influence on how they scored pain. Suggested further work included longitudinal studies, to investigate the influence of observer age and other potential factors on perception of pain.

There has been interest in sex, gender and pain over the last 20 years. Many studies have investigated the influence of patient gender on pain assessment and management in verbal humans (Cleeland et al., 1997, Heins et al., 2010, Lord et al., 2009, McDonald, 1994, Safdar et al., 2009). There have been no studies reporting the influence of patient gender in attitudes to pain in non-verbal humans.

2.12 Observer characteristics as influencing factors on attitudes to pain

2.12.1 Gender

Previous studies have demonstrated a patient gender difference in pain expression and willingness to report pain (Robinson et al., 2001, Wise et al., 2002, Racine et al., 2012) and observation of pain in others (Robinson and Wise, 2003). It has been suggested that health worker characteristics, such as gender, may be a potential factor contributing to unequal pain management (Bartley et al., 2015, Boissoneault et al., 2016).

Although attitude to pain in veterinary species has been studied extensively (Becker et al., 2013, Becker et al., 2014, Bell et al., 2014, Capner et al., 1999, Coleman and Slingsby, 2007, Dohoo and Dohoo, 1996, Dohoo and Dohoo, 1998, Hewson et al., 2006, Hewson et al., 2007b, Hugonnard et al., 2004), there have been limited studies on the impact of observer gender on attitude to pain in animals. It has been reported that gender affects how veterinary students rate painful conditions in cattle (Kielland et al., 2009). A questionnaire was used which included descriptions of painful conditions in cattle, ranging in severity from fractures to neck calluses. The questionnaire was intended for use by cattle farmers, but was piloted on 171 Norwegian veterinary students. The students were asked to complete the questionnaire by assigning pain scores to the various conditions described, using both a Numerical Rating Score (NRS) and a Visual Analogue Scale (VAS). The resulting data was

analysed using cluster analysis to identify and two distinct clusters were identified. Multimodal logistic regression revealed that age, enrolment year, where the students grew up or previous experience of the conditions in cattle did not predict which cluster the students were in (Figure 2-5).

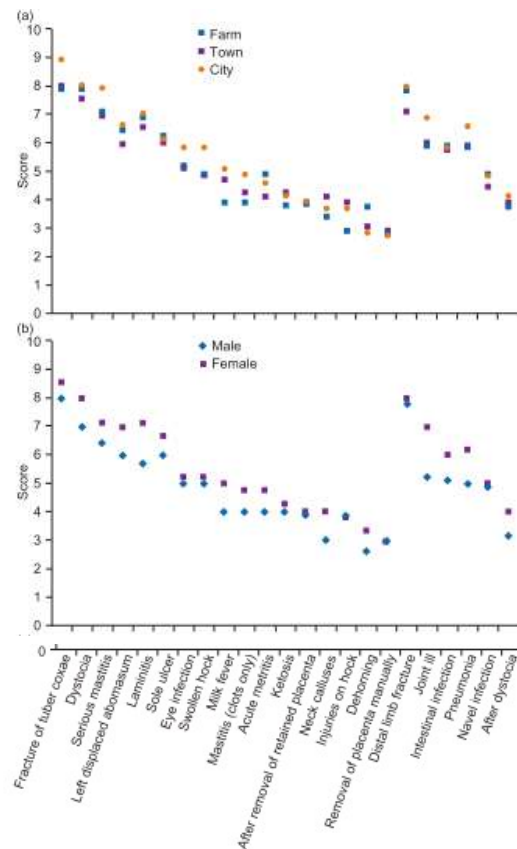


Figure 2-5. Median VAS scores given to each condition by the students depending on (a) where they grew up and (b) gender. Reproduced with permission from BMJ publishing group: licence number 4233580839229.

However, the gender and number of siblings of the students could be used to predict which cluster they would be in. It was also noted that female students tended to score the condition higher on VAS and NRS than male students. An abstract presented at the Association of Veterinary Anaesthetists in Lyon 2016 also demonstrated that observer gender influenced pain assessment in dogs and cats despite using a validated pain score (Doodnaught et al., 2016), reporting that female observers scored pain higher than male observers.

The influence of health care worker gender on pain management decisions has been investigated (Bartley et al., 2015). A total of 154 health care workers, comprising of medics and dentists were recruited to the study. They found that female health care workers were more likely to prescribe analgesics than male health care workers, which concurs with the majority of previous similar studies (Safdar et al., 2009, Weisse et al., 2003, Weisse et al., 2001), yet disagrees with another (Raftery et al., 1995).

Another study investigated health care workers' gender differences in pain treatment and the extent to which sexist attitudes were associated with these differences (Hirsh et al., 2014). The participants completed a questionnaire assessing sexist attitudes, called the Ambivalent Sexism Inventory (ASI) (Glick and Fiske, 1996), before assessing pain levels and making pain management recommendation for 16 fictitious patients based on reading text vignettes on patients' medical and psychosocial status. Ninety-eight healthcare workers, including medical residents, medical students, hospital physicians and nurses were included in the study. Fifty-two per cent of participants were female. The male participants scored significantly higher on the ASI than female participants with 68% of male participants exceeding the cut-off which indicated "high" sexism. Despite this there was no statistical difference in participants' pain management recommendations in relation to opioid medication. However, there was a difference in recommendations for prescriptions of anti-depressant medication and mental health referral, with female respondents more likely to recommend these treatment for vignettes of female patients (Figure 2-6).

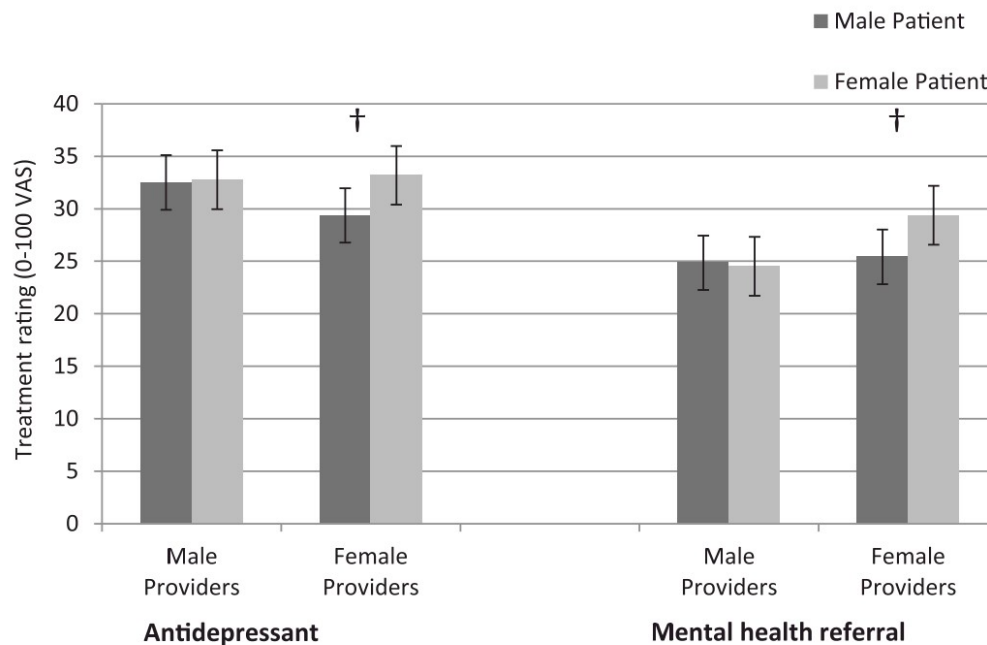


Figure 2-6. Antidepressant and mental health referral treatment ratings, controlling for sexism scores. Reproduced with permission, licence number 4431380638095.

The authors were unable to determine the reason for the disparity between anti-depressant treatment recommendations between male and female health workers, but suggested that gender stereotypes and medical text books often providing gender stereotypical information may contribute the problem.

2.12.2 Previous experience and background

There have been previous studies which have investigated the impact of previous pain experience on human patients attitude to pain (Marche et al., 2016, Noel et al., 2012) and Robinson and Wise (2004) reported that exposing observers to a painful cold-pressor test influenced how they then rated pain in virtual humans. There are no previous studies investigating how previous experience of pain influences attitude to pain in animals and non-verbal humans.

There is little information on the influence of background on attitude to pain. For example, very few studies have investigated the influence of previous pet

ownership on attitudes to pain in animals or non-verbal humans. One of these studies in the United States of America tried to determine this in pet owners and found small differences between cat and dog owners (Simon et al., 2018). For example people who only had experience of owning dogs were less likely to agree that “pain affects their pet’s quality of life”, “declawing [i.e. the surgical removal of cats claws] is painful” and “declawing should be banned in the United States” compared to people who had experience of owning cats. Another aspect of background which has not been fully investigated is the influence of family background on attitude to pain. However, a study on veterinary students found that students who had larger numbers of siblings were more likely to give higher pain scores for the conditions described in cattle (Kielland et al., 2009) (section 2.12.1). There have been no previous studies assessing the effect of previous pet ownership, experience of caring for non-verbal humans and previous pain experience on veterinary and medical student’s attitude to pain in animals and non-verbal humans.

It is argued that observing pain in another person has a profound and lasting impact on the development of a person’s attitude to pain (Goubert et al., 2011). There are two potential pathways of observational learning suggested: classical conditioning, where a previously neutral event is followed by a stimulus (Askew and Field, 2007); or operant conditioning, where a behaviour is followed by a positive or negative effect (Lousberg et al., 1996). Previous work has shown that people who observed the pain expression elicited by a specific painful stimulus, will then mimic the same pain expression when exposed to the pain stimulus (Bandura, 1965). This demonstrates that there is a tendency for humans to absorb cues on how to behave appropriately to any given pain stimulus. Thus through observation of another’s behaviour in a particular situation, information is acquired about that situation, the consequences of specific actions in that situation and the appropriate way to behave which is socially and culturally acceptable (Craig, 1986). There are also numerous functional MRI studies carried out by neurophysiologists, which suggest observing pain in another activates similar neural pathways to those

experienced during a noxious stimulus (Decety et al., 2008, Masten et al., 2011, Moriguchi et al., 2007).

Goubert et al (Goubert et al., 2011) suggest that modulation of observational learning may occur through two mechanisms: modulation due to environmental factors; and modulation due to observer characteristics. They conclude by recommending future research be carried out to investigate the extent to which these factors and characteristics may influence the attitude towards pain learned through observation. There has been no research to investigate in what context observational learning influences development of attitudes to pain; and what mechanisms result in changes to these attitudes.

2.12.3 Personal traits

Knowledge and attitude towards opioid use in pain management have been investigated in a cross year and longitudinal of 88 medical students (Weinstein et al., 2000). Students completed a 49-item 7-point Likert questionnaire on their knowledge and attitudes towards the use of opioids in painful patients, as well as 3 measures of reluctance to prescribe opioids, for example, fear of patient addiction. To determine personal traits which might influence attitude to pain, the questionnaire included standardized measures of intolerance to clinical uncertainty; need for structured environment; authoritarianism; reliance on high technology medicine; and psychologic orientation. Final year students were also asked to indicate their choice of speciality.

Eighty-eight students starting first year in 1991 initially completed the questionnaire. In the spring of 1995 the same students were retested, along with final year students from two other medical schools, resulting in a total of 490 final year medical students. Responses were grouped for each class and not matched for individual students. Students with a preference for paediatrics, surgery and anaesthesia had the least positive attitudes to pain and pain management. Students preferring surgery or anaesthesia had the most negative psychologic profiles regarding pain. Students with a preference for psychiatry had the most positive attitudes to pain. The authors commented

that after four years of medical school students displayed more negative personal traits than those of first year students. In addition students preferring certain specialities demonstrated consistent similarities in personal traits which may suggest a preselection for certain traits with specialities.

2.13 Empathy

There have been many studies on physician empathy in the clinical setting and the potential impact on pain management in patients (Banja, 2006, Danziger et al., 2006, Fernando and Consedine, 2017, Hovi and Lauri, 1999, Passik et al., 2007, Sinclair et al., 2017, Tait, 2008). The literature on empathy and pain is vast and has been studied by a variety of disciplines including psychologists, neurobiologists and health care workers (Bufalari et al., 2007, Danziger et al., 2009, Danziger et al., 2006, Decety et al., 2010a, Decety et al., 2008, Decety et al., 2010b, Fan and Han, 2008, Gu and Han, 2007, Gu et al., 2010, Han et al., 2008, Jackson et al., 2005, Lamm et al., 2007). In addition, the word empathy has many connotations and can mean different things depending on the context. This section gives an overview of the term 'empathy' and defines its use in the context of this project. Secondly, the section provides a review of the relevant literature focussing particularly on those studies which are pertinent to this project, of which the focus is attitude towards pain.

The term 'empathy' was first coined by Edward Titchener (Titchener, 1909) who used the Greek word *empathia* as a translation for the German philosopher Theodor Lipps' term *Einfühlung*, meaning 'to feel one's way into'. The terms empathy, sympathy and compassion are often used to describe emotions experienced in response to another being's suffering (Jeffrey, 2016a), although each has aspects which distinguish it from the other. To date there is disagreement between philosophers, psychologists and neuroscientists over the correct use of the term empathy.

Darwell (1998) defined empathy as 'the sharing of another's mental state' which is markedly different from caring for another person, or feeling sympathy for the person from the third person perspective. Darwell describes the

simplest form of empathy as ‘emotional contagion’, for example if you walk into a room where people are laughing and happy it positively affects your own mood. Conversely, a room full of depressed or sad people can result in you feeling similarly.

‘Empathy’ has also been used to describe the ability to understand another, enabling the observer to be attuned to the other individual and respond appropriately (Sinclair et al., 2017). This ability to understand another’s point of view or feelings represents a complex construct, yet doesn’t necessarily go hand in hand with a desire to alleviate suffering.

Empathy and compassion share many aspects and are often used interchangeably in the literature. Compassion means ‘to suffer with’ and is usually accompanied by a motivation to alleviate another’s suffering (Jeffrey, 2016a). In the context of medical care compassion usually refers to an awareness of the pain or suffering of patients and a motivation to alleviate suffering through verbal or physical actions (Crawford et al., 2014). This description of compassion is also applicable to people working in the veterinary profession, who are expected to be sensitive to the suffering of animals under their care and act appropriately to alleviate suffering.

Compassion is a central concept in many religious teachings including those of Christianity and Judaism, where there are recurring messages of compassionate responses to an individual’s suffering. For example the story of the ‘*Good Samaritan*’ is a well-known description of compassion from The Bible. The concept of compassion is also a core element in other religions, such as Sikh and Hindu religions (Vieta et al., 2006). Buddhism places a particular emphasis on compassion where it is considered a defining virtue. Feldman and Kuyken (2011) describe compassion in the context of Buddhism as;

Compassion is a multi-textured response to pain, sorrow and anguish. Above all compassion is the capacity to open to the reality of suffering and to aspire to its healing

As an alternative to the word *compassion* Darwell (1998) chose to use the terms *sympathetic concern* or *sympathy* when describing an emotion that responds to actual or potential suffering of an individual and a desire to alleviate it. Sympathy has also been used as a description of an emotional reaction to another individual's plight, especially where their treatment is perceived to be unjust or unfair (Sinclair et al., 2017). Sinclair suggested that sympathy is not concerned with understanding how another person may feel, but instead relies upon a 'self-orientated' perspective where the individual imagines how they would feel in a particular situation. For example, watching the news reports of fleeing Syrian refugees elicits a sympathetic response due to imagining oneself in the situation.

Empathy has been identified as an essential component of the doctor-patient relationship (Shapiro et al., 1993) and allows the doctor to view the world from the patient's perspective. The term empathy can be applied to eight phenomena, which are related but distinct from each other (Table 2-2). Exploring each facet on the empathy construct is beyond the scope of this review, however it is helpful to have an understanding of the complexity of empathy as a multi-dimensional construct.

Empathy concepts	Description
Knowing another's internal state	Referred to as empathy by some researchers. This has also been referred to as "cognitive empathy" or "empathic accuracy".
Understanding the posture or expression of an observed other	Adopted Among psychologists this is more likely to be termed "motor mimicry" or "imitation". E.g. squirming and tensing when watching someone on a tightrope.
Feeling the same emotion that another person feels	This is a common dictionary definition and is used by some philosophers, neuroscientists and psychologists. Early philosophers, such as the Scottish philosopher David Hume, called this "sympathy". Psychologists refer to it as "emotional contagion", "affective empathy" and "automatic emotional empathy"
Imagining oneself in another's situation	This is the state for which the term empathy was first used by the British psychologist Edward Titchner. It is rarely used as a modern definition for empathy.
Imagining how another person is thinking or feeling	You imagining how another is thinking and/or feeling can be based on their actions and your knowledge of their character. This has also been called "psychological empathy", "projection" and "empathy/perspective taking".
Imagining how you would think and feel in another's place	This is the act of imagining how you would think and feel in another's situation. Has also been described as "role taking" and "cognitive empathy"
Feeling distress at witnessing another's suffering	This does not involve feeling distressed <i>for</i> the other person, but instead feeling distressed <i>by</i> the state of the other person. Also referred to as "empathic distress" and "personal distress".
Other-oriented feelings for another person's welfare	Other-oriented refers to the focus of the emotion <i>i.e.</i> it is felt for the other person. It is congruent <i>i.e.</i> positive when the welfare of the other person is perceived as positive; negative when the welfare is perceived as negative. In modern psychology the terms "empathy" or "empathic concern" are often used, but it has also been called "pity", "compassion", "sympathetic distress" or "sympathy". This is the concept most often invoked to explain what motivates a person to respond in a caring manner to the suffering of another.

Table 2-2. Eight phenomena or concepts for which the term empathy is used (Batson, 2009)

2.13.1 Empathy as an influencing factors on attitude to pain

When witnessing another person in pain most people experience feelings of empathy and activation of neural pathways involved in sensory processing (Giummarra et al., 2014). Research suggests that the way people respond empathetically to pain is influenced by their own prior pain experience, gender and perceived similarity with observed person (Preis and Kroener-Herwig,

2012). Empathic concern refers to the motivation to care for someone in distress or pain (Gleichgerricht and Decety, 2014).

Previous work by Norring et al. (2014) examined the empathy and attitudes of Finnish veterinary students, and assessed the students' sensitivity to cattle pain with questions about pain scoring. A web-based questionnaire was developed which included a demographic question section; 13 named condition which respondents were asked to rate for pain; pain statements with Likert scale responses and the Davies Interpersonal Reactivity Index (IRI) to assess empathy. The authors modified the empathic concern subscale of the IRI to be relevant for empathy towards animals by changing the terms used, and used this modified form to assess animal directed empathy.

Seventy nine veterinary students completed the questionnaire, of which 75% were female. Analyses revealed a positive association with pain scores and empathy towards humans. In addition, the effects of gender, education, experience and empathy for humans were also examined and found an association between a larger family size and empathy for animals. This conflicted with previous work which found having a child in the house was not associated with increased empathy for animals and an inverse relationship between larger households and empathy towards animals Paul (2000), Ellingsen et al. (2010). However, (Kielland et al., 2009) had also found those with more siblings gave higher pain scores (section 2.12.1).

Kielland et al. (2010) also examined the relationship between dairy farmer empathy and their rating of how painful they perceived certain condition to be in cattle. One hundred and fifty four farmers were grouped depending on whether they agreed or disagreed with the statement "animals experience physical pain as humans do", which they used as a measure of empathy for animals. The majority of farmers either agreed (39%) or totally agreed (31%) with the statement, with the remainder disagreeing or being indifferent. They found a relationship between whether farmers believed animals to experience pain as humans do and how painful they perceived different conditions in cattle

to be, with farmers displaying more negative attitudes towards pain in animals rating the conditions as less painful.

The relationship between observer empathy and ability to accurately perceive pain in others has been studied by psychologists. In one study by *Green et al.* (2009) psychology undergraduate students were asked to rate facial pain expression of subjects undergoing a cold pressor test by observing video clips and also to complete the Davies empathic concern scale, which is measure of an individual's tendency to show compassion and concern for another's distress. They found that students who scored highly for empathic concern were more likely to rate the pain experienced by the subjects in the video higher than those who had low scores for empathic concern.

A review of effects of empathy on perception of pain in others discussed how empathy may lead to an inclination to help when observing others in pain. The ability to accurately perceive another's pain or distress was described as empathic accuracy (Goubert et al., 2005). The authors proposed that this is fundamental to the process of delivering effective care to people in pain. Importantly it is suggested that models of pain need to consider the personal and interpersonal processes of empathy which occur when observing another in pain. These ideas were re-iterated in a later review by Craig et al. (2010) who also suggested that in order to understand pain in another person it is important that non-verbal communication is taken into consideration.

2.14 Influence of education on attitudes towards pain in animals

2.14.1 Veterinary undergraduates

A study reviewed earlier in this chapter (section 2.8.1) aimed to determine whether animal related factors and level of training had any influence on attitude to pain in animals (Hellyer et al., 1999). Undergraduate veterinary students, as well as clinical veterinary academics, support staff and post-

graduate veterinary trainees were asked to complete a questionnaire on attitude to pain and pain management in different animal species. It was evident that as veterinary undergraduates progressed through their training they were more reluctant to advocate analgesic administration for painful conditions.

A similar approach was used by Mich *et al.* (2010) to assess the effect of training on veterinary undergraduate's assessment of pain in animals and their propensity to advocate analgesic therapy. Having identified a gap in the training provided to veterinary undergraduates on pain assessment, Mich *et al.* (2010) developed a questionnaire which included watching videos of dogs and assessing their pain using the Colorado State University Canine Acute Pain Scale. One hundred and ten 3rd year students were included in the study during their clinical anaesthesia rotation. The students were asked to complete the questionnaire and then were given a 20 minute training presentation on pain assessment and management in dogs. Two weeks later the students were given a post-training questionnaire.

Differences between gender and students on small animal only track versus general or large animals only track were assessed. Although the training did appear to affect the pain scores given by the students, it was not statistically significant. However, students who were tracking small animal only scored higher when assessing pain and were more likely to advocate the use of analgesics. The authors noted the tendency for large animal track students to value pain as a method of restraint post-operatively and were therefore less likely to treat pain.

In some veterinary schools, particularly in the United States of America, students are able to select a specialisation track early on in their training and opt to qualify in a particular area of veterinary work. For example, students can opt to track as small animal only where their training and assessment is tailored for small animal practice exclusively and they will not be qualified to work with horses or farm animals. This study from Colorado State University found that students who had tracked as small animal were more likely to give

higher pain scores and advocate the use of analgesics, whereas students who had tracked large animal gave lower pain scores for animals in the videos.

In the United States it has been recognised that undergraduate animal science students were taught about painful procedures on livestock, including castration, tail docking, beak trimming, teeth clipping and ear notching without administration of anaesthesia or analgesia by lecture, demonstration and performance, (McGlone and Hicks, 1993). McGlone & Hicks carried out a telephone survey of 20 animal science schools in the United States to determine whether the pain associated with and ethics of carrying out painful procedures on livestock were discussed with students. Thirty per cent of schools questioned did not discuss the pain associated with painful procedures they taught to students. The authors speculated that failure to discuss pain with students may be because those schools did not believe the pain caused to have any consequence to the animals involved.

There are previous studies which have assessed the level of agreement between observers of different experience when using pain assessment tools in order to validate these methods for clinical use in animals (Brondani et al., 2013, de Oliveira et al., 2014, Firth and Haldane, 1999, Grandemange et al., 2013, Hellyer et al., 2006c, Holden et al., 2014, Holton et al., 2001, Reid et al., 2013, Wiseman-Orr et al., 2006). These studies often use students as the less experienced cohort because of the ease of recruitment if the studies are conducted in University clinical hospitals. Whilst these studies do not investigate the effect of education or training on attitude to pain, they do give an indication of how attitudes may differ between trainees and qualified vets. These studies have reported students awarding higher pain scores to animals, despite the use of validated scoring tools (Barletta et al., 2016, Vinuela-Fernandez et al., 2011).

The importance of pain management education was identified in a report of the future direction of Malaysian veterinary education described by Lim et al (2014). The authors investigated the influence of pain training on 4th and 5th year veterinary undergraduates from the University of Putra Malaysia. The

students were asked to assess pain in cats post-surgery by viewing videos and allocating a VAS for pain, as well as completing pre- and post-training questionnaires on opinion on feline pain marked on a 5-point Likert scale. The pain training provided consisted of a 40 minute video based presentation on feline pain. Ninety-two students completed the study, the majority of which were female (72%). Seventy five per cent of students agreed that “cats can react to pain as humans do”, with eighty nine per cent of students agreeing pain management in cats should be given the same considerations as in humans. Ten per cent of students thought cats tolerate pain better than dogs, which did not change with training. In fact the number of students who were unsure about whether cats could tolerate pain better than dogs actually increased after training from 29.3% to 45.7%. The authors speculated that this increase in training was due to students misinterpreting the guidance given in the training presentation i.e. cats often display subtle signs of pain. Despite training the majority of students missed subtle signs of pain of the cats in the videos.

Progression through training has been associated with a deterioration in attitudes towards welfare in veterinary students (Paul and Podberscek, 2000). Students who had progressed further in training rated animals as having lower sentience than those earlier on in training, and correspondingly lower expectation of welfare for these animals.

Watt-Watson et al (2009) carried out a survey of ten Canadian Universities which delivered healthcare type degrees at undergraduate level. The survey asked questions about time spent on undergraduate pain education and whether this was formal or informal teaching. Ten universities responded, including nine medical schools and four veterinary medical schools. All respondents from veterinary schools were able to identify where in the curriculum formal teaching on pain took place and the total number of hours allocated for compulsory formal pain teaching. The veterinary schools allocated more time to formal pain teaching compared to the medicine faculties. Many of the medical schools acknowledged that a large amount of

the undergraduate pain teaching was informal and took place on clinical placements. This informal teaching also occurs in veterinary medicine training, with students expected to complete time on Extra Mural Studies (EMS) in clinical practice in the United Kingdom (RCVS, 2015).

2.14.2 Medical students

There have been no studies investigating the effect of education on medical student attitude to pain in animals.

2.15 Influence of education on attitudes towards pain in non-verbal humans

2.15.1 Veterinary students

There have been no studies investigating the influence of education on veterinary student attitude to pain in non-verbal humans.

2.15.2 Medical students

There is evidence that pain management in humans who are unable to verbally communicate their own pain levels is poor (Taylor et al., 2008, Shrestha-Ranjit and Manias, 2010, Plummer et al., 2016, Alexander and Manno, 2003, McKay and Clarke, 2012, Feldt et al., 1998). In addition numerous studies have found that medical education is lacking in training on pain assessment and management for these patients (Poyhia et al., 2005, Mezei and Murinson, 2011, Cohen and Bennett, 2006, Saroyan et al., 2008, Yanni et al., 2010). It has been suggested that there is a link between poor pain management in non-verbal humans and inadequate emphasis on teaching and under resourcing of the subject in undergraduate curricula (Watt-Watson et al., 2004a).

Pöyhiä et al (2005) attempted to assess the quality and quantity of undergraduate pain education in five Finish medical schools. All medics

graduating from one of five Finish medical schools in 2001 were sent a questionnaire asking their opinion on the undergraduate pain teaching they had received. The respondents overall ratings for pain teaching varied between 3.4 to 4.6 out of 10, with paediatric pain, geriatric pain and pain in cognitively impaired patients being identified as most poorly taught. The results of this study were mirrored in the United States of America where a survey of 246 medical graduates revealed a lack of confidence in dealing with patients with pain and only 17% of graduates reporting that they were 'confident' in assessing pain (Yanni et al., 2010).

A further study of undergraduate medical students from Helsinki revealed a severe lack of undergraduate teaching of pain in non-verbal patients (Leila et al., 2006). Ninety-seven final year medical undergraduates completed an electronic questionnaire asking them to identify how well the International Association of the Study of Pain (IASP) curriculum had been covered during their degree course. The percentage of students who could recall being taught about paediatric pain and pain in the cognitively impaired was low, 8.82% and 14.7 % respectively.

In the same year a short communication Cohen & Bennett (2006) acknowledged that trainee doctors, doctors and nurses demonstrate poor levels of comprehension of paediatric pain. They carried out a survey of undergraduate medical students completing their first year of clinical training which highlighted a lack of awareness of paediatric pain. Cohen & Bennet suggested this lack of awareness amongst students is due to little time or emphasis being placed on paediatric pain in the medical undergraduate curricula, largely due to the vast amount of information and skills that are required to be covered and assessed.

Many authors have identified a lack of awareness, recognition and comprehension of paediatric pain in the clinical setting (Mather and Mackie, 1983, Schechter et al., 1986, Petrack et al., 1997, Wolfe et al., 2000, Alexander and Manno, 2003).

Saroyan *et al.* (Saroyan et al., 2008) attempted to assess clinical resident understanding of paediatric pain management by using a multiple choice questionnaire distributed to residents in all specialities. The respondents scored poorly in questions relating to administration of opioids and assessment of pain in cognitively impaired children. The authors suggested that poor understanding and inadequate treatment of paediatric pain is due to insufficient education in the subject.

Ameringer et al (2012) investigated the influence of education on medical undergraduate's attitude towards paediatric pain (Wilson et al., 1992). Two hundred and ninety one 3rd and 4th year students completed an online training module on paediatric pain as well as pre- and post-test questionnaires. The questionnaires included items such as 'children do not experience as much pain as adults' and 'babies do not experience pain' which were marked on a Likert scale of strongly agree/agree/disagree/strongly disagree. The authors reported an improvement in attitudes related to analgesic drug administration to paediatric patients after participation in the on-line training module. Scores for attitudes towards pain in children or babies did not change markedly from pre- to post-test as most respondents had positive attitudes prior to the training module, for example, for the item 'babies do not experience pain' 100% responded 'strongly disagree' or 'disagree'.

Manfredi et al (2003) used medical students in a study investigating the reliability of facial pain expressions in dementia patients. The students were asked to watch videos of nine dementia patients having dressing changes of decubital ulcers and assess whether the patient experienced pain. The authors had previously determined the level of pain likely to be elicited during the procedure as moderate by asking cognitively intact patients to self-report pain experienced during similar procedures. Whilst the students were able to identify the dementia patients in the videos were experiencing pain, they consistently rated the pain as low. The authors concluded that while facial expression was a reliable indicator of pain in this group of patients, it was a

poor tool for assessing severity of pain. It should be noted that all the students failed to recognise any expression of pain in one of the nine patients assessed.

A study has investigated undergraduate medical students' attitude towards pain and the influence of education (Niemi-Murola et al., 2007). A questionnaire with two sections - 7 demographic questions and 28 pain related items answered using a 6-point Likert scale - was distributed electronically to medical undergraduates at the University of Helsinki. Four hundred and thirty students completed the questionnaire. The age of the respondent correlated significantly with 'not seeing pain as a normal part of the ageing process', i.e. the older the student was the less likely they were think that pain is normal. The students closer to the end of the course who had received more training about pain, appeared to be more concerned about their ability to treat pain when compared to students from lower years. The female students reported most anxiousness about ability to treat pain and the authors speculated this could be due to female students being more empathetic.

Mezei and Murinson (2011) performed a systematic review of the curricula of 117 medical schools in the North America. A large number of medical schools did not report any formal teaching of pain, which is similar to the findings of Watt-Watson et al (2009) who surveyed ten Canadian medical schools. Less than 15% of medical schools reported having any formal teaching on paediatric or geriatric pain. It was suggested that dedicated pain-focused courses should be increased within the undergraduate curriculum in order to improve patient pain management in the future (Mezei and Murinson (2011). In a supporting editorial of the same issue of the journal *Pain Medicine*, a professor of family medicine at Washington State University, emphasized the importance of training medical undergraduates in pain management in order to improve pain management in clinical patients (Norris, 2011).

A systematic review of Day One Competencies relating to pain was carried out in Canadian health science students (dentistry, medicine, nursing, psychology, physiotherapy and pharmacy) and veterinary medicine students (Watt-Watson et al., 2013). A number of documents for each profession were examined for

inclusion of competencies relating to pain and ethics, for example, the documents examined relating to medical student competencies included *The Royal College of Physicians and Surgeons of Canada*; and *Medical Council of Canada: objectives for Qualifying Examinations* document.

Documents relating to veterinary medicine and nursing contained nine competencies relating specifically to pain, whilst dentistry documents contained two specific pain competencies. No references to competencies relating to pain were found in any of the other health science documents, including those for medicine. None of the documents examined included any competencies pertaining to ethics. It was suggested that the failure to include pain as a Day One Competency for medicine may hinder the advancement of pain management and have ethical implications for patients (Watt-Watson et al., 2013).

A study sought to determine medical students' perceptions of their medical school education on patient suffering (Egnew et al., 2014). A mixed methods approach was adopted with students from four North American medical schools asked to complete an online questionnaire containing questions about suffering, answered on a 3-point Likert scale, and free text boxes. The term 'suffering' was not defined to allow unrestricted interpretation by the students. One thousand and forty three students completed the questionnaire, with only 32.8% reporting being taught explicitly about suffering. Eleven per cent of students left comments in the free text boxes, which revealed four themes including that of empathy/understanding of suffering, for example one of the students commented,

“it is only when one is face-to-face with someone in pain that one appreciates the depth, difficulty and delicacy with which a physician must act when dealing with a patient's suffering” (Egnew et al., 2014)

The authors noted that the responses varied depending on which medical school the student attended, indicating a lack of consistency in curriculum between schools and suggestive of curricula gaps. Areas where curricula

gaps were evident included teaching about diagnosis of suffering and guidance on how to personally deal with feelings arising from caring for suffering patients. In conclusion, the authors suggest future work was needed to determine how best to teach future medics to engage with suffering patients and thereby improve the management of suffering patients by future doctors.

2.16 Hidden curriculum

The hidden curriculum is acknowledged as having a profound effect on student learning ((Mossop et al., 2013, Phillips, 2013)) and tacit information which convey aspects of the formal and informal curricula to students (Whitcomb, 2014). Within the hidden curriculum students learn about what it means to be a veterinary or medical professional, colloquial terms and policy enforcement and has been described as studying the student's lived-experiences (Whitcomb, 2014). Informal curriculum is the term used to describe the delivery of the formal curriculum, although it is sometimes used to describe clinical training. It encompasses learning that occurs outside the formal curriculum, and may include discussion with peers and / or clinical staff, informal discussion with teaching staff and it is suggested that;

The social environment or “informal” curriculum of a medical school profoundly influences students' values and professional identities. (Suchman et al., 2004)

The terms informal learning and hidden curriculum overlap and are sometimes used interchangeably (Whitcomb, 2014), but for the purpose of this thesis the term hidden curriculum is used.

2.16.1 Veterinary training and the hidden curriculum

In recent years the hidden curriculum has been studied in veterinary undergraduate education. The hidden curriculum and how it relates to veterinary students' understanding of professionalism was studied at the Royal Veterinary College (Roder and May). They found that student's relationships with individual clinicians as role models and also members of their rotation group influenced the direction and strength of attitude change. The process of

choosing a role model appeared to be active, with students often looking for characteristics that they deemed important in their role models. For example if a student already considered compassion an important attribute in a veterinary clinician they would look for this in their role model. If they were unable to find a role model who demonstrated this they would opt for a role model who was an expert in a particular speciality.

Although role models who exhibited compassion appeared to influence students, this was secondary to other factors such as the clinical services and assessments being focused on rewarding technical skills and knowledge, and students feeling that showing compassion would potentially hamper their own learning.

2.16.2 Medical training and the hidden curriculum

A recent critical scoping review of publications on chronic pain education from the last 20 years found

“significant discrepancies between the prevalence of chronic pain in society and the low priority assigned to educating future physicians about the complexities of pain” (Webster et al., 2017).

The same review highlighted that even if the subject of pain is covered well in a curriculum, the skill of applying those facts to a real situation is developed during clinical training and interaction with clinicians – hence the successfulness of pain education is often dependent on the hidden curriculum (Webster et al., 2017). Webster et al (Webster et al., 2017) recommended further research on the impact of the hidden curriculum on pain education.

A qualitative study on the influence of the hidden curriculum on medical students learning about chronic pain found a perception amongst students that clinicians didn't value chronic pain cases as good training opportunities and so had less exposure to these cases (Rice et al., 2018). The students recounted that chronic pain was often incurable and had the impression that patients with

chronic pain were a 'nuisance'. The medical students described management of chronic pain as challenging and unrewarding, partly due to their perception that pain was subjective. These findings concur with survey based studies on medical students attitude to patients with chronic pain which have found more negative attitudes as students' progress through training (Yanni et al., 2010).

2.17 Summary of literature

There is limited information on veterinary student attitude towards pain in specific animal species as most publications have focused on attitudes to pain in qualified veterinary practitioners and pain assessment of specific conditions. There is no information on veterinary student attitude to pain in non-verbal humans. (Section 2.8.1).

Although there is more information on medical students attitude towards pain in general, and also towards specific types of pain, such as cancer or lower back pain, there is no information on their attitude towards pain in different types of non-verbal humans. There is no information on medical student attitude towards pain in animals. (Section 2.9.2)

When considering the influence of patient characteristics on attitude towards pain - how people view the role of a particular animal species and its ability to experience pain appears to influence their attitude to welfare in that species. For human patients, the gender, age and ethnicity of the patient appear to influence the attitude of the observer to the patient's pain, with neonates and ethnic minorities receiving poor pain management. (Section 2.10).

Female observers have a tendency to rate pain experience of animals and non-verbal humans higher. Previous pain experiences of the observer does not appear to influence their attitude towards pain. There is some evidence that growing up in a larger family may have a patient benefitting effect on attitude towards pain. (Section 2.12).

There has been interest in the influence of education on medical and veterinary student attitude towards pain. Studies have found that attitudes towards pain

in patients deteriorates as students' progress through both veterinary and medical training. In addition, many studies have found that training in pain management for non-verbal humans is lacking in the medical undergraduate curriculum (Section 2.14).

An observer's empathy may influence their attitude towards pain in an observed patient, but the interaction is complex and not fully understood. (Section 2.13.1)

It is recognised that the hidden curriculum has an influence on many aspects of student development. The evidence for the influence of the hidden curriculum specifically on attitudes towards pain is limited, but from what is available it appears that clinical role models convey negative and less helpful attitudes to students about patients in pain. (Section 2.16).

2.18 Gaps in the literature

The search and review of the literature revealed the following gaps in knowledge:

- No information on veterinary and medical student baseline attitudes to pain in different animal species and different types of non-verbal humans.
- No studies comparing attitudes of veterinary and medical students.

In addition, it was identified that there was limited information on:

- What factors influence veterinary and medical student attitude to pain in animals and non-verbal humans.
- No studies investigating how empathy may influence veterinary and medical student attitude to pain in animals and non-verbal humans.
- Limited information on how veterinary and medical student attitudes to pain in different animal species and different non-verbal humans change during training, and whether the influencing factors change.

The following chapter will describe the methods used to investigate the knowledge gaps and answer the research questions described in Chapter 1, namely:

RQ1. What are the attitudes of veterinary and medical students entering University towards pain in animals and non-verbal humans, and what factors influence development of these attitudes?

RQ2. Is there an association between veterinary and medical students' empathy and their attitude towards pain in animal and non-verbal humans?

RQ3. Do attitudes of veterinary and medical undergraduates towards pain in animals and non-verbal humans change during training, and what influencing factors are they exposed to during training?

Chapter 3 Methods

3.1 Introduction

The purpose of a methods chapter in quantitative research is to describe the data collection methods and statistical analysis used. Quantitative research depends on a positivist paradigm, which is the belief that a real physical world exists that can be measured and quantified (Teddlie and Tashakkori, 2010). It would be unusual for a quantitative thesis to delve into a discussion of research paradigms (a set of assumptions about how the world works), ontology (the nature of reality) or epistemology (the nature of knowledge and ways of knowing and learning about social reality).

Qualitative research can utilize any one of a variety of paradigms that inform the methodology and methods. As such methods chapters in a qualitative thesis often include a description of the paradigms, ontology and epistemology used (3.4.1). As this is a mixed method thesis, the methods chapter does include a description of the research paradigm, as well as descriptions of the quantitative and qualitative methods used for data collection and analyses.

3.2 Chapter overview

This chapter will provide a detailed description of the methods used to answer the following research questions (section 1.5).

RQ1. What are the attitudes of veterinary and medical students entering University towards pain in animals and non-verbal humans, and what factors influence development of these attitudes?

RQ2. Is there an association between veterinary and medical students' empathy and their attitude towards pain in animal and non-verbal humans?

RQ3. Do attitudes of veterinary and medical undergraduates towards pain in animals and non-verbal humans change during training, and what influencing factors are they exposed to during training?

Specifically this chapter describes the study population and reasons for choice (section 3.5); study rationale which explores reasons for the choice of a mixed method approach rather than purely quantitative or qualitative (section 3.3) following; an overview of the project with an explanation of the timeline of data collection (section 3.3.3) and lastly detailed description of the methods used for;

- Questionnaire on attitude to pain (section 3.6)
- Assessment of empathy in veterinary and medical students (section 3.7)
- Pain scoring of animals and non-verbal humans (section 3.8)
- Statistical analysis (section 3.10)
- Interviews with veterinary and medical students (section 3.11)

3.3 Introduction to methodology

Previous studies on attitudes in the healthcare setting have often relied on Likert-type questions to assess attitudes, which are scales made up of Likert items which is simply a statement that the respondent are asked to evaluate by giving a quantitative value on any kind of subjective or objective dimension (Hartley and MacLean, 2006). The use of Likert-type questions alone does not allow deeper exploration of 'why' someone may hold a particular attitude, as

respondents are only asked to evaluate 'what' their attitudes are on the Likert scale.

Adding a qualitative element to this study enables deeper exploration of the motivation behind respondent's attitudes. A mixed methods research (MMR) approach allowed methodological eclecticism by enabling the most appropriate techniques for the research question to be selected without being as tied to a particular research philosophy (Clausen, 2018). As such, the use of both QUAN and QUAL research tool can be beneficial as the strengths of one method can be used to overcome the weaknesses of the other, and vice versa (Creswell et al., 2004).

A MMR approach was chosen for this project as the research questions are broad, and require an understanding of both student attitudes and the factors which influence these attitudes. Adopting a mixed method approach allows different research methods to be used to approach the same research question. For example, the influences on veterinary and medical students attitudes to pain in various animal species and non-verbal humans was investigated using a questionnaire (chapter 4) and also by interviewing the students (chapter 5). In this instance using a MMR approach, allows a broader and deeper investigation of the research questions.

3.3.1 Research paradigms

Traditionally research methods have fallen into either a QUAN or QUAL approach. The approach to research and the methods used are governed by the research paradigm, which in turn determines the ontology and epistemology (Figure 3-1).

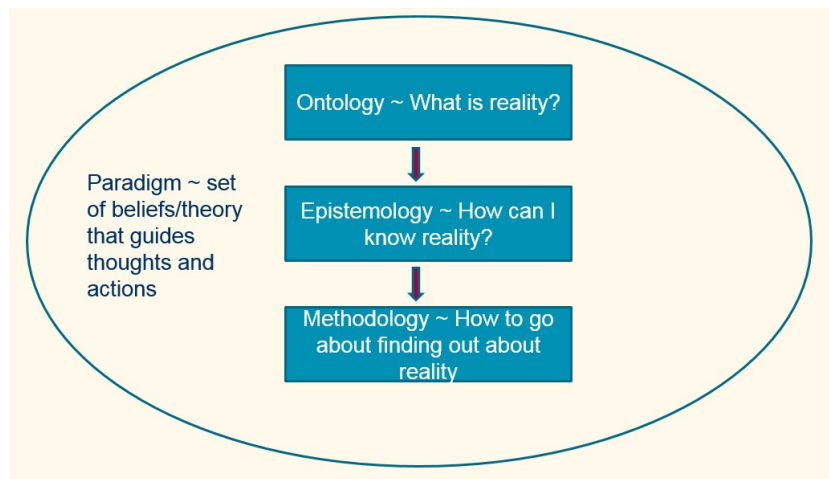


Figure 3-1. Definitions of paradigm, ontology and epistemology and their relationship within the context of research.

Quantitative methodology relies upon a deductive approach where a hypothesis is generated and subsequently a study is designed to test this hypothesis (Gorard, 2010). The paradigm that underpins QUAN research is positivist, i.e. an assumption that there is a real world which can be objectively measured (Figure 3-2).

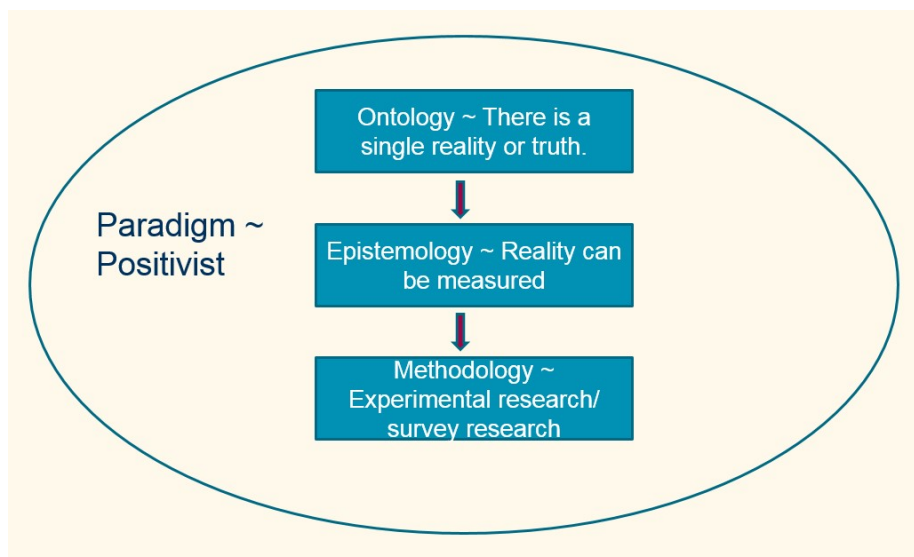


Figure 3-2. Ontology and epistemology of positivist paradigm which underpins quantitative research.

There are many paradigms which can be adopted when using a QUAL approach and discussion of these is beyond the scope of this thesis. A common theme in the paradigms that underpin QUAL research is the belief that reality differs depending on how it perceived by individuals or groups of people (Table 3-1). For example, critical realism (3rd row in Table 3-1) integrates the realist ontology (there is a real world that is independent of our own perceptions and can be measured) along with a constructivist epistemology (understanding of the world is inevitably influenced by our own perception and standpoints) (Maxwell and Mittapalli, 2010). Critical realism can use critical discourse analysis as a methodology, to analyse data collected by open-ended questionnaires, interviews and/or focus groups.

Paradigm	Ontology What is reality?	Epistemology How can I know reality?	Methodology How do I go about finding out?	Methods What techniques do I use?
Social constructivism	No single reality. Reality created by individuals in groups.	Reality needs to be interpreted – to discover underlying meaning	Ethnography; Phenomenological ; Discourse analysis	Interview; Focus group; Case history; Narrative thematic identification
Subjectivism	Reality is what we perceive to be real.	All knowledge is a matter of perspective	Discourse theory	Auto-ethnography; Literary analysis
Critical realism	Some entities exist in the 'real world', not all are socially constructed	Reality can be interpreted from individuals, but real world phenomenon can be measured.	Critical discourse analysis	Open-ended questionnaires; open-ended interviews; Focus groups.

Table 3-1. Examples of possible paradigm, ontology and epistemology which can underpin qualitative research.

MMR does not adhere to one particular research methodology, instead allowing the researcher to select the most appropriate research tools to answer

the particular research question – not being constrained by only having access to either quantitative or qualitative methods (Guetterman et al., 2015). This allows the choice of ‘best’ methods to answer the research question, whilst still recognizing that the best method for any given study may be purely QUAL or QUAN (Gorard, 2010). Hence MMR tends to favour a balanced approach rather than at either end of the methodological spectrum. For illustrative purposes QUAN and QUAL can be considered to be opposite in terms of the methodological approach, with MMR bridging the gap between the two methodologies (Figure 3-3).



Figure 3-3. Methodological spectrum: showing Qualitative and Quantitative methods at either extreme (adapted from (Clausen, 2018)).

QUAL research methodology often adopts a descriptive and inductive approach, where understanding is built from examining the data for patterns and relationships which lead to theory development (Gorard, 2010). Whereas, QUAN research relies on the development of an experiment to test an already formed idea or hypothesis (Gorard, 2010).

In comparison, MMR adopts an iterative cyclical approach using both deductive and inductive logic, which can be thought of as a ‘horses for courses’ approach utilising the best methods to answer the research question (Teddle and Johnson, 2009). It is argued that this approach is epistemologically incoherent as it doesn’t adhere to a particular research philosophy (Gorard, 2010), however MMR research can use a pragmatism paradigm to underpin its approach, which challenges this criticism (Biesta, 2010) (Figure 3-4).

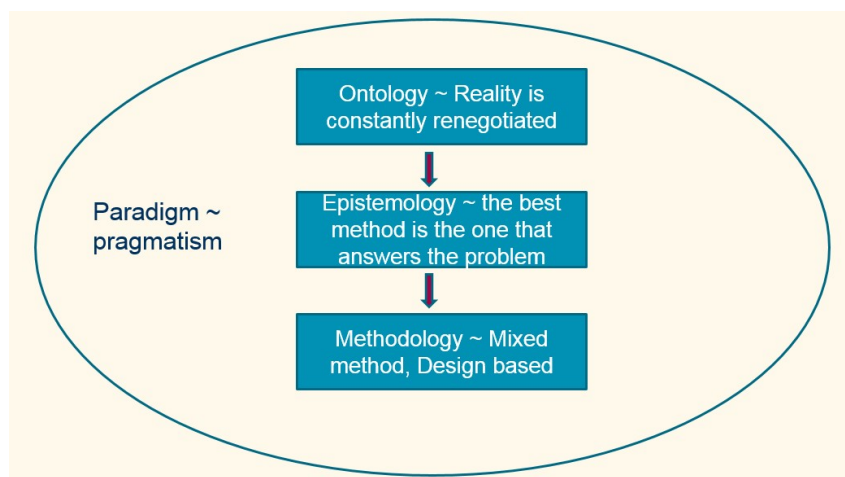


Figure 3-4. Pragmatism paradigm and ontology/epistemology

The approach for this thesis was a pragmatism paradigm. Pragmatism sits somewhere between positivism and constructivism and is underpinned by an ontology which accepts there might be an external reality but we cannot monitor it with certainty (Biesta, 2010). When using a pragmatism paradigm, the ontology is one where reality exists, but can be affected and changed by an individual's perception. The epistemology is one which allows the 'best' method, whether that be quantitative, qualitative, or both, to be used to answer the research question.

In mixed method research the theoretical drive describes the relative the dominance of one paradigmatic approach over the other, i.e., whether the research is more heavily reliant on qualitative or quantitative (Ostlund et al., 2011). The theoretical drive of this research was initially quantitative, with a complementary element of qualitative research.

3.3.2 Research design

There is set of accepted and commonly used MMR research designs (known as 'signature' designs) which are commonly agreed upon, although they go by different names (Collins, 2010). They include parallel mixed designs, *"a family of MMR designs in which mixing occurs in an independent manner either*

simultaneously or after some time has lapsed” (Teddle and Tashakkori, 2010). For example, QUAN and QUAL data can be collected simultaneously and then results are compared and contrasted after data analysis has been completed, Figure 3-5.

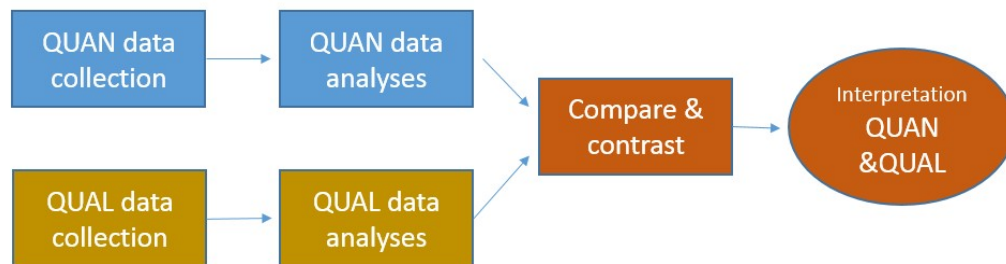


Figure 3-5. Example of parallel mixed design for mixed method research (adapted from (Clausen, 2018)).

Sequential mixed method designs involve data collection of either QUAN or QUAL, followed by analysis. Results from the analysis then inform the next stage of data collection, with merging and integration of all results at the end. (Figure 3-6).

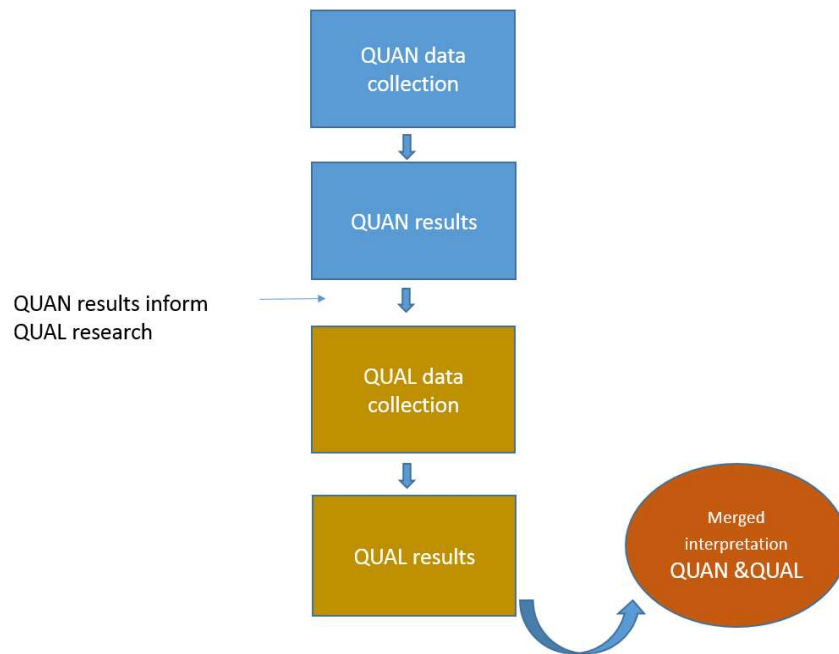


Figure 3-6. Example of sequential design for mixed method research (adapted from (Clausen, 2018))

For this longitudinal study a sequential design was used with an initial quantitative (QUAN) questionnaire, which informed the data collection of the following qualitative (QUAL) data collection phases (Figure 3-7).

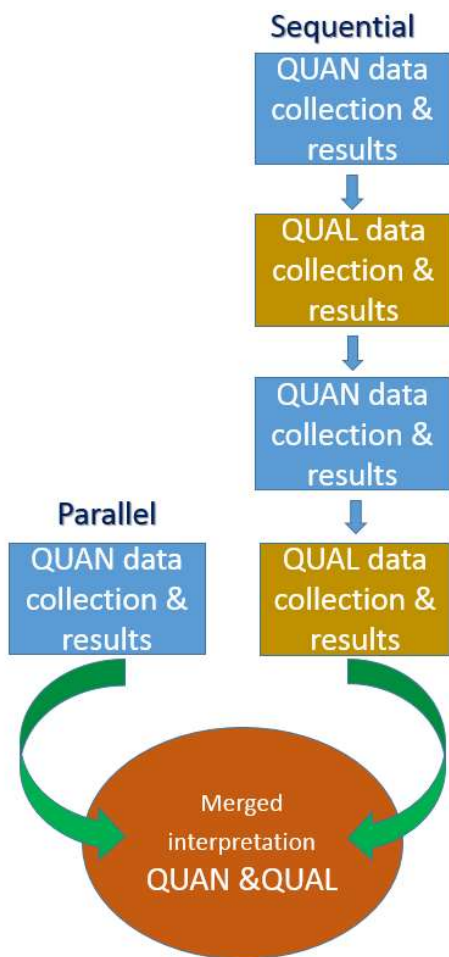


Figure 3-7. Diagram of design for longitudinal study. Right hand side show sequential element of project; left hand side parallel quantitative element. (adapted from (Clausen, 2018))

Initially a QUAN questionnaire to collect background information on the study population and to inform the qualitative data collection. Interviews took place with a small group of students after completion of the first year of undergraduate training, and again in the third semester of their final undergraduate year. There was an additionally parallel QUAN element of the study which assessed student empathy and its relationship with how students assessed pain in animals and non-verbal humans.

3.3.3 Overview of study

As the thesis has many elements, the methods have been divided into;

- 1) Quantitative (QUAN) methods used for a questionnaire;
- 2) QUAN methods used to investigate student empathy and its relationship with pain scoring for animals and non-verbal human;
- 3) Qualitative (QUAL) methods used for interview data.

As well as being a longitudinal study with data collection occurring at various time points over a six year period, the study populations are from different educational schools and different year intakes. There was also the potential for students not to complete follow-up questionnaires for various reasons, such as moving off programme to study for MSc qualifications or leaving the program. The multi-dimensional aspect of the project makes identification of study populations, data collection time points and data collection methods crucial as there is potential for confusion. A timeline was produced to identify when data collection was anticipated to occur for each study population (Table 3-2).

Academic year	2012 intake	2013 intake	2014 intake
Sept 2012 - July 2013 Study population	QUAN: Background & pain attitude Questionnaire V2012_17 M2012_17		
Sept 2013 – July 2014 Study population	QUAL: interviews V2012_17 M2012_17	QUAN: Background & pain attitude Questionnaire V2013_18 M2013_18	
Sept 2014 – July 2015 Study population			QUAN: Background & pain attitude Questionnaire (veterinary Graduate Entry Programme) GEP2014_18
Sept 2015 – July 2016 Study population	QUAN: Empathy questionnaire & Pain scoring videos V2012_17 M2012_17	QUAN: Empathy questionnaire & Pain scoring videos QUAN: Repeat pain attitude questionnaire V2013_18 GEP2014_18 M2013_18	
Sept 2016 – July 2017 Study population	QUAL: interviews V2012_17 M2012_17		
Sept 2017 – July 2018 Study population		QUAN: Repeat pain attitude questionnaire V2013_18 GEP2014_18 M2013_18	

Table 3-2. Overview of study timeline. Quantitative data in Green, Qualitative data in Orange. Veterinary (V) and medical (M) students from intake year 2012 (2012_17) or 2013 (2013_18), and Graduate Entry Programme veterinary students intake year 2014 (GEP2014_18). Blue arrow denotes GEP merging with V2013_18.

3.4 Ethical approval

Full ethical approval was granted in August 2012 by University of Edinburgh, College of Medicine and Veterinary Medicine Advisory committee for the use of student volunteers in experimental work (Ref: JLR/KM/2012/9).

3.5 Study population

The attitudes of veterinary and medical students towards pain in animals and non-verbal humans when entering University have not been investigated (section 2.7). There have been studies investigating attitude of veterinary students towards pain in a few species of animals (Hellyer et al., 1999, Kielland et al., 2009, Mich et al., 2010). However, there has been no research into baseline attitudes towards pain in a range of animal species, and whether veterinary undergraduate training influences or contributes to development of attitudes towards pain. In order to improve qualified veterinary surgeons attitude towards pain in animals, particularly the attitude of those who anecdotally dismiss or disregard pain in particular species of animal, it is important to gain an understanding of what attitudes are held by those entering the profession and what factors underpin those attitudes. As such veterinary undergraduates were selected as a target study population (section 1.2.1).

Experimental research is a potential future career path for both veterinary and medical students which often involves the use of experimental animals in study protocols. The most common experimental animals are fish, mice and rats; but cats, dogs, sheep, horses, rabbits and primates are also used in experimental research (Home Office, 2018). Those involved in research using experimental animals have the potential to improve animal welfare if they have a positive attitude to pain in species used for experimental research (Franco et al., 2018). As such it is important that educators have an understanding of both veterinary and medical students attitude towards pain in animals commonly used in experimental research.

Medical undergraduates were initially included in the study to provide a comparison group of students with similar educational background and

studying a similar science based clinical subject. It was anticipated that medical students would provide a group for comparing attitudes to pain in animals. Through the course of the research project it became apparent that the medical students were an interesting study group themselves and non-verbal humans were comparable to animals in their inability to verbally communicate their own pain experience and at risk of inadequate pain management (Chatelle et al., 2014, Curtiss, 2010, Feldt et al., 1998, McJunkins et al., 2010, Alexander and Manno, 2003, Harrison et al., 2014, Hatfield, 2014) (section 1.1.2). Therefore, a decision was made to include medical students as a study population for the entirety of the project, and also focus on attitudes to pain in non-verbal humans, as well as those for pain in different animal species (section 1.2.2).

The 2012 and 2013 intake of veterinary and medical students to University of Edinburgh, College of Medicine and Veterinary Medicine (CMVM) were chosen as these students were predicted to graduate between 2017 – 2018, enabling data to be collected during the entirety of the part-time PhD study (September 2012-September 2019). In order to clearly identify students and cohorts a unique identification system was adopted for each cohort and each individual student. Veterinary students were allocated the prefix V and a unique number, followed by their intake year and predicated graduation year, for example V1.2012_17. Similarly, Medical students were given the prefix M and a unique number followed by their intake year and predicted graduation, for example M1.2012_17.

The veterinary program has an intake of students who have already completed an undergraduate degree, called the Graduate Entry Programme. These students enter the veterinary course and complete an initial preparation year before being combined with main veterinary cohort of students at the start of the third year of training. The 2013 intake of veterinary students were joined by Graduate Entry Programme students who entered University of Edinburgh in semester 1 of 2014. These Graduate Entry Programme students were given

the prefix GEP, and a unique number, followed by their intake year and predicated graduation year, for example GEP1.2014_17.

3.6 Methods for Questionnaire on attitude to pain

3.6.1 Questionnaire Development & pre-testing

i. Initial questionnaire

There was no previously published attitude measure designed to assess and compare attitude to pain in animals and non-verbal humans. Previous publications which have assessed other aspects of attitude towards pain have relied upon Likert-type questions (sections 2.8 & 2.9). Attitude is a complex and multi-dimensional construct which is difficult to measure accurately (section 2.7). In addition, attitude doesn't necessarily predict behaviour.

For the purpose of this thesis it was assumed that student attitude towards pain would be an indicator of future clinical behaviour in the context of pain management in animals and non-verbal humans. After reviewing previous attitude scales, an attitude measure (*Expectation of Pain (EP)* questionnaire) was constructed using Likert-type questions, specifically to determine the attitude of veterinary and medical students towards pain in animals and non-verbal humans. A questionnaire was developed in an online tool (SurveyMonkey 1999-2017) and pre-tested on three final-year veterinary students for clarity and ease of completion (Appendix 1).

This composed of;

Section A: Questions concerning personal information including age, gender, nationality and relevant experiences, e.g., '*previous pain experiences*', '*personal pain threshold*', '*previous experience caring for non-verbal patient groups*', '*parent/caregiver in a clinical profession*' and '*previous experience caring for animals*').

Section B: The *Expectation of Pain (EP)* section comprised of 20 questions, using a 0 to 7 Likert-type scale, to assess students' expectation of the ability of various non-verbal patients to experience pain in comparison to a "typical" human adult. The Likert scale had anchor points at 0 (unable to experience pain) and 4 (equivalent pain experience to a typical adult) and 7 (significantly greater pain experience compared to a typical adult).

The species included in the *EP* included higher primates (*Chimpanzee*), companion animals (*Dog; Cat; Horse; Rabbit*), production animals (*Cow; Pig*), laboratory animal (*Rat*); exotic or wildlife species (*Bird; Snake; Fish; Insect*).

Non-verbal human groups were: paediatric subjects [foetus in last trimester (*Foetus*); new-born baby (*Baby*)]; vulnerable adults [person with learning difficulties (*Learning difficulties*); person with dementia / cognitive impairment (*Dementia*)]; and critically ill/ unconscious patients [person in a coma (*Coma*); anaesthetized person (*Anaesthetized*)].

Section C: A statement about involvement in further research and voluntary section to provide student (SMS) number to allow linking of future data. (Appendix 1).

Published evidence on factors which influence attitudes to pain and/or pain assessment were used to develop the Section A of the questionnaire. Previous research has indicated that the perceived function of an animal influences how people approach welfare (Taylor and Signal, 2009). For this reason the questions for Section B were developed by identifying animals which are considered to have different functions e.g. companion animals, production animals and wildlife species. Initially 16 animal species were included in Section B, which were reduced to 12 species after piloting of the questionnaire and further discussion.

During initial development of the *EP* scale an ascending scale with a lower anchor point (0=unable to experience pain) and an upper anchor point (4=equivalent pain experience to typical adult human) was used. However,

after initial pilot questionnaire testing, feedback from test volunteers indicated that for some animal species and non-verbal humans respondents may opt to score more than 4, therefore additional points on the scale were added (5,6 & 7), with a new upper anchor point (7 = much greater pain experience than typical adult human).

ii. Follow-up questionnaire

The initial questionnaire was exported to Bristol Online Survey (Bristol Online Surveys), and modified by removing Section A and changing the order of the questions in Section B. (Appendix 1) The order of presentation of the animal and non-verbal human was altered in subsequent questionnaires, with animal and non-verbal human questions interspersed. This was done to maximize completion of *EP* scores as in the initial questionnaire some medical students did not complete the animal *EP* score section, instead opting to only complete the non-verbal human section. By interspersing the animal species and non-verbal humans it was hoped that students would complete *EP* ratings for both, rather than either animals or non-verbal humans.

3.6.2 Data collection

i. Initial questionnaire

Veterinary students were asked to complete hard copies of the questionnaire at the end of a compulsory lecture during the first week of entering University. Medical students were asked to complete hard copies of the questionnaire after an optional lecture, which was given during the first week of them entering University. A short oral presentation on the study background and aims was given to the students before distribution of the hard copy questionnaire.

ii. Follow-up questionnaires

Third year questionnaire

The original questionnaire was amended to alternate between animals and non-verbal humans. This was done to avoid medic students only responding to questions on humans and vice versa. A short power point presentation which briefly discussed pain in animals, the background of the study and how the students could participate was given to veterinary students at the end of a

compulsory lecture during their 3rd year of training in semester 1, 2015-2016 academic year (Appendix 5). Hard copies of the questionnaire were available for students to complete during the presentation, as well as providing a URL for students to complete the questionnaire electronically. Two follow-up emails were sent to third year veterinary students during the first semester of 2015-16 academic year reminding them to complete the questionnaire. An electronic notice was also put up on the third year discussion board with a link to the recorded version of the introductory presentation and the online questionnaire.

Third year medical students during 2015-16 academic year were sent an email inviting them to complete the questionnaire online. A link to the recorded presentation was also provided. The online questionnaire remained open for 3 months during Semester 1.

Final year questionnaire

An email inviting final year veterinary students to complete the online questionnaire were sent during semester 2 of 2017-18 academic year. Up to two reminder emails were sent to those students who had not completed the questionnaire.

Final year medical students were handed out hard copies of the questionnaire at the start of a compulsory lecture at the end of semester 2 during 2017-18 academic year. Fliers with the URL for the online version were also available. A short oral presentation on the study was given during a break in the compulsory lecture, where students were urged to complete the questionnaire.

3.7 Assessment of empathy of students

3.7.1 Empathy test

There are many self-reporting tests of empathy used for research among medical students and physicians, (for example, the EQ, employed in this part of the current study, Jefferson Scale of Physician Empathy (JSPE) and the

Interpersonal Reactivity Index (IRI) (Davis, 1980)), but all have important limitations (Lawrence et al., 2004). The JSPE is not intended as a measure of empathy in the general population and has low test re-test validity over a 12 month period (Hojat et al., 2004). More recently concerns have been raised about its 'bluntness' and inaccuracy across cultures. The IRI which was developed for use with the general population and to provide a broader assessment of empathy has been extensively used in medical research. However, there is doubt whether one of its subscales, personal distress, is a relevant aspect of empathy (Lawrence et al., 2004).

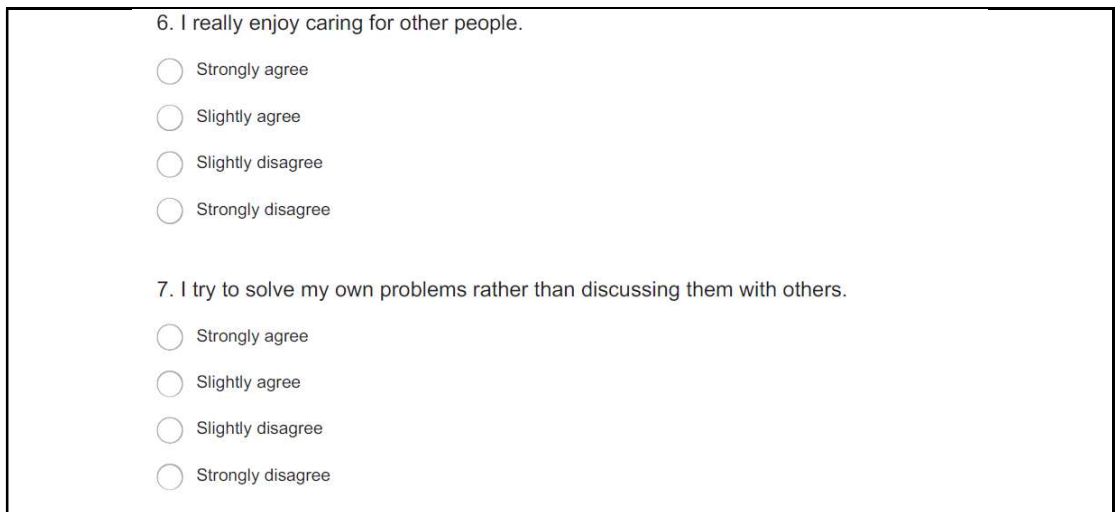
After reviewing previously published empathy tests, including those for clinical empathy (Table 3-3) and seeking external advice on the most appropriate empathy test to use, the Empathy Quotient (EQ) Questionnaire was selected for use (Baron-Cohen and Wheelwright, 2004).

Empathy measure	Number of items and sample	Response format
Barrett-Lennard Relationship Inventory, BLRI (Barret-Lennard, 1964, Wiebe and Pearce, 1973)	16 items (e.g. Usually senses what I am feeling)	Self and patient versions. 7 point scale 'strong agreement' to 'strong disagreement'
Hogan Empathy Scale, HES (Hogan, 1969)	64 items (e.g. I am usually short tempered with people)	True or false.
Questionnaire Measure of Emotional Empathy, QMEE (Mehrabian and Epstein, 1972)	33 items (e.g. The people around me have great influence on my mood)	Self-version. 9 point scale. +4 (very strong agreement) to -4 (very strong disagreement)
Empathy Construct Rating Scale, ECRS (La Monica, 1981)	100 items (e.g. listens carefully) 20 items	Self, peer and patient versions. 6 point scale: 'extremely like' to 'extremely unlike'
Interpersonal Reactivity Index, IRI (Davis, 1994)	28 items, 7 per scale (e.g. I sometimes try to understand my friend better)	Self-version. 5 point scale from 0 (does not describe me well) to 4 (describes me very well)
Reynolds Empathy Scale, RES (Reynolds et al., 2000)	12 items (e.g. attempts to explore and clarify feelings)	Self, peer and patient versions. 7 point scale, 'never like' to 'always like'
Empathy Quotient, EQ (Baron-Cohen and Wheelwright, 2004)	60 items (e.g. I really enjoy caring for other people)	Self- version 4 point scale, 'strongly agree' to 'strongly disagree'
Jefferson Scale of Physician Empathy, JSPE (Hojat et al., 2005)	20 items (e.g. I try to understand what is going on in patients minds)	Self and patient versions. 7 point scale 'strongly agree' to 'strongly disagree'
CARE Measure (Mercer et al., 2004)	10 items (e.g. How was the doctor at...)	Patient version. 5 point scale 'poor' to 'excellent'
Animal Empathy Scale, AES [developed from QMEE] (Paul, 2000)	28 items (e.g. pets have a great influence on my mood)	Self-version 9 point scale 'agree very strongly' to 'disagree very strongly'
Empathy for Pain Scale, EPS (Giummarra MJ, 2015)	4 scenarios (e.g. a person being accidentally injured) 12 response items (e.g. distress, discomfort, disgust, fear)	Self-version 5 point scale 'strongly agree' to 'strongly disagree'

Table 3-3. Published empathy assessment tools

The EQ was chosen for this study as it is a well-regarded measure of empathy that has good cross-cultural validity (Berthoz et al., 2008, Groen et al., 2015, Kim and Lee, 2010) and high internal validity, with previously reported cronbach's alpha of 0.65 (Sreehari et al., 2016). The EQ was originally developed for use in diagnosing autism and high functioning Asperger's, but is also short, easy to use, measures both cognitive and affective elements of empathy, and is sensitive to a lack of empathy in individuals (Baron-Cohen and Wheelwright, 2004). An online version of the EQ was created for use in this study [appendix 4].

The EQ contains 40 empathy and 20 filler questions, and is answered using a 4-point Likert scale ranging from 'strongly agree' to 'strongly disagree' (Figure 3-8).



6. I really enjoy caring for other people.

☐ Strongly agree

☐ Slightly agree

☐ Slightly disagree

☐ Strongly disagree

7. I try to solve my own problems rather than discussing them with others.

☐ Strongly agree

☐ Slightly agree

☐ Slightly disagree

☐ Strongly disagree

Figure 3-8. Example of questions included in Empathy Quotient.

The 20 filler items were non-empath questions and included to distract the participant from a relentless focus on empathy (Baron-Cohen and Wheelwright, 2004) (Figure 3-9).

3. I try to keep up with current trends and fashions.

☐ Strongly agree

☐ Slightly agree

☐ Slightly disagree

☐ Strongly disagree

Figure 3-9. Example of filler question included in the Empathy Quotient score.

Each of the 40 empathy questions scored 1 point if the respondent records the empathic behaviour mildly, or 2 points if the respondent records the behaviour strongly (as described in (Baron-Cohen and Wheelwright, 2004)). Approximately half the items were worded to produce a “disagree” response and half to produce an “agree” response for the empathic response, to avoid a response bias either. The scores were added to calculate an empathy score with a maximum score of 80. The fillers were not allocated a numerical score and not analysed.

3.8 Pain scoring of animals and non-verbal humans

3.8.1 Video clip development

Video clips of animals obtained from clinical cases at The University of Edinburgh veterinary hospital were: a lamb after non-surgical castration (where narrow rubber rings are placed on the scrotum above the testicles); a dog after laparotomy (surgical incision into the abdomen); and non-painful cat hospitalized before surgery (Figure 3-10, Table 3-4).



Figure 3-10. Stills of animals (a lamb after non-surgical castration; and a cat before surgery; a dog after laparotomy) depicted in video which veterinary and medical students were asked to pain score.

Video	Duration (Seconds)	Patient depicted	Description
Animal	100	<i>Lamb</i>	1 week old blackface lamb in straw barn housed with other sheep; Alert and responsive; not vocalising; reluctant to move into recumbency. Shifting of weight.
	63	<i>Dog</i>	Small terrier in hospital cage; abdominal stent visible; hunched stance with tense abdomen; quiet, alert and responsive; no vocalisation.
	64	<i>Cat</i>	Adult cat in hospital cage; quiet alert and responsive; slow eye blinking.

Table 3-4. Description of animal patients in video clips viewed and scored by students for pain using Numerical Rating Score and modified Face, Legs, Activity, Crying and Consolability pain assessment tool.

Dogs and cats were chosen as species likely to be familiar to both medical and veterinary students, whilst the lamb was used because of its relative familiarity with veterinary, rather than medical students. Video clips of animals lasted

between 50 and 64 seconds. Animal owners gave written consent for the use of the videos for research purposes.

Obtaining permission to film and use video footage of non-verbal human patients proved difficult, therefore edits of television documentaries using “Box of Broadcasting National” (BoB) were used for the clips showing humans, which were: a non-painful baby before surgery; an 18-month-old infant with a tracheostomy receiving assisted ventilation; and an elderly dementia patient with a fractured femur (Figure 3-11, Table 3-5).

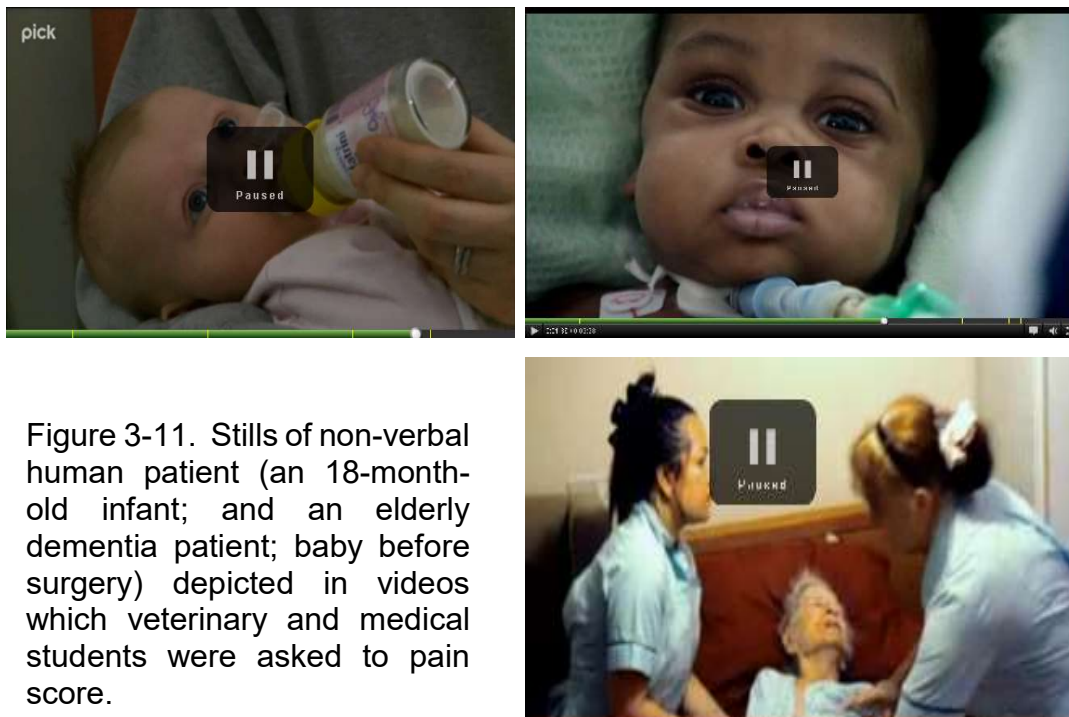


Figure 3-11. Stills of non-verbal human patient (an 18-month-old infant; and an elderly dementia patient; baby before surgery) depicted in videos which veterinary and medical students were asked to pain score.

Video	Duration (Seconds)	Patient depicted	Description
Non-verbal Human	50	<i>Baby</i>	Caucasian 2-month-old baby; being held by parents; quiet, alert and responsive. No vocalisation. Background music playing.
	106	<i>Infant child</i>	18-month-old Black female infant in ICU; Distressed facial expression. Restless and kicking of limbs. Background music playing.
	46	<i>Elderly person</i>	CCTV footage of frail elderly Caucasian woman in bed being moved by care staff; distressed, disorientated and frequently vocalising.

Table 3-5. Description of non-verbal human patients in video clips viewed and scored by students for pain using Numerical Rating Score and modified Face, Legs, Activity, Crying and Consolability pain assessment tool.

Edited clips of human patients lasted between 46 – 106 seconds. Editing and use of clips adhered to BoB's terms and conditions. The patients depicted in the videos were not graded in terms of their pain severity, but were reviewed by two experienced specialist veterinary anaesthetists and a medical general practitioner. Based on these opinions the severity of pain depicted in the videos were (least pain to most pain); *Cat* → *Baby* → *Small dog* → *Infant child* → *Lamb* → *Elderly person*. The six brief video clips (three featuring three featuring animals and human patients) were added to an online platform. Access to the videos was protected and could only be viewed by students or staff of The University of Edinburgh who had been sent the following electronic link;

<http://www.apps.vet.ed.ac.uk/web/ease/pain-human-animal-patients/story.html>

3.9 Pain assessment tools

In order to investigate the relationship between student empathy and how they scored pain in animals and non-verbal humans, a method of assessing pain in

observed subjects was needed. It was decided to use both a subjective and objective method for assessing pain in observed subjects, and use these measures to determine if any relationship existed with student empathy.

3.9.1 Numerical rating scale

The pain scoring section used the Numerical Rating Pain Scale (NRS) which is scored from 0 to 10; 0 represents no pain at all and 10 represents the worst possible pain (Gordon, 2015). Numerical Rating Scales have shown high correlations with other pain-assessment tools in several studies and good compliance have also been proven (Hjermstad et al., 2011). Although the NRS is simple to use and has wide applications, it is a subjective measure of pain, which has led to the development of multi-dimensional (Gordon, 2015) behavioural pain assessment tools for use in animals and non-verbal humans.

3.9.2 Face Limbs Activity Crying & Consolability assessment tool

The FLACC was chosen after reviewing pain assessment tools developed for animals (Holton et al., 2001, Hellyer et al., 2006a, de Grauw and van Loon, 2016); and non-verbal humans (Beltramini et al., 2017, Chow et al., 2016, Gelinas, 2016, Lichtner et al., 2014, Manocha and Taneja, 2016, Tsai et al., 2018) (Table 3-6) .

Pain assessment	When to use	Pain Behaviours assessed	Scoring
<i>Paediatric Pain Assessment Tools (observational)</i>			
FLACC Pain Assessment Tool. (Merkel et al., 1997)	Children	5 behaviours: facial expression, Leg movement, activity, cry and consolability.	Score of 0 – 2 for each behaviour
Procedure Behaviour Checklist (PBCL) (Katz, 1980)	During invasive procedures. Age group 3 – 18 years.	8 operationally defined behaviours: muscle tension, screaming, crying, restraint used, pain verbalized, and physical resistance.	Score of 1 – 5 for each behaviour
Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) (McGrath, 1985)	Post-operative pain. Age group 1 – 12 years.	6 behaviours: cry, facial, child verbal, torso, touch and legs.	Score of 0 – 3 for each behaviour
COMFORT Scale (Ambuel, 1992)	Intensive care. Age group 0 – 18 years	8 domains: alertness, respiratory response, physical movement, mean arterial BP, heart rate, muscle tone, facial tension.	Score of 1 – 5 for each domain.
Nursing Assessment of Pain Intensity (NAPI) (Schade et al., 1996)	Infants and children with cerebral palsy	4 behaviours: Vocalisation, body movement, facial expression, response to touch	Score of 0 – 2 for each behaviour
Premature Infant Pain Profile (PIPP) (Stevens et al., 1996)	SCBU/NICU Premature babies	Seven indicators of pain: heart rate, oxygen saturation, facial expression, eye squeeze, brow bulge, nasolabial furrow, crying	Scored on 4-point scale for each item.
Non-communicating Children's Pain Checklist – Post operative Version (NCCPC-PV) (Breau et al., 2002)	Children with severe cognitive impairment	27 domains: vocal, social, facial, activity, body, limbs, physiological signs	Score of 0 – 3 for each domain
Echelle Douleur Enfant San Salvador (DESS) (Collignon and Giusiano, 2001)	Children with cerebral palsy	10 behaviours: facial expression, guarding, crying, etc	Score of 0 – 4 for each behaviour
<i>Non-verbal adult pain assessment tools</i>			
Behavioural Pain Scale (BPS) (Payen et al., 2001)	Critical care	3 behaviours: Facial expression, vocalisation, upper limb movements	Scored 1 – 4 for each behaviour

Pain assessment	When to use	Pain Behaviours assessed	Scoring
Critical Care Pain Observation Tool (CPOT) (Gelinas et al., 2006)	Critical care	4 domains: facial expression, mechanical ventilation/vocalisation, muscle tension, physiological domains	Scored 0 – 2 for each domain
Non-Verbal Pain Scale (NVPS) (Payen et al., 2001)	Critical care	6 domains: facial expression, ventilation, activity, guarding, vital signs, skin & pupils	Scored 0 – 2 for each domain
Checklist of Non-Verbal Pain Indicators (CNPI) (Odhner et al., 2003)	Critical care, dementia patients	5 behaviours: vocalization, grimacing- furrowed brow, bracing – clutching, restlessness, rubbing affected area	Score 0 - 1 for each behaviour
FLACC. (Voepel-Lewis et al., 2010)	Critical Care	(see above)	(see above)
<i>Pain assessment in animals (Acute Postoperative Pain)</i>			
Colorado State University Canine Acute Pain Scale (Hellyer et al., 2006a)	Postoperative pain in dogs	Domains vary between 5 pain categories e.g. posture, vocalisation, response to palpation.	Pictures and descriptors used to score.
Colorado State University Feline Acute Pain Scale (Hellyer et al., 2006b)	Postoperative pain in cats	Domains vary between 5 pain categories e.g. posture, vocalisation, response to palpation.	Pictures and descriptors used to score.
University of Glasgow Composite Pain Scale (Holton et al., 2001)	Postoperative pain in dogs	7 domains: Posture, activity, vocalisation, mobility, attention to wound, demeanour, response to touch.	Descriptors used to score each domain. Score varies between domains.
4A-VET Pain Scale (Grandemange et al., 2013)	Postoperative pain in dogs	6 domains: Subjective overall assessment, general behaviour, interactive behaviour, heart rate, response to palpation, intensity of response	Score of 0 – 3 for each domain.
Revised- Glasgow Composite Measure Pain Scale for Acute Pain in Cats (R-CMPF) (Holden et al., 2014)	Postoperative pain in cats	6 domains: Vocalisation, attention to wound, motor activity, response to touch, response to wound palpation, demeanour	Descriptors used to score each domain. Score varies between domains.

Pain assessment	When to use	Pain Behaviours assessed	Scoring
UNESP-Botucatu Multidimensional Composite Pain Scale (Brondani et al., 2013)	Postoperative pain in cats	10 domains: comfort, activity, attitude, miscellaneous behaviours, reaction to palpation of the surgical wound	Score of 0 – 3 for each domain
UNESP-Botucatu Unidimensional Pain Scale for Acute Postoperative Pain Assessment in Cattle (de Oliveira et al., 2014)	Postoperative pain in cattle	5 behaviours: locomotion, interactive behaviour, activity, appetite, miscellaneous behaviour.	Score of 0 – 2 for each behaviour
University of Melbourne Pain Scale (Firth and Haldane, 1999)	Postoperative pain in dogs	6 domains: physiological data, response to palpation, activity, mental status, posture, vocalization.	

Table 3-6. Table of pain assessment tools used in animals and non-verbal people.

Many of the domains assessed in the FLACC were similar to those found in commonly used animal pain assessment tools, for example the FLACC 'crying' domain (no cry/moans, whimpers or occasional complaint/ crying steadily, screams or sobs, frequent complaints) is similar to the 'vocalisation' domain found in the Glasgow Composite Pain Scale for dogs (no vocalisation/ crying or whimpering/ groaning or screaming) (Table 3-7).

The FLACC scores five domains, namely: facial expression; limb movements; overall activity; level of vocalisation and response to attempts to console. It's use is validated in neonatal and paediatric patients (Merkel et al., 1997), but has also been applied to critically-ill patients (Voepel-Lewis et al., 2010) and elderly dementia adults (Sheu et al., 2011).

Domain	Description of scoring			Example of animal pain assessment tool with similar domains
	0	1	2	
Face	No particular expression or smile	Occasional grimace, frown, withdrawn or disinterested	Frequent to constant frown, clenched jaw and quivering chin	<i>Colorado state University Canine Acute Pain Scale(Hellyer et al., 2006c) (happy content; worried expression)</i>
Legs	Normal position or relaxed	Uneasy, restless or tense	Kicking, or legs drawn up	<i>Unesp-Botucatu-MCPS (Brondani et al., 2013) (natural posture and relaxed muscles; tense; pelvic limbs extended or contracted)</i>
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth or tense	Arched, rigid or jerking	<i>Glasgow Composite Pain Scale (Holton et al., 2001) (relaxed, comfortable; hunched, tense; restless) 4A-Vet Scoring System (Grandemange et al., 2013) (restless; crouched/ stooped posture)</i>
Crying	No cry	Moans, whimpers or occasional complaint	Crying steadily, screams or sobs, frequent complaints	<i>Colorado State University Canine Acute Pain Scale(Hellyer et al., 2006c) (may whimper or cry; crying or groaning; constantly groaning or screaming) Glasgow Composite Pain Scale (Holton et al., 2001) (no vocalisation; crying or whimpering; groaning or screaming)</i>
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to; distractible	Difficult to console or comfort	<i>Colorado State University Canine Acute Pain Scale(Hellyer et al., 2006c) (easily distracted; difficult to distract from pain) Unesp-Botucatu-MCPS (Brondani et al., 2013) (comfortable, interacts when stimulated; interacts a little with observer; does not interact)</i>

Table 3-7. Table defining assessment domains of Face Limb Crying Consolability (FLACC) pain scoring tool and comparing domains to those found in commonly used and validated pain scoring tools for animals.

3.9.3 Empathy & pain scoring participant recruitment

All third and fourth year medical and veterinary students during 2015-16 academic year were sent an email inviting them to attend an optional presentation about the study, during which the aims of the study were discussed as well as a brief overview of what had been done so far (appendix 5). The presentation contained a link to the online questionnaire and the videos of patients.

In addition, during September 2015 an email was sent to all third and fourth year veterinary and medical students, with links to the online questionnaire and video clips. Students were asked to complete the EQ before viewing videos of the three humans and three animals and completing NRS and FLACC pain assessment tools for each of the subjects of the six videos. Two reminder e-mails were sent between October and November to students who had not completed the study.

3.10 Statistical analysis

3.10.1 Programs and packages

Questionnaire data were exported to Excel, checked and imported into the R statistical package via R studio (R version 3.4.1, 2016), and processed using the following packages for analysis and plot production.

Package name	Function	Version	Author
dplyr	Data manipulation	v0.7.2	(2017b).
tidyr		v 0.8.3	Hadley Wickham [aut, cre], Lionel Henry [aut], March 2, 2019
ggplot2	Plot production	v2.2.1	(Wickham, 2009)
Likert		v 1.3.5	Jason Bryer , Kimberly Speerschneider, 2016-12-29
glmulti	Statistical analysis	v 1.0.7.1	Vincent Calcagno, 2013-04-10
AICcmodavg		v 2.2-2	Marc J. Mazerolle and portions of code contributed by Dan Linden. 2019-05-29
MuMIn		v1.43.6	Kamil Barton, 2019-04-08
visreg		v2.50	Author Patrick Breheny, Woodrow Burchett. 2018-02-26
wesanderson	Colour pallet	v 0.3.6	Karthik Ram, Hadley Wickham, Clark Richards, Aaron Baggett. 2018-03-29

Table 3-8. Table of R packages

3.10.2 How quantitative data was treated

i. Expectation of pain questionnaires

Descriptive statistics were used to describe the respondents and how they scored *EP* in animals and non-verbal human. *EP* scores were treated as ordinal count data. However, for descriptive statistics and model production purposes the data from the 7-point Likert scale were converted into a binary outcome measure by grouping results into ratings of ‘less expectation of pain than an adult human’ (0 - 3) and ‘comparable/ or more *Expectation of Pain* than a typical adult human’ (4 – 7).

ii. Empathy and pain scores

EQ scores were treated as continuous data as previously described (Baron-Cohen and Wheelwright, 2004), with mean and standard deviations reported. NRS and total FLACC scores were treated as ordinal count data, and each domain within the FLACC score was treated as ordinal, polychotomous data as previously described (Kain et al., 2002).

3.10.3 Plot production

Plots were produced using base R and the ggplot2 package.

3.10.4 Chi squared

Data from veterinary and medical students; and male and female students was examined for differences in the characteristic and experience domains using chi-squared test (Figure 3-12).

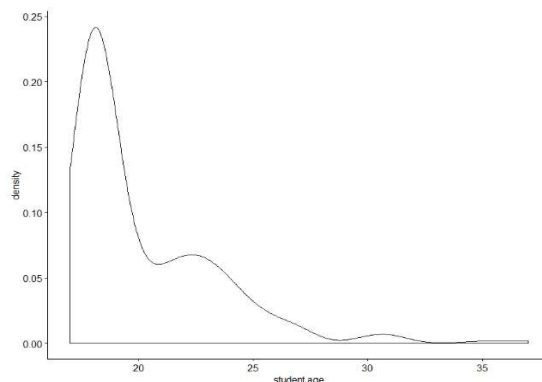
```
with(BckgrdComp, chisq.test(KeptDog, Course_VetOnly))
```

Figure 3-12. Example of call for Chi-squared test on experience of keeping dogs

3.10.5 Mann-Whitney U test

A Mann-Whitney U test was used to compare independent samples such as age between veterinary and medical students; and female and male students; EP scores between veterinary and medical students; EP scores between male and female students.

Student age was checked for normality using a Shapiro-Wilk test (Figure 3-13) and found not to be normally distributed.



```
shapiro.test(VetBckgrdComp $ Age)
      Shapiro-wilk normality test
data:  VetBckgrdComp$Age
W = 0.77535, p-value < 2.2e-16
```

Figure 3-13. Example of normality plot; call and output for Shapiro-wilk normality test for student age.

3.10.6 Wilcoxon signed rank test

The *EP* rating data from first and subsequent years was treated as not normally distributed dependent data. The null hypotheses was that there was no

difference between *EP* ratings. To determine if there was a difference between *EP* ratings allocated by students in 1st year and 3rd year, a Wilcoxon signed rank test (Test: *Wilcox*) test was used (Figure 3-14).

```
with(Only_First_Third, wilcox.test>Last_Trim_1st, Last_Trim_2nd, paired = T))
```

Figure 3-14. Example of code for performing wilcoxon signed rank test to compare Expectation of pain scores given by same students in 1st and 3rd year of training.

3.10.7 Student's t-test

Student's t-tests (Test: *t-test*) were used to identify differences in EQ Score between veterinary and medical students; and male and female students (Figure 3-15). The data was treated as continuous, normally distributed and independent.

```
t.test(FemaleVetEmp$Total_Empathy_Score, MaleVetEmp $Total_Empathy_Score)
```

Figure 3-15. Example code for Students t-test to compare empathy scores of female and male veterinary students.

3.10.8 Spearman's correlation co-efficient

The relationship between NRS and FLACC scores for the patient videos; and student Empathy Scores and NRS or FLACC were examined using Spearman's rank correlation co-efficient (r_s) (Test: *Spearman*) (Figure 3-16).

```
cor.test( ~ Patient_1NRS + Patient_1FLACC, data=VetBckgrdComp,method  
= "spearman", continuity = FALSE,conf.level = 0.95)
```

Figure 3-16. Example of code used for Spearman's correlation co-efficient to assess relationship between NRS and FLACC pain scores for patient 1.

3.10.9 General linear models

Two types of general linear model (*Test: glm*) were used to examine the interaction between course (veterinary or medical), and gender on Empathy Score; and the interaction of each of these variables on students NRS and FLACC scores. $P < 0.05$ was taken to indicate statistical significance.

Initially a linear model for count data with Poisson errors was used and the goodness of fit of the model checked by examining the deviance of the residuals. The model was deemed overdispersed if the residual deviance was not approximately equal to the residual degrees of freedom. If the model appeared overdispersed, simplification of the model was attempted using quasi-Poisson errors to account for the overdispersion (Crawley, 2013) (Figure 3-17).

```
a)summary(glm(Patient1_NRS ~ Course*Gender* Age, family = "poisson", data = SubsetCmbdEmpathy))  
b)summary(glm(Patient3_NRS ~ Course*Gender* Age, family = "quasipoisson", data = SubsetCmbdEmpathy))
```

Figure 3-17. Example code for linear model with a) Poisson errors and b) quasipoisson errors, for assessing interaction of course of study and gender on how students rated pain of patient 1 using NRS.

However, if the Poisson model appeared overdispersed by more than a factor of 2, a negative binomial (glm_{NB}) model was used (Crawley, 2013) (Figure 3-18).

```
summary(glm.nb(Patient1_NRS ~ Course*Gender, data = SubsetCmbdEmpathy))
```

Figure 3-18. Example of code for negative binomial model

3.10.10 Multivariable general linear models

Multivariable general linear models were used to assess association between student characteristics and how they rated *EP* in various animals species and

non-verbal human's. To facilitate analysis age was converted into 3 groups: 10 – 20 years, 21 – 30 years and 31 – 40 years.

In order to assess which variables (demographic data and characteristic domains) were associated with whether students rated *EP* for the animal species and patient groups as comparable to that of adult humans, multivariable general linear models with binomial errors (*Test: mvglm_b*) were used. However, the set of potential predictor variables was in excess of 30, and the potential for interactions between predictors was considerable, thereby making standard multivariable model selection and simplification very laborious and subjective.

Therefore a weighted model averaging technique was adopted (Burnham K. P., 2011). Initial *mvglm_b* were run for each patient group and animal species using the *glmulti* (2013)(v1.0.7) package with a genetic algorithm to identify a set of candidate multivariable models with different combinations of variables of potential explanatory value. Domains for inclusion in each specific initial model were chosen based on relevance to the patient group or animal species for which the model was being used. For example, when running for *mvglm_b* for Dog many of the potential predictors that were included in the model were connected to caring for animals or people (Figure 3-19).

```
glmulti_DogYes4to7 <- glmulti(glm(DogYes4to7 ~ KeptDog + KeptCat + KeptReptile + KeptBird + KeptRabbit + KeptRodent + KeptHorse + KeptSheep + KeptCow + KeptPig + WrkdCattleSheep + WrkdVetPrac + WrkdPetShop + WrkdKennels + WrkdStables + WrkdCattery + WrkdLab + WrkdAnimResc + WrkdWildlife + WrkdZoo + CareBabies + CareYoungChild + CareLearnDis + CareDement + CareCommDiff + Age_10 + Gender + Nation + MedicParents + MinorProced + VetMed + PainThresh, data = BckgrdComp, family = "binomial", na.action = na.omit), method = "g", level = 1)
```

Figure 3-19. Example of code used to call candidate multivariable models (*glmulti*). Domains included as explanatory variables in this example were chosen for relevance to pain in dogs (DogYes4to7).

On completion of the generation of the candidate multivariable models, weighted model average plots were created and viewed (Figure 3-20).

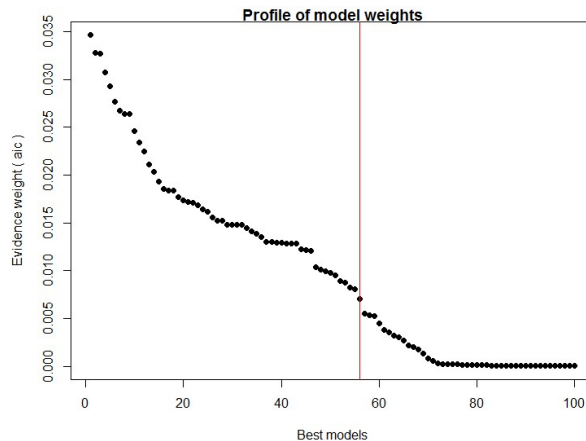


Figure 3-20. Example of weighted model average plot

A plot of the explanatory variables which appeared most commonly in the best-fit models was examined to determine which explanatory variables to include in the model (Figure 3-21).

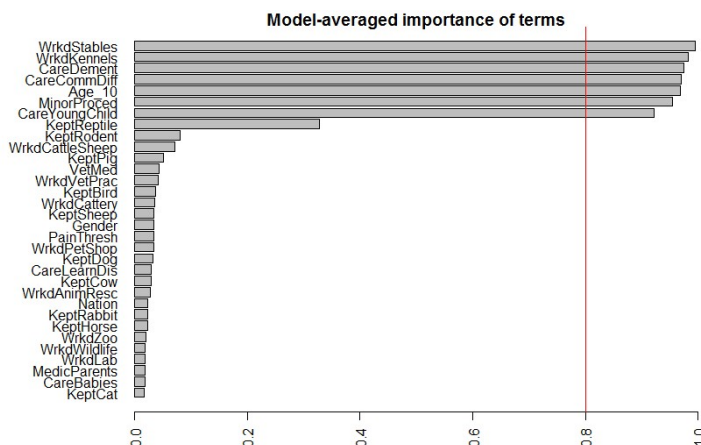


Figure 3-21. Example plot showing ranking of importance of explanatory variables in 'best fit' models. The explanatory variables which cross the red line at 0.8 indicates those which appear in the best-fit models.

For the Dog example the explanatory variables which appeared most commonly and crossed the 0.8 threshold were 'worked in stable', 'worked in kennels', 'cared for dementia patients', 'cared for people with communication difficulties', 'increasing age per decade', 'experience of a minor procedure' and 'cared for young children' (Figure 3-21). The explanatory variables that appeared most in the best-fit models were used in the subsequent model production (shown in red in Figure 3-22).

```
Call:
glm(formula = DogYes4to7 ~ wrkdKennels + wrkdStables + CareYoungChild +
    CareDement + CareCommDiff + MinorProced + Age_10, family = "binomial",
    data = BckgrdComp, na.action = na.omit)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.2532	0.3958	0.5354	0.7367	1.1523

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-0.40437	1.00335	-0.403	0.6869
wrkdKennelsYes	0.78396	0.30547	2.566	0.0103 *
wrkdStablesYes	0.68869	0.26945	2.556	0.0106 *
CareYoungChildYes	0.35262	0.24180	1.458	0.1448

Figure 3-22. Call and output for glm using explanatory variables identified as appearing most commonly in best-fit models.

Plots were examined to determine the number of candidate models to include in analysis. A peak above 1 on the AIC (y-axis) indicated the number of models (Figure 3-23). The Akaike information criterion (AIC) is an estimator of the relative quality of statistical models for a given set of data (Crawley, 2013).

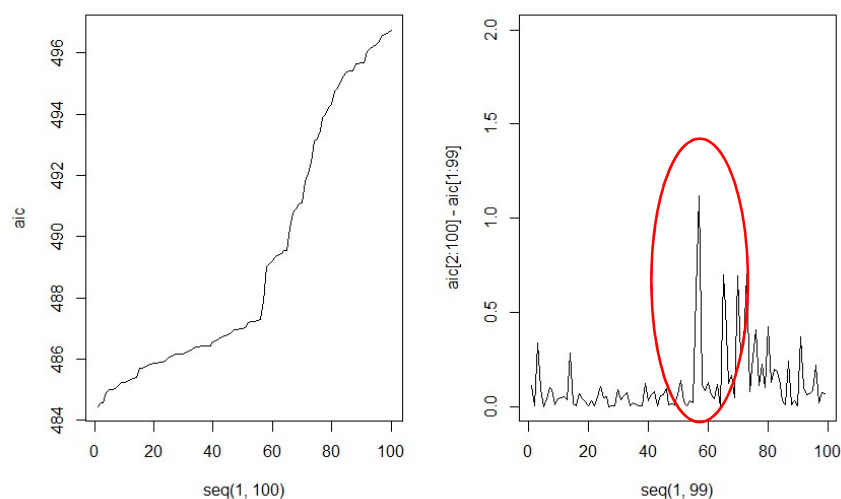


Figure 3-23. Example plot showing AIC (y-axis) versus number of models (x-axis). The increase at 60 (x-axis) would indicate that 60 models should be included in further analysis (highlighted with red oval).

If there was no peak, a maximum number of 60 models were included. The candidate models in each set of models were then compared to each other by calculating the 2° bias corrected Akaike Information Criteria (*AICc*) (Burnham K. P., 2011) using the package *AICcmodavg* (2017a) (v2.1.1). The Akaike information criterion (AIC) is an estimator of the relative quality of statistical models for a given set of data (Stoltzfus, 2011). This provided a relative measure of each candidate models' goodness of fit, penalised by its complexity. From this a 'best fit' model of demographic and characteristic domain variables which had the lowest *AICc* was determined (3-24).

```
glmulti_DogYes4to7_topmod[[i]]<glm(as.formula(as.character(glmulti_DogYes4to7_
wtable$model[i])), data = BckgrdComp, family = "binomial", na.action = na.omit)

aictab_n <- aictab(glmulti_DogYes4to7_topmod, modnames =
glmulti_DogYes4to7_topModnames)
```

	K	AICc	Delta_AICc	AICcwt	Cum.wt	LL
mod_7	7	478.21	0.00	0.04	0.04	-231.99
mod_3	9	478.23	0.02	0.04	0.09	-229.92
mod_1	8	478.82	0.62	0.03	0.12	-231.26
mod_2	7	478.87	0.67	0.03	0.15	-232.32
mod_6	6	478.97	0.76	0.03	0.18	-233.40
mod_4	9	479.04	0.83	0.03	0.21	-230.33
mod_11	7	479.16	0.96	0.03	0.24	-232.47
mod_9	5	479.25	1.05	0.03	0.26	-234.56
mod_12	7	479.37	1.16	0.02	0.29	-232.57
mod_15	7	479.42	1.21	0.02	0.31	-232.59
mod_13	6	479.49	1.28	0.02	0.34	-233.66
mod_14	9	479.53	1.33	0.02	0.36	-230.58
mod_5	9	479.56	1.35	0.02	0.38	-230.59

Figure 3-24. Example of call and output for comparison of 'best fit model' determined by lowest *AICc*.

In the above example model 7 is the best-fit model (Figure 3-24). The coefficients and standard errors of these variables were then calculated by an *AICc* weighted model averaging using the *modavg* function following the revised formula of Burnham and Anderson (Burnham K. P., 2011) over the set of candidate set of models for which $\Delta AICc < 2$.

The terms from the glm best –fit model were then extracted and Odds Ratios (Test: OR) and 95% confidence intervals of these demographic and characteristic domain variables were then calculated, with OR confidence intervals not crossing 1 taken to indicate statistical significance and an OR plot was created (Figure 3-25).

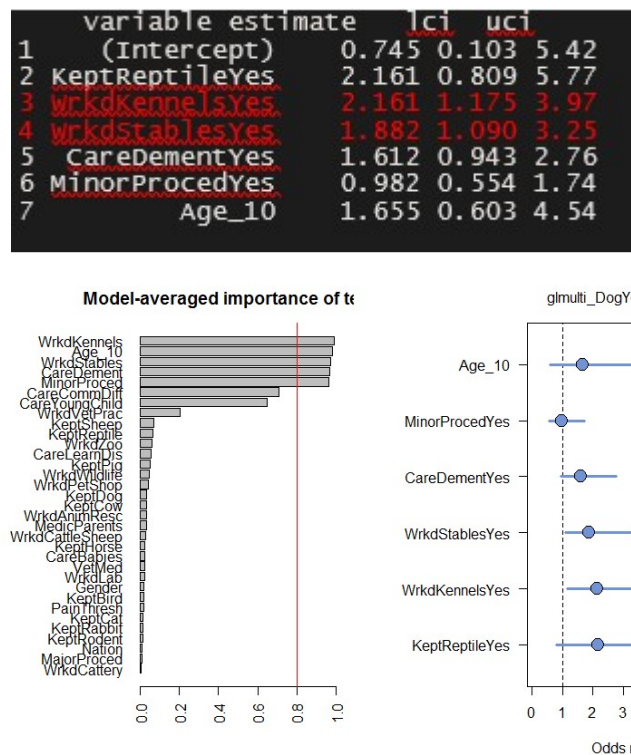


Figure 3-25. Example of output from odds ratio calculation (top) and odds ratio plot (below) for best-fit model. Explanatory variables highlighted in red indicate statistical significance as the confidence intervals do not cross 1.

In the example above ‘Age per decade’, ‘experience of minor procedures’, ‘experience of caring for dementia patients’, ‘working in a stable’ ‘working in a kennels’ and ‘ having kept a reptile’ all appeared in the best fit model for how Dog *EP* was scored by students. Of these only ‘worked in a stables’ and ‘worked in a kennels’ were statistically significant.

3.11 Interviews with veterinary and medical undergraduates

3.11.1 Reporting criteria

The COREQ (Consolidated criteria for reporting qualitative studies) formal reporting checklist for interviews was used as a template for reporting the methods of the qualitative semi-structured interviews (COREQ). The COREQ guidelines are a comprehensive framework for reporting of qualitative studies which are recommended by the EQUATOR (Enhancing the QUALity and Transparency Of health Research) network for reporting health based qualitative research. This includes;

1. Researcher reflective description of their bias/ views/ gender and how these may impact the data
2. Description of the theoretical framework (section 3.3)
3. Description of participant selection and sample size
4. Description of data collection
5. Description of data analyses

3.11.2 Researcher reflexivity

i. Personal characteristics

I arranged and conducted all interviews with the students. At the time of the interviews I held the position of Lecturer in Veterinary Anaesthesia and had an MSc by Research in equine anaesthesia and was a Diplomate of the European College of Veterinary Anaesthesia & Analgesia (DipECVAA). My previous experience consisted mainly of clinical veterinary work, both in general practice and at referral level and I was a specialist veterinary anaesthetist with an interest in analgesia and pain recognition in veterinary species, as well as being involved in undergraduate teaching on the BVM&S degree course.

ii. Relationship with participants

I had no prior relationship with any of the interviewees as my undergraduate teaching was confined to courses delivered in later years of the BVM&S course and I did not teach on the medical undergraduate course. The participants were aware that I was a member of staff and a veterinary anaesthetist and so may have inferred certain bias on my behalf based on their knowledge of veterinary staff and/or anaesthetists. In the initial contact with the students to gather the background data I gave a short presentation on the reasons for the study and aims, whilst being mindful of influencing perceptions of pain in the participants. The participants were told the aim of the study was to improve future teaching of 'pain' as a subject.

My own perception of pain is biased towards higher sentient animals being able to experience pain in much the same way as an adult human. My previous experience has left me unsure about whether lower sentient animals, birds and reptiles are able to experience pain in the same way as humans or whether human observers are unable to recognise signs of pain in these species. My experience as a mother has led me to believe that new-born babies are capable of experiencing pain, but adults are often unable to interpret pain behaviours in infants accurately. At the time of the interviews I was heavily pregnant (last trimester). Although I did not discuss my pregnancy with participants, I cannot discount that this may have influenced how they answered questions relating to pain in babies, infants and children.

3.11.3 Participant selection

i. Initial interviews

Students for interviews were selected from those who had completed the background questionnaire in September 2012 and had given written consent to be involved in future research (Figure 3-26).

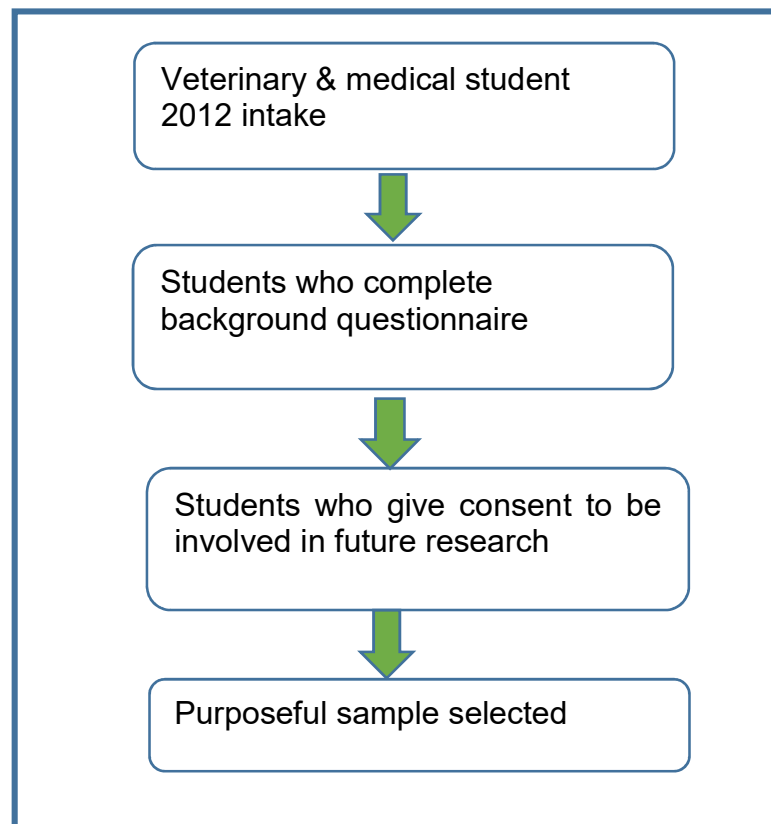


Figure 3-26. Figure to illustrate student selection for interviews

A target of 10 students for interview was based on the feasibility of completing interviews, transcription and analysis of data within the time constraints. Selection of students (10 medical and 10 veterinary) from those fulfilling the selection criteria requirements was based on obtaining a purposeful sample of maximum variation, identifying those students who represent the widest possible range of characteristics of interest. Previous studies have identified age and gender as an influencing factor on attitude to pain in veterinary surgeons (Raekallio et al., 2003, Becker et al., 2014, Bell et al., 2012, Capner et al., 1999, Dohoo and Dohoo, 1998, Hewson et al., 2006). It was anticipated that age, background, previous experience with animals, previous experience with non-verbal patients and personal pain experience may also influence attitudes to pain. Subsequently these criteria were used to select a sample of students who represented the widest variation in these criteria.

Selected students were contacted between September to October 2013 and invited to participate in a semi-structured interview. Email invitations were sent explaining the purpose and structure of the interview in the form of an information sheet (Appendix 6), as well as offering an incentive of a 'certificate of participation' as for taking part in the interview process (Appendix 7). Students who did not respond to the first email were contacted two further times.

Although all students who were contacted had previously given permission to be involved with future research, written consent for involvement in interview including recording of audio data was requested (Appendix 8).

ii. Follow-up interviews

Those students who had taken part in the initial interviews in autumn 2013, were contacted in autumn 2016 to invite them to take part in a second follow-up interview. Up to three further emails were sent to those students who did not respond to the initial invite and the students register on either Edinburgh Electronic Veterinary/ Medical Curriculum (EEVeC or EEMeC) was checked to ensure these students were still engaged in the respective programmes.

3.11.4 Interview Guide

i. Initial interviews

A semi-structured interview technique was used to explore student opinions on factors which influence student attitude towards pain in animals and non-verbal humans.

An interview guide consisting of open semi-structured questions was developed to explore student opinion and attitudes towards pain, particularly in relation to animals and non-verbal humans (Appendix 9). The schedule was tested on members of staff and final year veterinary students graduating in 2013, and refinements made based of feedback.

Initially the following vignette was included;

You are in a burning building where there is a human baby, snake, dog and elderly person. You are the only person able to rescue the animals and people in the building, but can only take one at a time. What order would you rescue them in?

At the end of each interview students were asked to give feedback on the interview process. Feedback from the first two interviewees, indicated that the vignette was not useful in the context of thinking about pain and students felt the vignette was distressing. In addition, the transcripts from the first two students were reviewed and it was found that inclusion of the vignette reduced the flow of conversation and hindered deeper discussion about pain and influences on attitude. After consideration of feedback and reviewing the transcripts, the vignette was omitted from the remaining interviews.

ii. Follow-up interviews

A broad interview guide was produced for the follow-up interviews which was informed by the experience gained during the initial interviews (Appendix 10). Although the guide contained question prompt in case of a break in the flow of conversation, the students were encouraged to elaborate on any facet of their own attitude towards pain or their experience of pain teaching that they felt was interesting. The students were told the duration of the interview would be approximately 40-60 minutes.

3.11.5 Setting

i. Initial Interviews

Initial interviews took place between November and December 2013 in a location convenient for the interviewee, but suitably informal to convey a relaxed atmosphere. All interviewees elected to be interviewed at a campus

cafeteria, resulting in the presence of non-participants in the vicinity, but not within close proximity to the interviewer or interviewee.

ii. Repeat interviews

Follow-up interviews were conducted between Jan – March 2017. Interviewees were given options for location of interview in either campus cafeteria, or a meeting room located close to where they were based at that time. During the final year of undergraduate training the veterinary and medical students were at various locations whilst doing clinical training, many opted for the interview to take place at a meeting room convenient for their location.

3.11.6 Recording

Audio was recorded onto a hand held Dictaphone (SONY ICDBX140 Digital Voice Recorder, Sony Europe BV) and uploaded to a secure area of the University server and a securely stored external hard drive. Student names were not used during the recording of interviews, instead each student was identified by a unique code e.g. m2012_17..10,; where the letter denoted medical or veterinary (m or v), and 2012_17 denoted the year of entry and predicted graduation year. These unique identifying codes were also used as file names for data storage purposes. Contemporaneous notes were also taken during the interview, but kept to a minimum in order to maintain a relaxed interview style.

3.11.7 Interview sample size

i. Initial interviews

Guidelines for determining interview sample size for qualitative studies often refer to the term 'theoretical saturation' as the time point when data from interviews yield repetitive and/or similar comments and no new concepts or information is found from subsequent interviews. Ideally interview data would have been analysed concurrently to inform subsequent interviews, which would have enabled data saturation to be identified (Elsie Baker and Edwards, 2012, Glaser and Strauss, 1966, Guest et al., 2006, Turner, 2010). However this was not possible as time constraints made it necessary to collect all interview data before the end of December 2013. Data was collected from all

eight interview participants and analysed a number of months after the interviews took place.

ii. Follow-up interviews

As the students were completing their clinical training at the time of the follow-up interview, they had very limited time in which interviews could be scheduled. This meant that interviews were scheduled when convenient for students and did not allow sufficient time between interviews for data analysis to occur concurrently. The decision was made to concentrate on interview data collection and analyse data at a later date.

3.11.8 Qualitative data analysis

Audio files were transcribed with the aid of Express Scribe software (NCH Software, Inc., 6120, Greenwood, Plaza, Blvd, Greenwood, Village, CO, 80111, USA). Transcripts were not returned to the participants for comment.

The transcribed interviews were uploaded into Nvivo (QSR International (UK) Limited, Europe, Middle East and Africa, Vanguard House, Keckwick Lane, Daresbury, Cheshire, WA4 4AB, United Kingdom) for analyses. Data was coded by one coder. Inductive, thematic analysis from a realist standpoint as described by Braun & Clark (Braun and Clarke, 2014) was used to analyse responses.

Interview transcripts were repeatedly read to become familiar with the text. Each transcript was then reviewed again, and line-by-line to identify any words and/or sentences which were relevant or interesting to the topic of attitude to pain in animals and non-vernal humans (Table 3-9).

Thematic coding was carried out by one researcher. It was anticipated that a second coder would independently analyse the data but due to other work commitments and time constraints this was not possible.

All analyses was conducted in NVivo by highlighting relevant or interesting text into temporary codes (termed 'nodes' in NVivo) (Figure 3-27). These words and/or sentences were highlighted and assigned to a temporary coding group

by identifying similar concepts in the highlighted text. The code names were initially derived from words used by the respondents.

Thematic analysis step	Description
1. Familiarisation with data	Audio recordings transcribed. Transcripts read through to become familiar with content and text imported into NVivo
2. Generation of initial codes	Relevant or interesting text highlighted and assigned to a temporary coding group. Codes reviewed which led to refinement and merging of coding groups into subthemes. Broader themes derived from group sub-themes into coherent groups.
3. Generation of initial themes	
4. Refining themes and developing a coding matrix	Themes assessed for coherence and/or to identify distinctions between themes, with supervisory discussion. A coding matrix was generated to assess breadth of coding.
5. Defining themes and naming	Theme names reviewed and amended to reflect content. Each theme was defined to describe the coding contents.

Table 3-9. Phases of thematic analyses

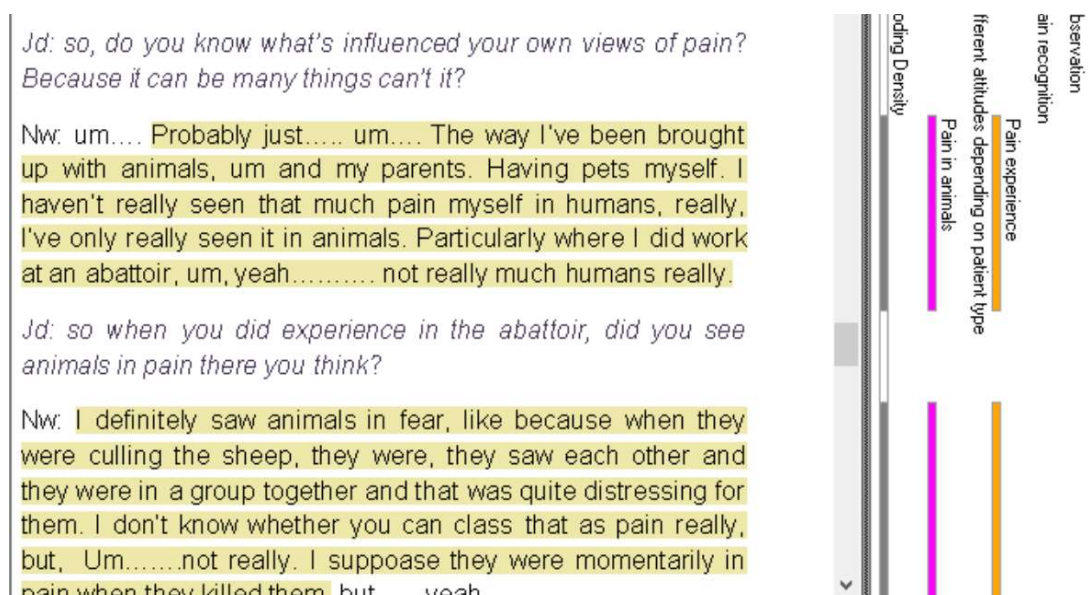


Figure 3-27. Example of transcript open coding process using NVIVO qualitative data analysis program. The highlighted sections of text and coding stripes (right hand side) can be seen which identify which nodes have been coded.

In the example shown in Figure 3-27, the highlighted sentences have been coded into the 'pain in animals' and 'pain experience' coding themes. Once the codes were refined they were then clustered into initial themes before a final coding of all data (Table 3-9).

In addition, a word frequency query was run on the transcripts with the interview text removed, word length set to a minimum of 4 letters and words grouped for synonyms. This was done to help identify potential codes and patterns that may have been missed in the initial review and coding of the transcript text.

After reviewing the transcripts again, including highlighted text which had been coded into temporary codes, further grouping of the highlighted codes occurred by identifying codes which had similarities, links or a relationship. New code names were constructed for these coding groups, which aimed to reflect the content and context of the codes they contained. During this process, memos were used to 'bookmark' when relationships linked codes and/or new concepts emerged from the coded data.

Broader themes were then developed from these constructed coding groups which encompassed concepts important to the research question (Table 3-9). After further review of the raw transcripts; codes derived from the text; and discussion of the context and relevance of the broad themes; the final themes were modified to accurately reflect their content and relationships between codes (Table 3-9). During the analysis process it became apparent that these themes could be linked or had relationships which enabled major-themes to be developed by grouping themes into common concepts based on circumstances or person/people which the themes described. The names of the major-themes were constructed to reflect the content and relationships of the constituent themes; some of which contained similar names.

3.11.9 Coding plots

Word clouds and cluster diagrams were produced to provide a visual representation of the word frequency query results, and aid in identification of potential relationships between codes. .

To aid in thematic analysis a coding matrix was created which allowed comparison of coding groups and themes across different students and enabled identification of relationships between coding themes (Figure 3-28).

	A : beliefs about why pai...	B : culture (2)	C : changing_growing up	D : education	E : medical culture	F : training	G : Family
1 : V17.1 (2)	1	1	0	0	0	1	3
2 : V17.4 (2)	2	1	0	1	3	0	5
3 : V17.41 (2)	0	1	0	0	0	0	3
4 : V17.49 (2)	1	1	0	0	0	0	0
5 : V17.1.2nd (2)	0	0	1	0	4	7	0
6 : V17.4.2nd (2)	1	0	1	0	3	12	0
7 : V17.49.2nd (2)	0	0	2	0	1	3	0

Figure 3-28. Example of coding matrix produced in NVivo qualitative data analysis program. Each row corresponds to an individual transcript for a veterinary student (left hand column). Top row shows sub-codes (referred to as nodes in NVivo). Red boxes indicate no coding; dark green indicates multiple coding.

This enabled relationships between coding groups and themes to be more easily recognised. The unique student identifications are shown in the first column and the various coding themes are shown in the first row. The coding matrix is heat colour coded- red being no coding, progressing to deep green for the most incidents of coding. For the example in Figure 3-28 there were 12 separate examples of coding at the 'training' theme for a veterinary student during the second interview (V17.4.2nd).

Visual representations of the final major themes developed from the open coding for all transcripts, and also for each individual student transcript were created to facilitate comparison of themes between initial interviews and follow-up interviews. However, the magnitude of times each theme was

coded does not represent the relative importance of the theme and is not intended to quantify the thematic coding.

Chapter 4 Veterinary & medical student attitudes at the start of training (Quantitative)

4.1 Introduction

In this chapter the attitudes of veterinary and medical undergraduates towards pain in animals and non-verbal humans (NVH) at the start of their undergraduate training is examined. This chapter answers Research Question 1;

RQ1. What are the attitudes of veterinary and medical students entering University towards pain in animals and non-verbal humans, and what factors influence development of these attitudes?

Specifically, this chapter presents quantitative (QUAN) data on attitude towards pain in various animal species and non-verbal humans from questionnaires completed at the start of the first year of the veterinary or medicine undergraduate courses. This chapter addresses the gaps in knowledge by examining attitudes of veterinary and medical students to pain on entering University and the data described in this chapter also serve as a benchmark in investigating whether student attitude towards pain changes during undergraduate training (chapter 7).

4.2 Recap of relevant literature

It is important that educators have knowledge of the attitude towards which veterinary and medical students have when entering University. Previous work has indicated that attitudes influence professional behaviour (Turner and Weiner, 2002), and so may affect the pain management choices that students make in their future clinical roles. There are many publications on veterinary practitioners attitude, recognition and treatment approach to pain in clinical veterinary cases (Becker et al., 2013, Becker et al., 2014, Bell et al., 2012, Brearley, 2014, Capner et al., 1999, Coleman and Slingsby, 2007, Dohoo and Dohoo, 1996, Dohoo and Dohoo, 1998, Hewson et al., 2006, Hugonnard et al., 2004, Huxley and Whay, 2006, Lascelles et al., 1999, Lim et al., 2014, Lorena et al., 2013, Lorena et al., 2014, Price et al., 2002, Waran et al., 2010, Weber

et al., 2012)). However there are only three previous publications which have investigated veterinary student attitude towards pain in animals: one which assessed animal and training factors which influenced attitude (Hellyer et al., 1999); another which assessed veterinary student attitudes towards specific painful conditions in cattle (Kielland et al., 2009); and lastly one which assessed impact of a pain training programme on veterinary student attitude (Mich et al., 2010). There have been no studies assessing veterinary student attitudes towards pain when entering University; in different animal species; and what patient and/or student factors influence these attitudes. Previous work on attitudes to animal welfare in people without veterinary training, for example farmers, has shown that factors such as gender and “pet” ownership influence welfare attitudes (Hemsworth et al., 2000, Vaisanen et al., 2008).

There has been more published on attitude towards pain, undergraduate pain teaching and effect of training in medical students (Egnew et al., 2014, Mutto et al., 2014, Norris, 2011, Paneduro et al., 2014, Weinstein et al., 2000, Wilson et al., 1992, Yanni et al., 2010, Ali and Thomson, 2009, Briggs et al., 2013, Chang, 2002, Corrigan et al., 2011, Hanna et al., 2005, Leila et al., 2006, Niemi-Murola et al., 2007, Schreiner et al., 2011, Sloan et al., 2004, Stevens et al., 2009, Tellier et al., 2013, Watt-Watson et al., 2004b). However, these studies did not investigate attitude towards pain in non-verbal humans, although many reported that undergraduate pain teaching for non-verbal humans was inadequate.

Of the few studies on medical students which have included pain in non-verbal humans, the results are conflicting. One study reported medical students as having positive attitudes towards pain in some non-verbal humans, for example, for the item ‘babies do not experience pain’ 100% responded ‘strongly disagree’ or ‘disagree’ (Ameringer et al., 2012). However, other authors have reported medical students as having more negative attitude towards pain in paediatric patients (Wilson et al., 1992). There have been no studies assessing medical student attitudes towards pain when entering University; in different non-verbal humans; and what patient and/or student

factors influence these attitude, although medical students' age and gender have been reported as being associated with attitude towards pain in general (Niemi-Murola et al., 2007).

In addition, there have been no previous studies investigating the attitude of veterinary students to pain in non-verbal humans; or the attitude of medical students to pain in animals. As medical students may be involved in future biomedical research using animal models, it would be helpful to know the attitude towards pain in various animal species of these students in order to promote development of helpful attitudes and improve animal welfare.

The aim of this chapter is to determine veterinary and medical student baseline attitudes towards pain in animals and non-verbal humans, and determine what animal/ patient and/ or students factors influence these attitudes.

4.3 Overview of chapter

This chapter presents the following;

- QUAN data from a questionnaire containing background demographic information and the *Expectation of Pain (EP)* section. This was completed by veterinary and medical students in their first week on of entering University.
- Comparison of how students rated *EP* when entering Edinburgh University
- Analysis of data to determine if there is an association between background demography and/or characteristics, and attitude towards pain in animals and non-verbal humans.
- Summary of results.
- Discussion of the results in the context of the research question.

4.4 Methods

A questionnaire was developed to gather quantitative data on student characteristics, prior experience and attitude to pain in various animal species (*Chimpanzee; Dog; Cat; Horse; Rabbit; Cow; Sheep; Pig; Bird; Snake; Fish; Insect*) and non-verbal humans (*Foetus; Learning difficulties; Dementia; Coma; Anaesthetized*) as measured by the *Expectation of Pain (EP)* attitudinal scale. Veterinary and medical students were asked to complete hardcopies of the questionnaire at the start of entering The University of Edinburgh College of Medicine and Veterinary Medicine.

The QUANT data described in this chapter was collected from 1st year (V2012_17, V2013_18, GEP2014_18, M2012_17 & M2013_18) students during the 2012-13, or 2013-14, or 2014-15 academic years (Table 4-1).

Academic year	2012 intake	2013 intake	2014 intake
Sept 2012 - July 2013 Study population	QUAN: Background & pain attitude Questionnaire V2012_17 M2012_17		
Sept 2013 – July 2014 Study population	QUAL: interviews V2012_17 M2012_17	QUAN: Background & pain attitude Questionnaire V2013_18 M2013_18	
Sept 2014 – July 2015 Study population			QUAN: Background & pain attitude Questionnaire (veterinary Graduate Entry Programme) GEP2014_18

Table 4-1. Overview of study timeline. Quantitative data collection time points highlighted in Green, Qualitative data collection time point highlighted in Orange. Where study population denotes veterinary (V) and medical (M) students from intake year 2012 (2012_17) or 2013 (2013_18), and Graduate Entry Programme veterinary students intake year 2014 (GEP2014_18). Red circles identify data presented in chapter 4.

The quantitative data was analysed to determine veterinary and medical students attitude towards pain in animals and non-verbal humans, and what factors were associated with these attitudes. A full description of the methods can be found in section 3.6.

4.5 Description of respondents

A total of 496 five-year veterinary students (V2012_17, V2013_18, GEP2014_18) and medical (M2012_17, M2013_18) students completed the questionnaire. Response rates from V2012_17, V2013_18 and GEP2014_18 were excellent, being between 89-95%, but the response rate from M2012_17 was poor (7.2%) due to early morning scheduling of the optional lecture. The response rate for M2013_18 improved and was 45.3%.

4.5.1. Respondent age and gender

The mean age of all respondents was 20.13 $\pm$ SD 3.2 years (Table 4-2).

Intake year		Number of students (%response rate)	Age in years (mean $\pm$ standard deviation)	Female (%)	Male (%)
2012	Vet (V201217)	119 (91.5%)	19.79 $\pm$ 3.36	84.0	16.0
	Med (M2012_17)	26 (7.2%)	18.65 $\pm$ 1.64	65.4	34.6
2013	Vet (V2013_18)	115 (89.1%)	19.30 $\pm$ 2.79	84.3	15.7
	Med (M2013_18)	190 (45.3%)	18.20 $\pm$ 0.95	49.4	51.6
2014	GEP (GEP2014_18)	46 (95.7%)	23.02 $\pm$ 1.96	86.9	13.1

Table 4-2. Descriptive statistics of students completing initial questionnaire. *denotes significant differences ($P < 0.001$) between age of Graduate Entry Programme Veterinary (GEP) and Five-year programme veterinary (Vet5)/ medical (Med) students.

Forty-six students were on the Graduate Entry Programme (GEP2014_18) entering the main veterinary undergraduate course in year 3 and having completed a previous undergraduate degree.

Hence GEP students were older when compared to non-GEP veterinary students on the five year undergraduate course (V2012_17, V2013_18) and medical students (M2012_17, M2013_18), with mean ages being 23.02 ± 1.96 [21-30], 19.56 ± 3.09 [17-37] and 18.26 ± 1.06 [17-26] for GEP2014_18, veterinary (V2012_17, V2013_18) and medical students (M2012_17, M2013_18), respectively ($P < 0.001$) [Test:t] (Figure 4-1).

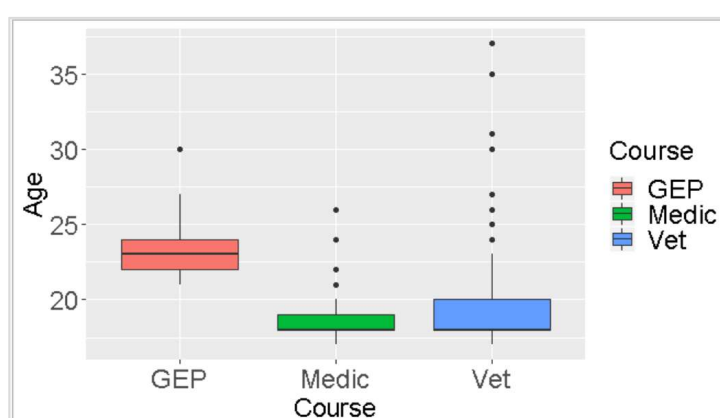


Figure 4-1. Boxplot of Age for Graduate Entry Programme veterinary students (GEP), medical students (medic) and five year course veterinary students (Vet).

There was a gender bias with females representing 84.1% and 86.9% of veterinary students (V2012_17, V2013_18, GEP2014_18), compared to 51.4% females in the medical students (M2012_17, M2013_18). However the gender balance of respondents reflected the overall gender balance in the veterinary and medical undergraduates, with female students accounting for 85% and 56% for Veterinary and Medical students, respectively.

4.5.2. Country/Continent of origin

When all student data was analysed, the majority of students originated from the United Kingdom or Ireland (number; percentage of total) (359; 71.8%) with

the remainder from mainland Europe (24; 4.9%) and North America (76; 15.1%).

Forty-three students (9.3%) originated from Asia including China, Japan and Singapore. A small number of students originated from Mainland Europe (8) and five students from other Countries across the world. Five students did not answer the question and gave no indication of Nationality or Country of origin.

When data from veterinary and medical students was analysed separately, a greater proportion (65.2%) of GEP2014_18 originated from North America, compared with 19.2% and 4.6% of non-GEP veterinary (V2012_17, V2013_18) and Medical students (M2012_17, M2013_18), respectively. The medical students were less diverse with most originating in the United Kingdom and Ireland (89.8%), with Scottish and English students accounting for 43.9% and 33.8%, respectively.

4.5.3.Previous experience with animals and non-verbal humans

i. Veterinary students

Experience of keeping animals was high amongst veterinary students and comparable between non-GEP veterinary and GEP for most pets. Experience of caring for animals was greatest for dogs (75.7%) and fish (66.4%), less for cats (57.5%), rabbits (38.9%), rodents (48.9%) and horses (28.9%) (Table 4-3).

		Percentage (%) of students answering 'Yes'			
		Vet	V2012_17 V2013_18 (234)	GEP2014_18 (46)	M2012_17 M2013_18 (216)
Domain					
	Dog	74.7*	73.5	87.0	43.5*
	Cat	57.5*	56.0	65.2	24.5*
	Rabbit	30.3	37.6	45.7	22.2
	Birds	38.9*	28.2	41.3	9.2*
	Horse	48.9*	29.1	28.3	5.0*

		Percentage (%) of students answering 'Yes'			
		Vet	V2012_17 V2013_18 (234)	GEP2014_18 (46)	M2012_17 M2013_18 (216)
Have you kept pet animals?	Rodent	18.9	48.3	52.1	22.2
	Reptile	28.9*	16.6	30.4	3.2*
	Insect	11.4	11.1	23.9	3.7
	Sheep	7.5	12.0	8.7	3.7
	Cattle	8.0	8.9	0	2.3
	Pig	5.0	5.1	4.3	1.3
	Fish	73.2*	64.1	78.3	52.7*
Have you worked with animals?	Cattle/sheep farm	76.0*	80.7	52.2	12.9*
	Pig farm	21.0*	23.1	10.9	0.5
	Fish farm	2.5	2.2	4.3	0.5
	Veterinary practice	97.1*	97.4	95.6	5.1*
	Kennels	64.6*	65.0	63.0	1.9*
	Cattery	42.5*	44.0	37.0	0*
	Stables	80.0*	81.2	73.9	12.9*
	Pet shop	12.9*	12.4	15.2 ^a	0*
	Laboratory	17.5*	15.0	30.4	2.8*
	Wildlife rescue	20.0*	20.0	19.6	0.5*
	Zoo	38.2*	39.7	30.4	0.9*
	Chicken farm	16.7*	18.4	8.7	1.8*
Have you experienced pain?	Minor painful procedure	88.9	88.5	91.3	70.8
	Major painful procedure	41.1	39.7	47.8	27.3
Have you cared for humans?	Babies	22.9	24.4	17.9	19.0
	Young Children	56.8	56.0	60.8	68.5
	Person with communication difficulty	10.7*	12.0	4.3	38.0*
	Dementia patients	15.0*	14.5	17.4	62.0*
	People with learning difficulties	18.9*	21.3	6.5	44.9*
Parent/caregiver in a clinical profession?	Medical profession	21.4	21.8	19.6	26.4
	Veterinary profession	5.3	6.1	2.2	1.4

Table 4-3. Percentage (%) of all veterinary students (Vet), [comprising of 234 five year degree veterinary students (V2012_17, V2013_18) and 46 Graduate Entry Programme veterinary students (GEP2014_18)], and 216 medical (M2012_17, M2013_18) students who answered positively to questions within five-characteristic domains included in the questionnaire. * denotes statistically significant ($P < 0.05$) differences between Vet and medical (M2012_17, M2013_18) students

As prospective veterinary students are encouraged to gain experience in caring for animals, a high percentage (>50%) of all veterinary students had experience in working with animals in stables, kennels, veterinary practices and/or cattle and sheep farms. GEP students (GEP2014_18) had less experience of working on cattle or sheep farms, but more experience of keeping reptiles and insects as pets compared to non-GEP veterinary students ($P < 0.05$) [Test:t] [Table 4-3].

Over fifty per cent of veterinary students (V2012_17, V2013_18, GEP2014_18) had experience of caring for young children (>56%) and/or dementia patients (>14.0%). Approximately 40% had experience of caring for people with learning difficulties (10.7%) and/or communication difficulties (38.0%). Fewer veterinary students had experience of caring for babies. Just under a quarter of respondents (23.2%) had a parent or caregiver in a clinical (medical or veterinary) profession. GEP students (GEP2014_18) had statistically significantly less experience in caring for people with learning disabilities, compared to Vet⁵ ($P = 0.036$) [Test:t].

As the data on previous experience of non-GEP (V2012_17, V2013_18) and GEP (GEP2014_18) veterinary students were comparable for the majority of domains (Table 4-3), it was decided to combine these groups into one veterinary group for further analysis of data.

ii. Medical students

Medical (M2012_17, M2013_18) students had less experience in caring for animals compared to veterinary students. Experience of keeping animals was most for fish (52.7%) and dogs (43.5%), less for cats (25.9%), rabbits (25.4%) and rodents (22.22%), and only 5.1% for horses. Most respondents had experience of caring for young children (68.5%), dementia patients (62.0%) or both. Many had experience of caring for people with learning difficulties (44.9%), communication difficulties (38.0%) or both. Only 19% of respondents had cared for babies. Just over a quarter of respondents (27.8%) had a parent or caregiver in a clinical (medical, allied healthcare or veterinary) profession.

4.5.4. Comparison of previous experience between veterinary and medical students

iii. Caring and /or working with animals and non-verbal humans

There were differences between veterinary and medical students in respect of their previous experience with animals and non-verbal humans, with veterinary students having more experiences of keeping and/or working with animals ($P < 0.01$) [Test: t]. Medical students had more experience in caring for non-verbal humans, although this was only statistically significant for experience of caring for people with communication difficulty; dementia patients and people with learning difficulties (Table 4-3).

iv. Self-reported Pain threshold

Eight-eight percent of all veterinary students had experienced a painful procedure prior to starting their degree (of which for 41.1% it was deemed a major painful procedure by the student) [Table 4-3]. Seventy-eight percent of Medical students had experienced a painful procedure before starting their degree. The median pain threshold for veterinary and medical students on a 1-5 ranking scale that students self-reported was 3 (range 1-5).

4.6 Veterinary students' Expectation of Pain (EP) in animals

The median EP scores for *Fish* and *Snake* were 3 [range 0-7] and 2 [0-7] for *Insect*. The median scores for all other species included were 4 [0-7]. The percentage of veterinary students who rated animals as 'less able to experience pain when compared to a typical adult human' varied depending on the species (Table 4-4).

Animal species		N	% rating EP 'less than adult human' (EP<4)	% rating EP 'unable to experience pain' (EP=0)
Primates	Chimpanzee	276	1.8	0

Companion animals	Dog	278	14.0	0
	Cat	278	14.8	0
	Horse	276	17.4	0
	Rabbit	271	26.9	0
Production animals	Pig	276	21.4	0
	Cow	276	27.5	0
Laboratory/pet animals	Rat	276	33.9	0
Wildlife/exotic pets	Bird		36.7	0
	Snake	275	54.6	1.2
	Fish	275	67.8	0
	Insect	276	75.3	7.8

Table 4-4. Percentage of veterinary students who rated 'Expectation of Pain' (*EP*) of animal species as 'less than that of an average' adult human or 'unable to experience pain'. Students were asked to rate *EP* on a 0 to 7 Likert scale, where 0 = unable to experience pain; 4 = pain experience comparable to a typical adult human; and 7 = greater pain experience than a typical adult human.

Over 50% of veterinary students scored *EP* for Snake and Fish below 4, with three-quarters scoring this for Insect. Similarly, over a third of veterinary students scored Rat and Bird; and a quarter scored Cow, as lower *EP* compared to a typical adult. In comparison, fewer students scored Horse, Cat and Dog with lower *EP*. Ratings of less than 4 on the Likert scale were lowest for Chimpanzee (1.8%) and highest for Insect (75.3%) [Table 4-4, Figure 4-2].

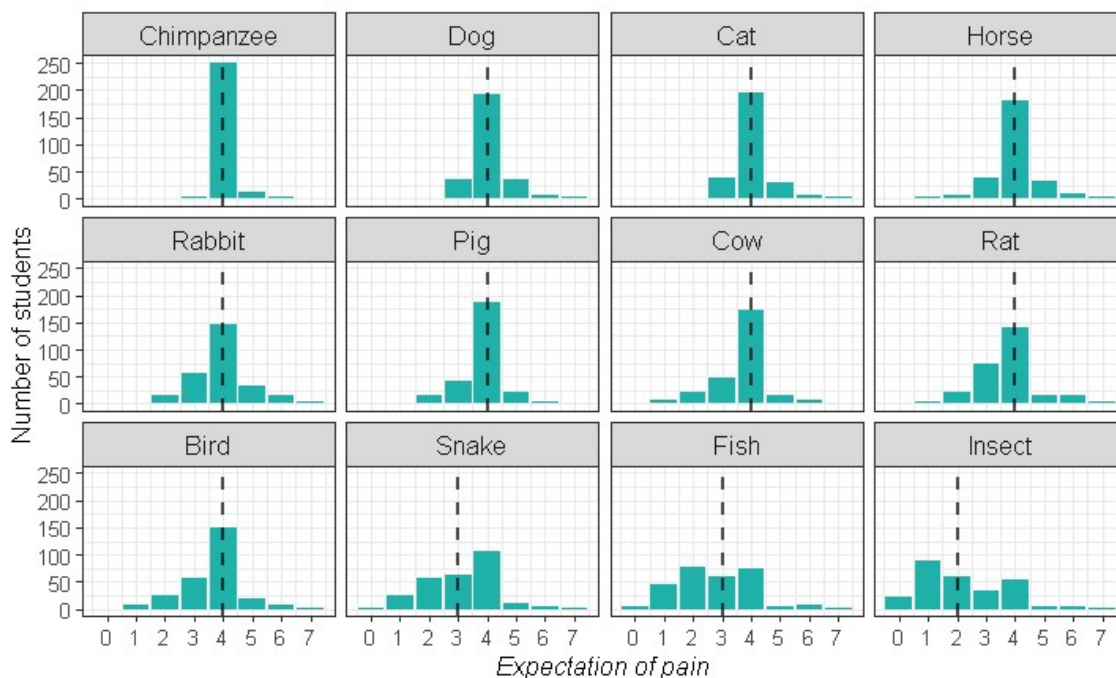


Figure 4-2. Veterinary students (Veterinary) rating of *expectation of pain (EP)* on a Likert scale for various animals [primates (*Chimpanzee*), companion animals (*Dog*; *Cat*; *Horse*; *Rabbit*), production animals (*Pig*; *Cow*), laboratory animal (*Rat*); exotic or wildlife species (*Bird*; *Snake*; *Fish*; *Insect*)]. Where *Expectation of pain* is 0 = unable to experience pain, 4 = comparable EP as a typical adult and 7 = significantly more EP than a typical adult. Vertical dashed line denotes median EP scores.

Chimpanzee was scored most consistently, with ninety one percent of veterinary students scored EP as 4 for *Chimpanzee*. No veterinary students scored primates, companion animals or production animals as EP=0, that is being 'unable to experience pain'. A small number of students rated *Snake*, *Fish* and *Insect* as being unable to experience any pain, a score of 0 on the Likert scale (Figure 4-3).

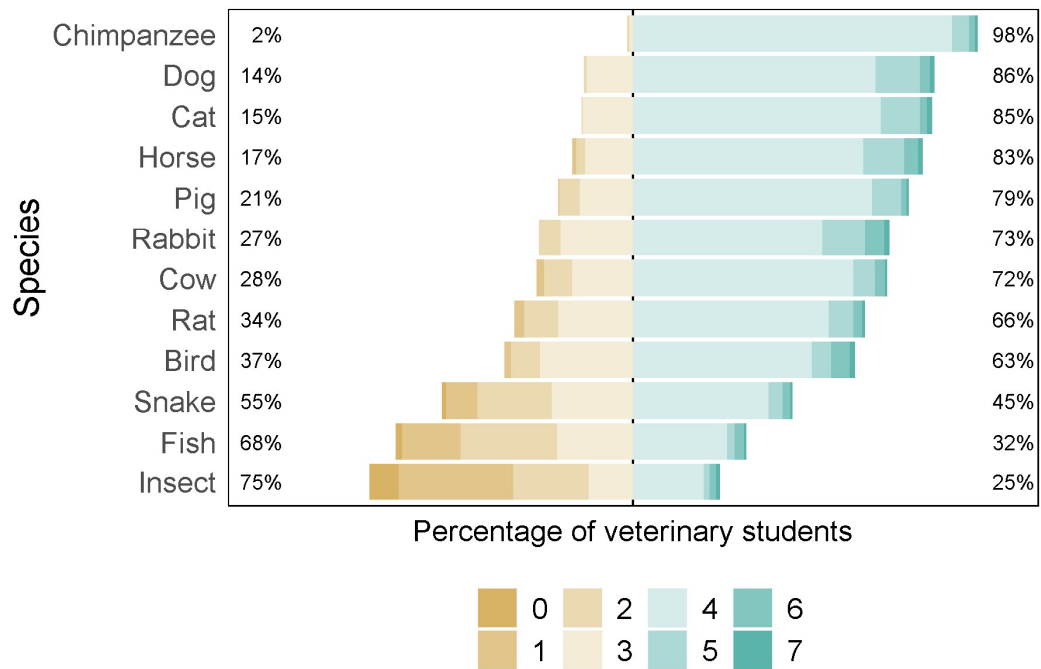


Figure 4-3. Likert plot of *Expectation of pain (EP)* rating for animal species in [Insect; Fish; Snake; Bird; Rat; Cow; Rabbit; Pig; Horse; Cat; Dog; Chimpanzee] given by veterinary students when entering University (1st year). Where *EP* is graded as, 0 = unable to experience pain (deep green), 4 = comparable *EP* as a typical adult (grey) and 7 = significantly more *EP* than a typical adult (deep pink).

4.6.1 Comparisons of veterinary student *EP* scores for different animal species

EP scores given to *Snake* and *Insect* were strongly positively correlated ($\rho=0.702$, $P<0.001$) [Test: *Spear*], as were scores given to *Chimpanzee* and *Dog* ($\rho=0.413$, $P<0.001$). *EP* scores for *Cow* were also positively correlated with *Chimpanzee*, *Dog*, *Rat*, *Snake* and *Insect* ($\rho>0.266$, $P<0.001$). In contrast, there was no statistically significant correlations between *EP* scores for *Chimpanzee* and *Rat*, *Snake* and *Insect* ($\rho<0.146$, $P>0.016$), nor between *Dog* with *Snake* or *Insect* ($\rho<0.138$, $P>0.02$). Students scored *EP* in *Chimpanzee* higher compared to *Cow*, *Rat*, *Snake* and *Insect* ($P<0.001$, Figure 4-4). Students scored *EP* in *Insects* lower compared to all other species tested ($P<0.001$, Figure 4-4). There was no difference in *EP* scores between *Chimpanzee* and *Dog* ($P=0.809$); and *Cow* and *Rat* ($P=0.07$, Figure 4-4).

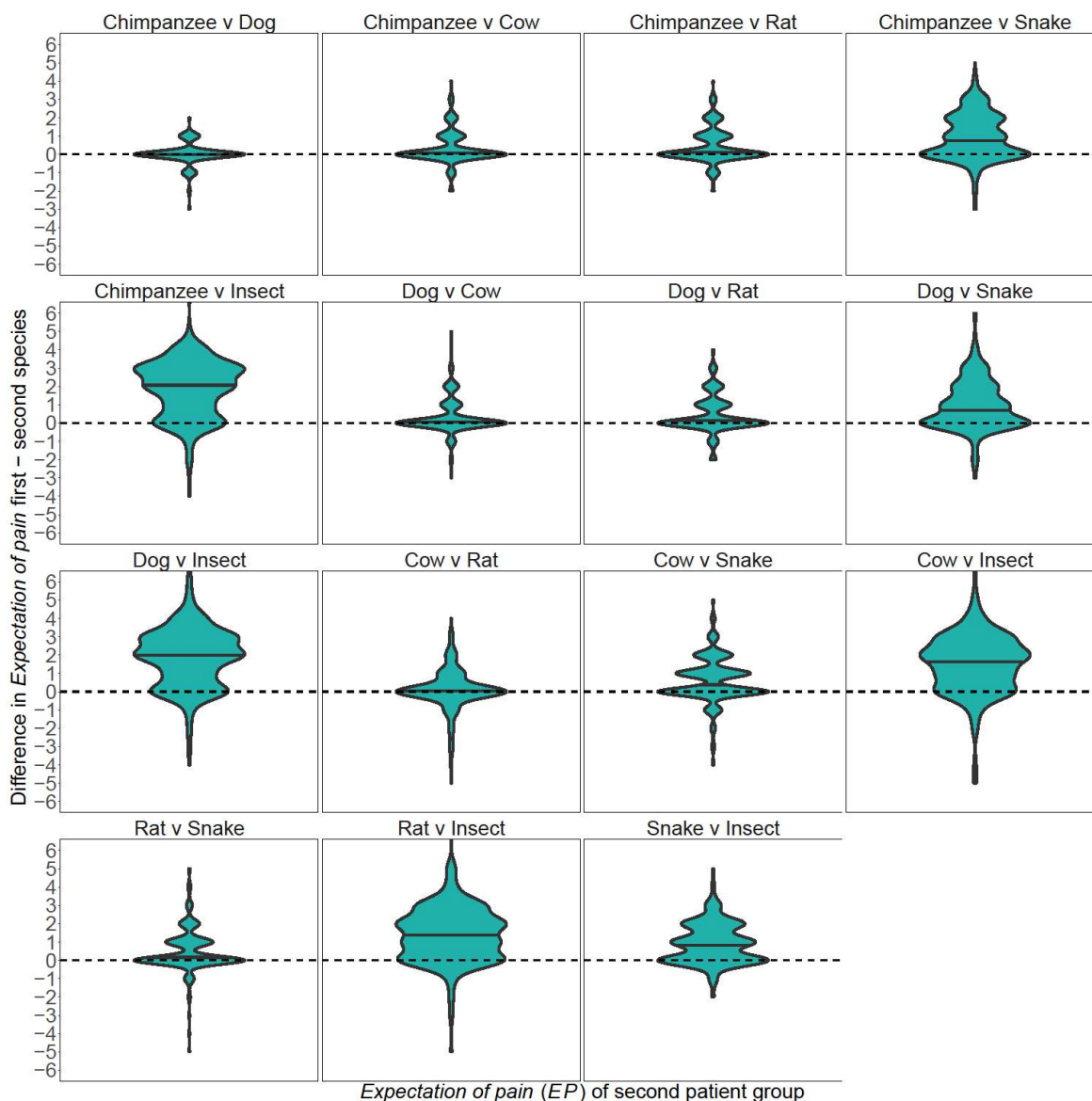


Figure 4-4. Violin density plots of the difference in *Expectation of Pain (EP)* scores given to different animals by veterinary students (Vet), where the width at any value indicates the proportion of students who gave that difference. For each panel, positive values indicate that the first patient group was given a higher *EP* score compared to the second patient group and vice versa. Solid horizontal line represents the median difference in the *EP* given to the pair of patient groups. Dashed horizontal line indicates no difference in *EP* scores between patient groups.

4.7 Veterinary student *EP* scores for non-verbal humans

The median scores for *EP* allocated to *Baby*, *Learning Difficulties* or *Dementia* were 4 [range (1-7)], with the median *EP* score for *Foetus* of 3 (0-7). The lowest median *EP* scores were allocated to *Anaesthetized* (1) and *Coma* (2) (Figure 4-5).

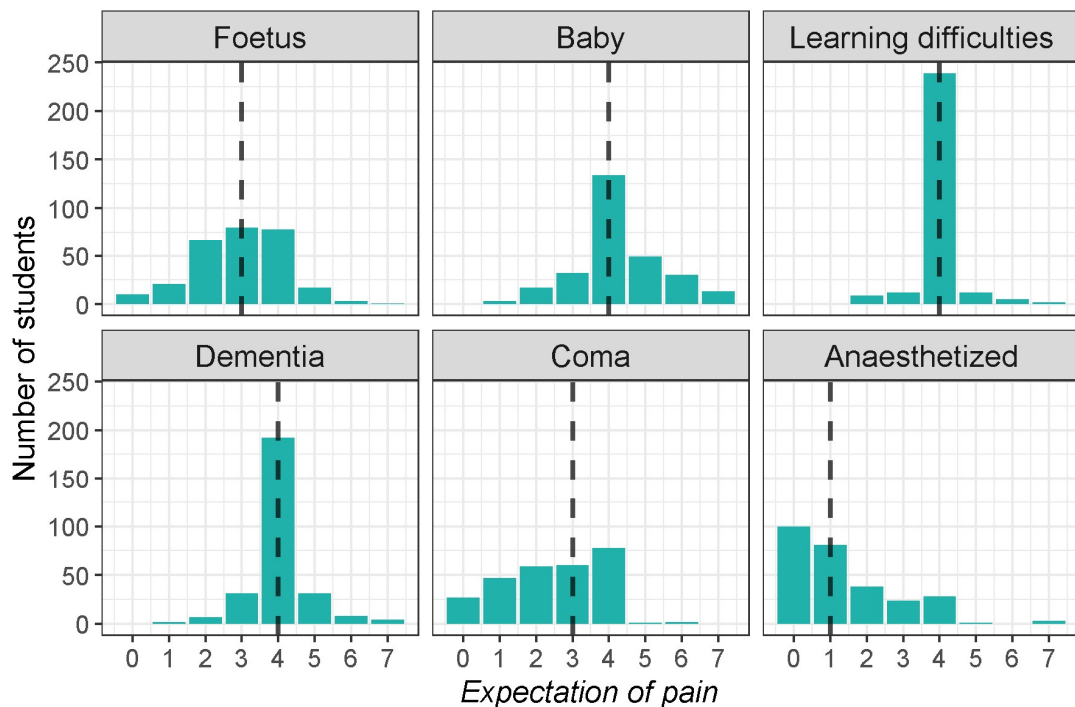


Figure 4-5. Veterinary (Vet) students rating of *expectation of pain (EP)* on a Likert scale for non-verbal patient groups [*Foetus* in last trimester (*Foetus*); Newborn baby (*Baby*); person with learning difficulties (*Learning difficulties*); person with dementia/ cognitive impairment (*Dementia*); person in a coma (*Coma*); anaesthetized person (*Anaesthetized*)], where *Expectation of pain* is 0 = unable to experience pain, 4 = comparable *EP* as a typical adult and 7 = significantly more *EP* than a typical adult. Vertical dashed line denotes median expectation pain scores for all students.

Learning difficulties was scored most consistently with 85% of veterinary students scoring *EP* as 4 for this patient type. The majority of students (over 60%) scored *Foetus*, *Coma* and *Anaesthetized* as having lower expectation of ability to experience pain when compared to a typical adult human (Figure 4-6).

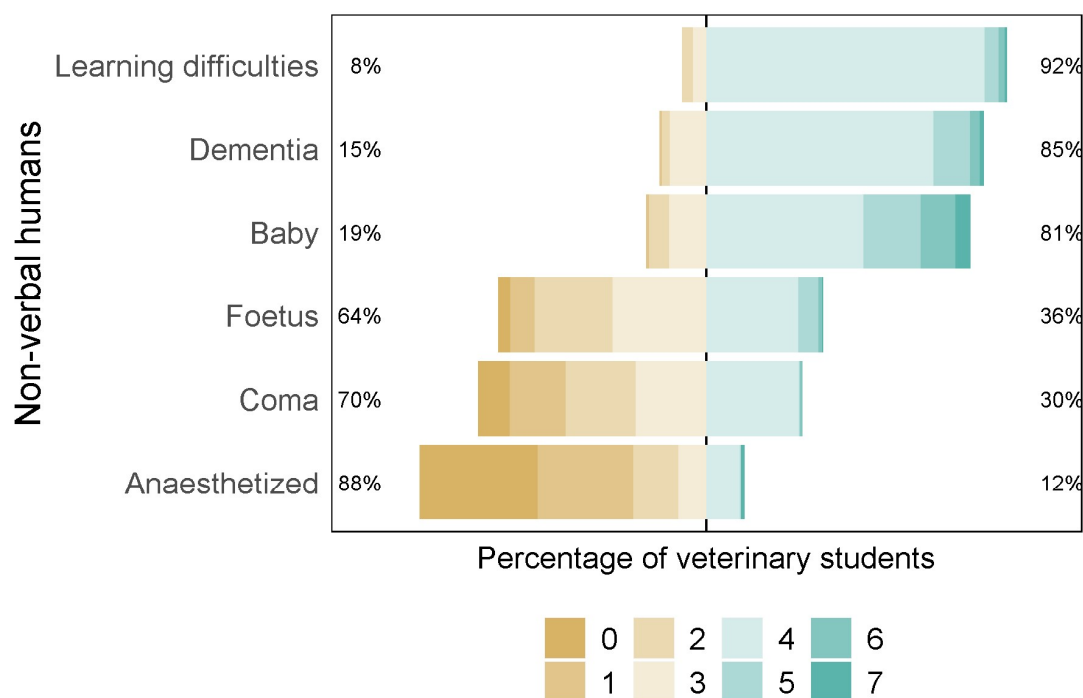


Figure 4-6. Likert plot of Expectation of pain (*EP*) rating for Non-verbal humans [Anaesthetized; Coma; Foetus; Baby; Dementia; Learning Difficulties] given by veterinary students when entering University (1st year). Where *Expectation of pain* is graded as, 0 = unable to experience pain (deep green), 4 = comparable *EP* as a typical adult (grey) and 7 = significantly more *EP* than a typical adult (deep pink).

Compared with the number of veterinary students who rated *Foetus*, *Coma* and *Anaesthetized* as less able to experience pain, a lower percentage of veterinary students rated *Baby* (18.7%), *Dementia* (14.5%) and *Learning difficulties* (7.7%) with lower pain capability when compared to a typical adult human (Table 4-5). No veterinary students rated *Baby*, *Learning difficulties* or *Dementia* as unable to experience pain (*EP*=0). However, over a third rated *Anaesthetized* as unable to experience pain. A small number of veterinary students rated *Foetus* and *Coma* as unable to experience pain.

Non-Verbal Human Patient type		Veterinary students(EP) rating	
		% rating 'less than an adult' (EP<4)	% rating 'unable to experience pain' (EP=0)
Paediatric	Foetus in last trimester (<i>Foetus</i>)	64.1	2.9
	Newborn baby (<i>Baby</i>)	18.7	0
Vulnerable adults	Person with profound learning difficulties (<i>Learning difficulties</i>)	7.7 ^a	0
	Person with dementia / cognitively impairment (<i>Dementia</i>)	14.5	0
Hospitalized patients	Person in a coma (<i>Coma</i>)	70.4	9.4
	Anaesthetized person (<i>Anaesthetized</i>)	88.4	35.5

Table 4-5. Percentage of 280 veterinary students who rated 'Expectation of Pain' (EP) of various non-verbal human (NVH) patients when compared to a typical adult human, as less than that of a typical adult. Students scored EP on a 0 to 7 Likert scale, where at 0 (unable to experience pain) and 4 (equivalent pain experienced to a typical adult) and 7 (significantly greater pain experienced compared to a typical adult). ^a = 279.

4.7.1. Comparisons between veterinary student EP scores of different non-verbal humans

Students scored EP in *Foetus* lower compared to *Baby*, *Learning Difficulties* or *Dementia* ($P<0.001$), but higher compared to *Coma* and *Anaesthetized* ($P<0.001$). This higher average EP compared to *Coma* and *Anaesthetized* was also observed for *Baby*, *Learning Difficulties* or *Dementia* ($P<0.001$). Students also scored *Coma* patients on average as having a higher EP compared to *Anaesthetized* ($P<0.001$, Figure 4-7).

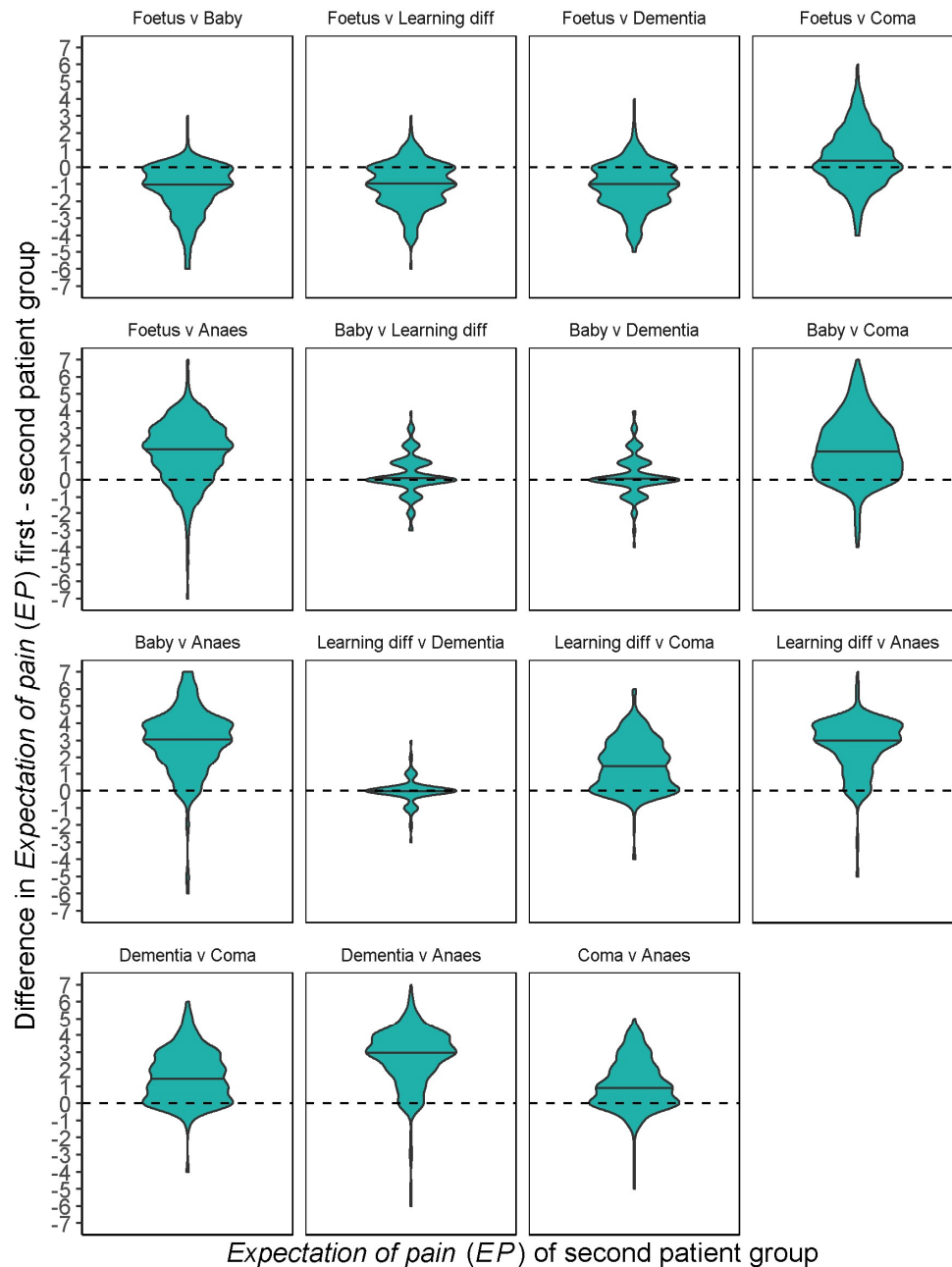


Figure 4-7. Violin density plots of the difference in *EP* scores given to different patient groups (see Figure 1) by veterinary students (Vet), where the width at any value indicates the proportion of students who gave that difference. For each panel, positive values indicate that the first patient group was given a higher *EP* score compared to the second patient group and *vice versa*. Solid horizontal line represents the median difference in the *EP* given to the pair of patient groups. Dashed horizontal line indicates no difference in *EP* scores between patient groups.

EP scores given to *Foetus* and *Baby* were weakly positively correlated ($\rho=0.270$, $P<0.001$), as were *EP* scores for *Coma* and *Anaesthetized* ($\rho=0.459$, $P<0.001$) [Test: Spear]. *EP* scores for *Dementia* were also positively correlated with *Foetus*, *Baby* and *Learning Difficulties* ($\rho>0.188$, $P<0.001$). In contrast, there was no statistically significant correlations between *EP* scores for *Dementia* and *Anaesthetized* ($|\rho|<0.123$, $P>0.156$).

There was weak positive correlation between *EP* scores given to *Coma* patients and *Foetus*, ($\rho = 0.228$, $P<0.001$), but no correlation between *EP* scores for *Coma* and *Baby*, *Learning Difficulties* or *Dementia* ($|\rho|<0.144$, $P>0.02$).

4.8 Medical students' Expectation of Pain (*EP*) of animals

The median *EP* scores for *Rat*, *Bird* and *Snake* were 3 [range 0-7] and 2 [0-7] for *Insect* and *Fish*. The median scores for all other species included were 4 [0-7] (Figure 4-8).

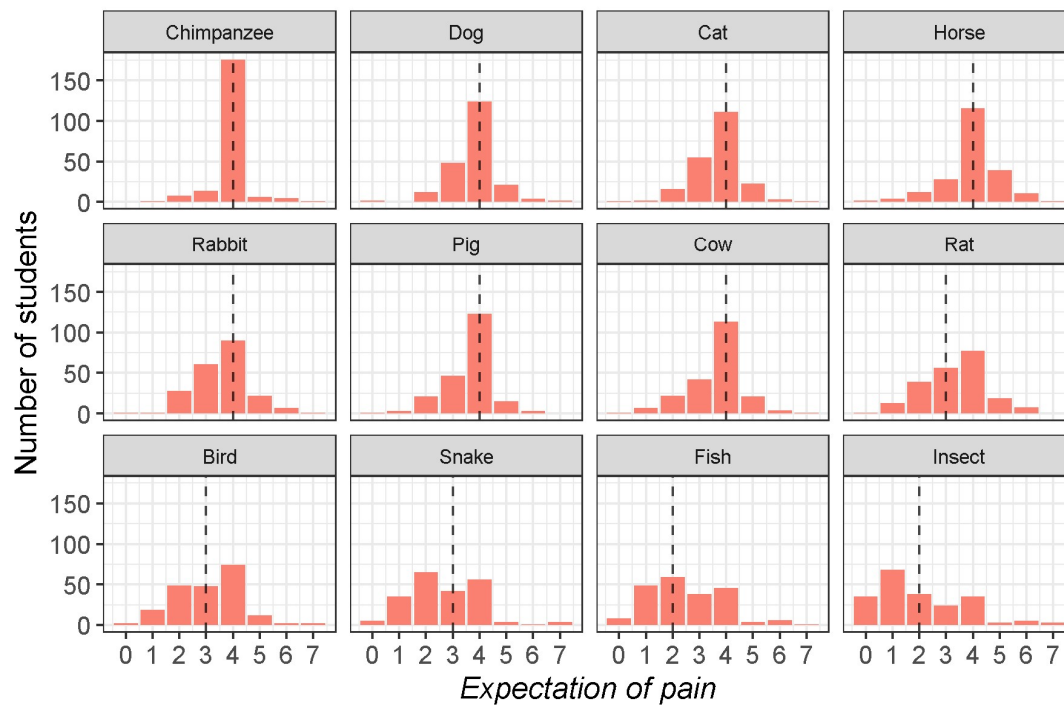


Figure 4-8. Medical students rating of *Expectation of pain (EP)* on a Likert scale for various animals [primates (*Chimpanzee*), companion animals (*Dog*; *Cat*; *Horse*; *Rabbit*), production animals (*Pig*; *Cow*), laboratory animal (*Rat*); exotic or wildlife species (*Bird*; *Snake*; *Fish*; *Insect*)]. Where *Expectation of pain* is 0 = unable to experience pain, 4 = comparable *EP* as a typical adult and 7 = significantly more *EP* than a typical adult. Vertical dashed line denotes median expectation pain scores for all students. .

The percentage of students who rated animals as less able to experience pain when compared to an adult human (that is *EP* < 4 on the Likert scale) varied depending on the species. No medical students scored primates as *EP*=0, that is being '*unable to experience pain*'. A small number of students rated companion animals, production animals, laboratory animals and wildlife/exotic animals as being unable to experience any pain (Table 4-6)

Animal species		N	% rating <i>EP</i> 'less than adult human' (<i>EP</i> <4)	% rating <i>EP</i> 'unable to experience pain' (<i>EP</i> =0)
Primates	<i>Chimpanzee</i>	208	10.9	0
Companion animals	<i>Dog</i>	213	29.1	0.9
	<i>Cat</i>	212	34.9	0.5
	<i>Horse</i>	213	21.6	0.9
	<i>Rabbit</i>	211	43.1 ^a	0.5 ^a
Production animals	<i>Pig</i>	213	33.8 ^a	0.5 ^a
	<i>Cow</i>	211	34.1 ^a	0.5 ^a
Laboratory/ pet animals	<i>Rat</i>	211	56.7 ^a	0.9 ^a
Wildlife/ exotic pets	<i>Bird</i>	211	51.2	0.5
	<i>Snake</i>	211	69.3 ^a	2.3 ^a
	<i>Fish</i>	212	72.9 ^a	3.7 ^a
	<i>Insect</i>	211	78.2 ^a	16.2 ^a

Table 4-6. Percentage of medical students who rated *Expectation of Pain (EP)* of animal species as 'less than that of an average adult human' or 'unable to experience pain'. Students were asked to rate *EP* on a 0 to 7 Likert scale, where 0 = unable to experience pain; 4 = pain experience comparable to a typical adult human; and 7 = greater pain experience than a typical adult human. ^a= 213

Over 50% of medical students scored *EP* for *Rat*, *Bird*, *Snake* and *Fish* below 4, with over three-quarters scoring this for an *Insect*. Over a third of medical students scored *Cat*, *Rabbit*, *Pig* and *Cow*; and over a quarter scored *Dog* and *Horse*, as lower *EP* compared to a typical adult (Table 4-6, Figure 4-9).

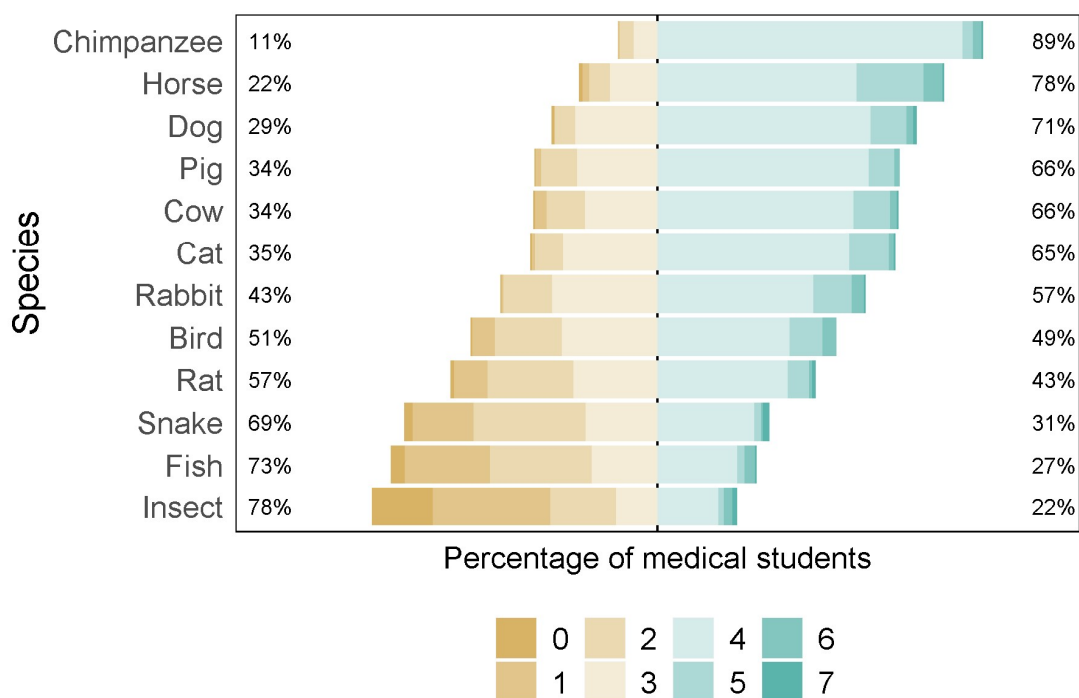


Figure 4-9. Likert plot of medical student *Expectation of pain (EP)* rating for animal species [*Insect; Fish; Snake; Rat; Bird; Rabbit; Cat; Cow; Pig; Dog; Horse; Chimpanzee*] given by medical students when entering University (1st year). Where Expectation of pain is graded as, 0 = unable to experience pain (deep orange), 4 = comparable EP as a typical adult (grey) and 7 = significantly more EP than a typical adult (deep green).

4.8.1 Comparison of medical student EP scores of animals

EP scores given to *Snake* and *Insect* were strongly positively correlated ($\rho=0.617$, $P<0.001$), as were scores given to *Chimpanzee* and *Dog* ($\rho=0.427$, $P<0.001$). EP scores for *Cow* were positively correlated with *Chimpanzee*, *Dog*, *Rat*, *Snake* and *Insect* ($\rho<0.366$, $P<0.001$).

Students scored EP in *Chimpanzee* higher compared to *Cow*, *Rat*, *Snake* and *Insect* ($P<0.001$, Figure 4-10). Students scored EP in *Insect* lower compared to all other species tested ($P<0.001$, Figure 4-10). There was no difference in EP scores between *Chimpanzee* and *Dog* ($P=0.018$).

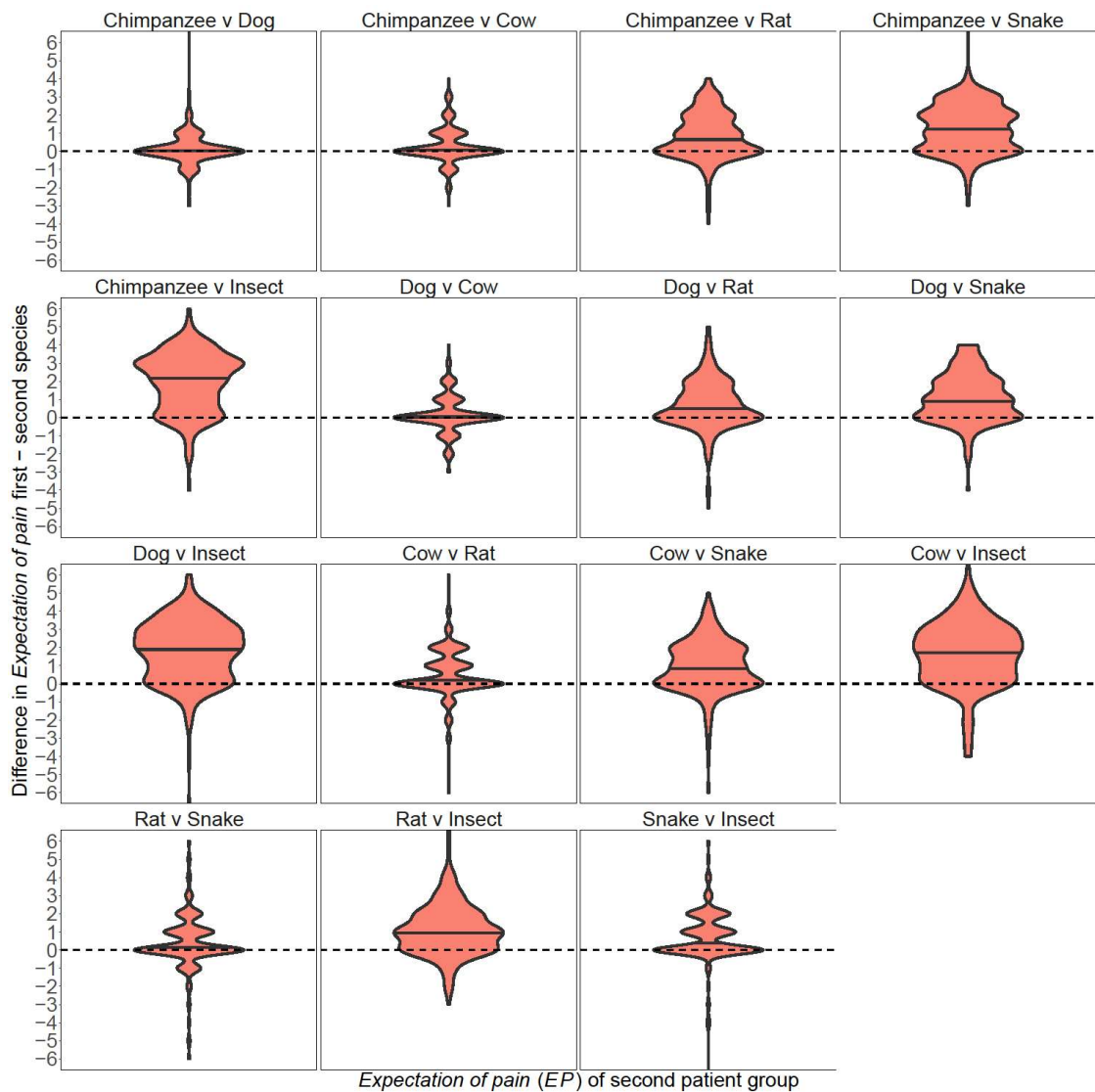


Figure 4-10. Violin density plots of the difference in *EP* scores given to different animals by medical students, where the width at any value indicates the proportion of students who gave that difference. For each panel, positive values indicate that the first patient group was given a higher *EP* score compared to the second patient group and vice versa. Solid horizontal line represents the median difference in the *EP* given to the pair of patient groups. Dashed horizontal line indicates no difference in *EP* scores between patient groups.

4.9 Medical student *EP* scores for non-verbal patient groups

The median *EP* scores for *Baby*, *Learning difficulties* and *Dementia* were 4 [range 1-7] and 3 [0-7] for *Foetus*. The median *EP* score for *Coma* was 2 [0-7]

and *Anaesthetized* was 1 [0-7]. The percentage of students who rated animals as less able to experience pain when compared to an adult human (that is $EP < 4$ on the Likert scale) varied depending on the species. Over 90% of students scored $EP < 4$ for *Anaesthetized*, with three-quarters scoring this for *Coma*. Similarly, over half of all students scored *Foetus* $EP < 4$, and a quarter of students scored *Baby* $EP < 4$. In comparison, fewer students scored *Dementia* or *Learning Difficulties* $EP < 4$ (Table 4-7, Figure 4-11).

Patient type		Medical students(EP) rating		
		N	% rating 'less than an adult' ($EP < 4$)	% rating 'unable to experience pain' ($EP = 0$)
Paediatric	Foetus in last trimester (<i>Foetus</i>)	212	59.0	7.1
	Newborn baby (<i>Baby</i>)	214	26.1	0
Vulnerable adults	Person with profound learning difficulties (<i>Learning difficulties</i>)	214	7.9	0
	Person with dementia / cognitively impairment (<i>Dementia</i>)	213	20.2	0
Hospitalized patients	Person in a coma (<i>Coma</i>)	212	75.5	13.2
	Anaesthetized person (<i>Anaesthetized</i>)	214	91.6	46.3

Table 4-7. Percentage of 216 medical students who rated ability of various non-verbal patients to experience pain when compared to a typical adult human (EP), as less than that of a typical adult. Students scored EP on a 0 to 7 Likert scale, where at 0 (unable to experience pain) and 4 (equivalent pain experienced to a typical adult) and 7 (significantly greater pain experienced compared to a typical adult).

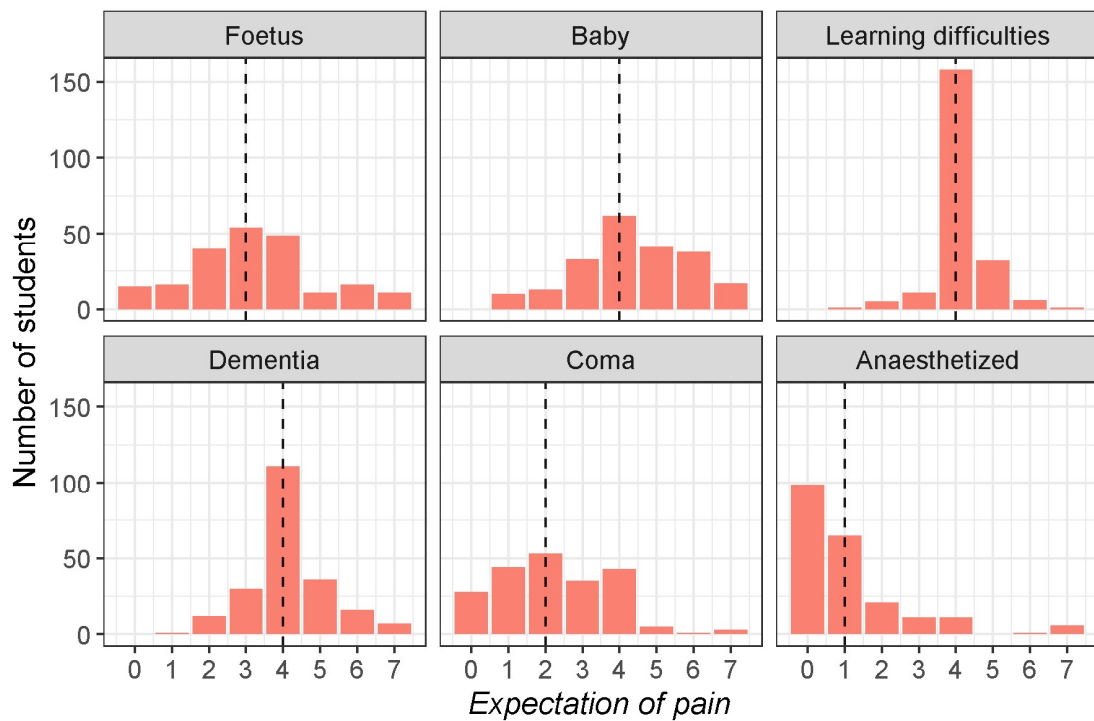


Figure 4-11. Medical students rating of expectation of pain (*EP*) on a Likert scale for non-verbal patient groups [*Foetus* in last trimester (*Foetus*); Newborn baby (*Baby*); person with learning difficulties (*Learning difficulties*); person with dementia/ cognitive impairment (*Dementia*); person in a coma (*Coma*); anaesthetized person (*Anaesthetized*)], where 0 = unable to experience pain, 4 = comparable *EP* as a typical adult and 7 = significantly more *EP* than a typical adult. Vertical dashed line denotes median expectation pain scores for all students.

No students scored *EP* as 0 for *Baby*, or *Dementia* or *Learning Difficulties*. However, 7% and 13% of students scored *Foetus* and *Coma* as having no *EP*, respectively. In addition, 46% of students scored *Anaesthetized EP* as 0 (Table 4-7, Figure 4-11). *Learning difficulties* was scored most consistently with 70% of veterinary students scoring *EP* as 4 for this patient type. The majority of students (over 59%) scored *Foetus*, *Coma* and *Anaesthetized* as having lower expectation of ability to experience pain when compared to a typical adult human(Figure 4-6).

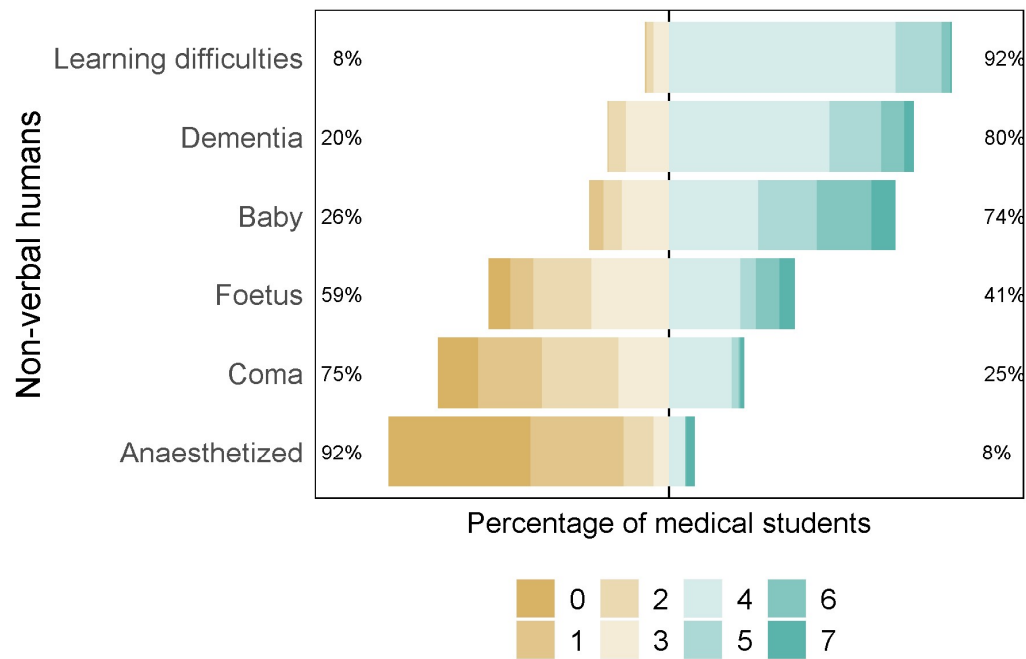


Figure 4-12. Likert plot of *Expectation of pain (EP)* rating for Non-verbal humans in alphabetical order [*Anaesthetized; Coma; Dementia; Foetus; Learning Difficulties; Baby*] given by medical students when entering University (1st year). Where *Expectation of pain* is graded as, 0 = unable to experience pain (deep green), 4 = comparable *EP* as a typical adult and 7 = significantly more *EP* than a typical adult (deep pink).

4.9.1 Comparison of medical student *EP* scores for non-verbal humans

EP scores given to *Foetus* and *Baby* were strongly positively correlated ($\rho=0.575$, $P<0.001$), as were *EP* scores for *Coma* and *Anaesthetized* ($\rho=0.518$, $P<0.001$). *EP* scores for people with *Dementia* were also positively correlated with *Foetus*, *Baby*, *Learning Difficulties* and *Anaesthetized* ($\rho>0.155$, $P<0.001$). In contrast, there was no statistically significant correlations between *EP* scores for *Coma* with *Foetus*, *Baby*, *Learning Difficulties* or *Dementia* ($|\rho|<0.123$, $P>0.075$), nor between *Anaesthetized* with *Foetus*, *Baby*, or *Dementia* ($|\rho|<0.077$, $P>0.264$) (Figure 4-13).

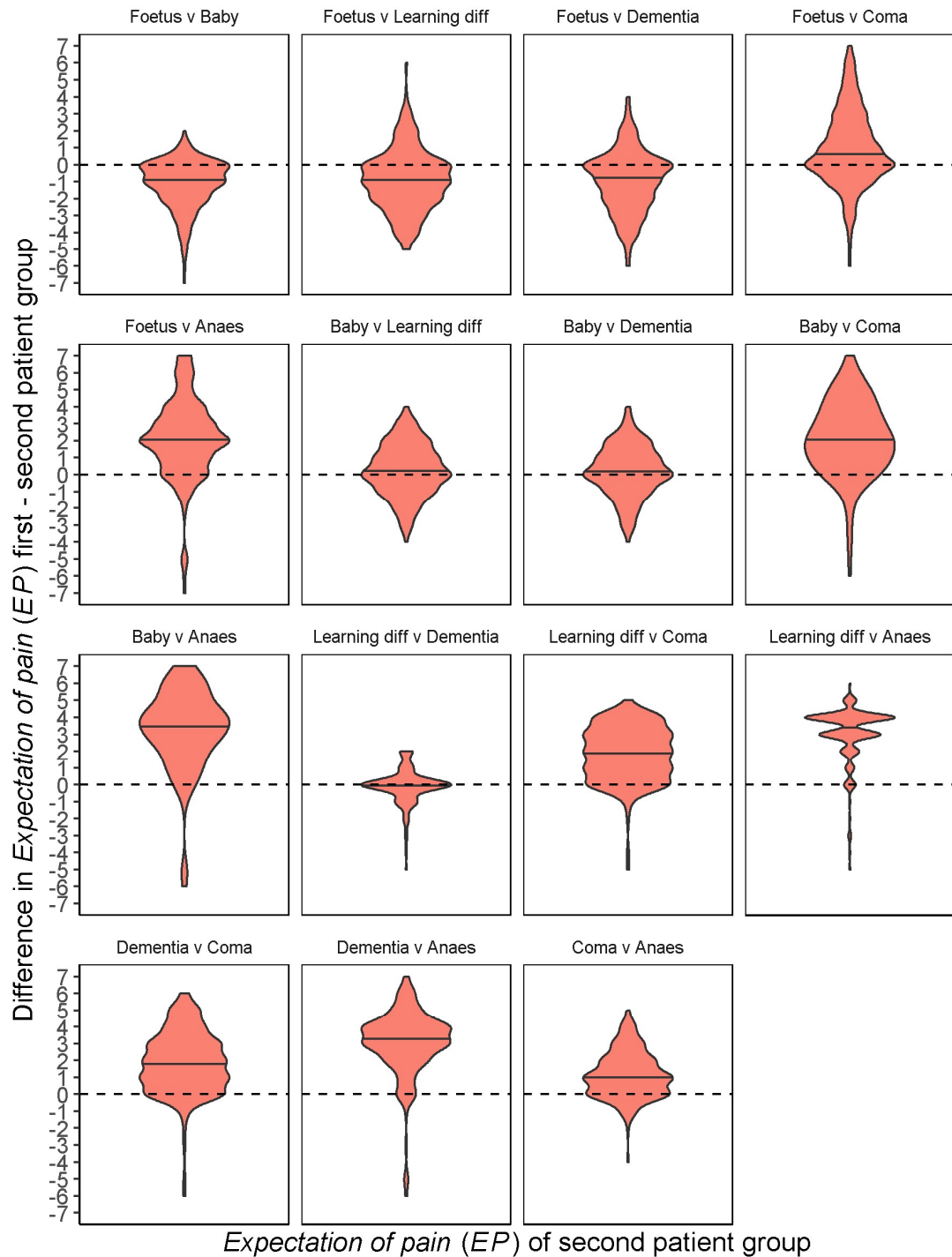


Figure 4-13. Violin density plots of the difference in *EP* scores given to different patient groups (see Figure 1) by medical students, where the width at any value indicates the proportion of students who gave that difference. For each panel, positive values indicate that the first patient group was given a higher *EP* score compared to the second patient group and *vice versa*. Solid horizontal line represents the median difference in the *EP* given to the pair of patient groups. Dashed horizontal line indicates no difference in *EP* scores between patient groups.

Students scored *EP* in *Foetus* lower compared to *Baby*, *Learning Difficulties* or *Dementia* ($P<0.001$), but higher compared to *Coma* and *Anaesthetized* ($P<0.001$). This higher average *EP* compared to *Coma* and *Anaesthetized* was also observed for *Baby*, *Learning difficulties* and *Dementia* ($P<0.001$). Students also scored *Coma* on average as having a higher *EP* compared to *Anaesthetized* ($P<0.001$, Figure 4-13).

4.10 Comparison of veterinary and medical students *EP* data for animals

For all the species included in the questionnaire a higher percentage of medical students rated $EP<4$ compared to veterinary students. For example, only 1.8% of veterinary students rated *Chimpanzee* <4 , compared to over 10% of medical students (Table 4-8).

Species		Med		Vet	
		N	% rating pain less than adult human	N	% rating pain less than adult human
Primates	<i>Chimpanzee</i>	208	10.9	276	1.8
Companion animals	<i>Dog</i>	213	29.1	278	14.0
	<i>Cat</i>	212	34.9	278	14.8
	<i>Horse</i>	213	21.6	276	17.4
	<i>Rabbit</i>	211	43.1	271	26.9
Production animals	<i>Pig</i>	213	33.8	276	21.4
	<i>Cow</i>	211	34.1	276	27.5
Laboratory	<i>Rat</i>	211	56.7	276	34.0
Wildlife/exotic	<i>Bird</i>	213	51.1	276	36.7
	<i>Snake</i>	212	69.3	275	54.6
	<i>Fish</i>	211	73.0	276	67.8
	<i>Insect</i>	211	78.2	275	75.3

Table 4-8. Number and percentage of first veterinary students (Vet) and medical students (Med) who rated *EP* of various animal species as less than that of a typical adult human.

There was a statistically significant difference in how veterinary and medical students rated pain in all but two of the species ($p<0.031$), with more medical

students than veterinary students scoring these species as less able to experience pain compared to a typical adult human. However there was no statistically significant difference between how veterinary and medical students rated *EP* for *Horse* and *Cow* ($p > 0.29$, Figure 4-14) [test:Mann-Whit].

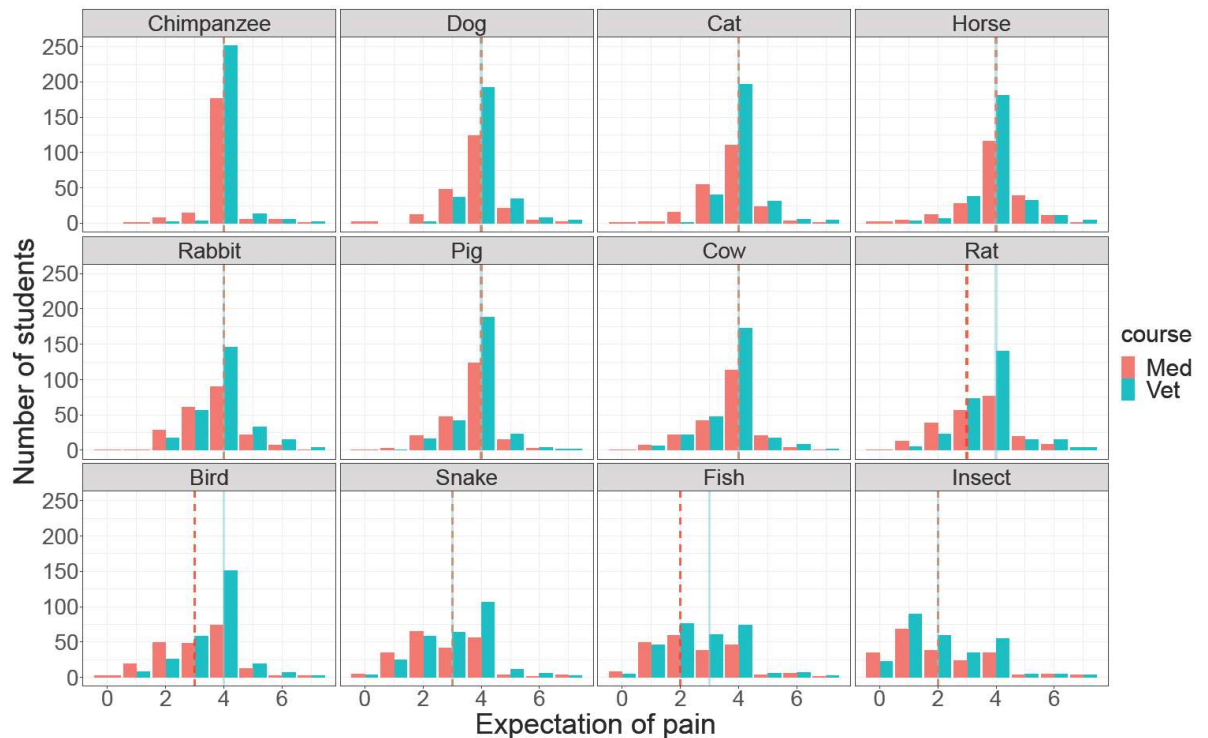


Figure 4-14. Veterinary (Vet) and medical (Med) students rating of *EP* of various animals [primates (*Chimpanzee*), companion animals (*Dog*; *Cat*; *Horse*; *Rabbit*), production animals (*Pig*; *Cow*), laboratory animal (*Rat*); exotic or wildlife species (*Bird*; *Snake*; *Fish*; *Insect*)]. Where *Expectation of pain* is 0 = unable to experience pain, 4 = comparable *EP* as a typical adult and 7 = significantly more *EP* than a typical adult. Red vertical dashed line denotes median expectation pain scores for medical students. Solid blue line denotes median expectation of pain scores for veterinary students.

4.11 Comparison of veterinary and medical students *EP* data for non-verbal humans

For the majority of the non-verbal human groups included in the questionnaire, a higher percentage of medical students rated $EP < 4$. For *Foetus* a higher percentage of veterinary students rated $EP < 4$, compared to medical students (Table 4-9).

Patient type / species		Med		Vet	
		N	% rating pain less than adult human	N	% rating pain less than adult human
Children	<i>Foetus</i>	212	59.0	276	64.1
	<i>Baby</i>	214	26.1	278	18.7
Vulnerable adults	<i>Learning difficulties</i>	214	7.9	279	7.5
	<i>Dementia</i>	213	20.2	275	14.6
Hospitalized patients	<i>Coma</i>	212	75.5	274	70.4
	<i>Anaesthetized</i>	214	91.6	275	88.4

Table 4-9. Percentage of first medical students (Med) and veterinary students (Vet) who rated *EP* of various non-verbal human groups [*Foetus* in last trimester (*Foetus*); Newborn baby (*Baby*); person with learning difficulties (*Learning difficulties*); person with dementia/ cognitive impairment (*Dementia*); person in a coma (*Coma*); anaesthetized person (*Anaesthetized*)] as less than that of an average adult human.

There was a statistically significant difference in medical and veterinary student *EP* in *Anaesthetized*, with medical students more likely to rate *EP* lower in *Anaesthetized* compared to the veterinary students (Table 4-9, Figure 4-15, $P = 0.009$). However, no statistically significant differences were observed for the other five non-verbal human groups: *Foetus*, *Baby*, *Learning difficulties*, *Dementia* and *Coma* ($P > 0.061$, Figure 4-15).

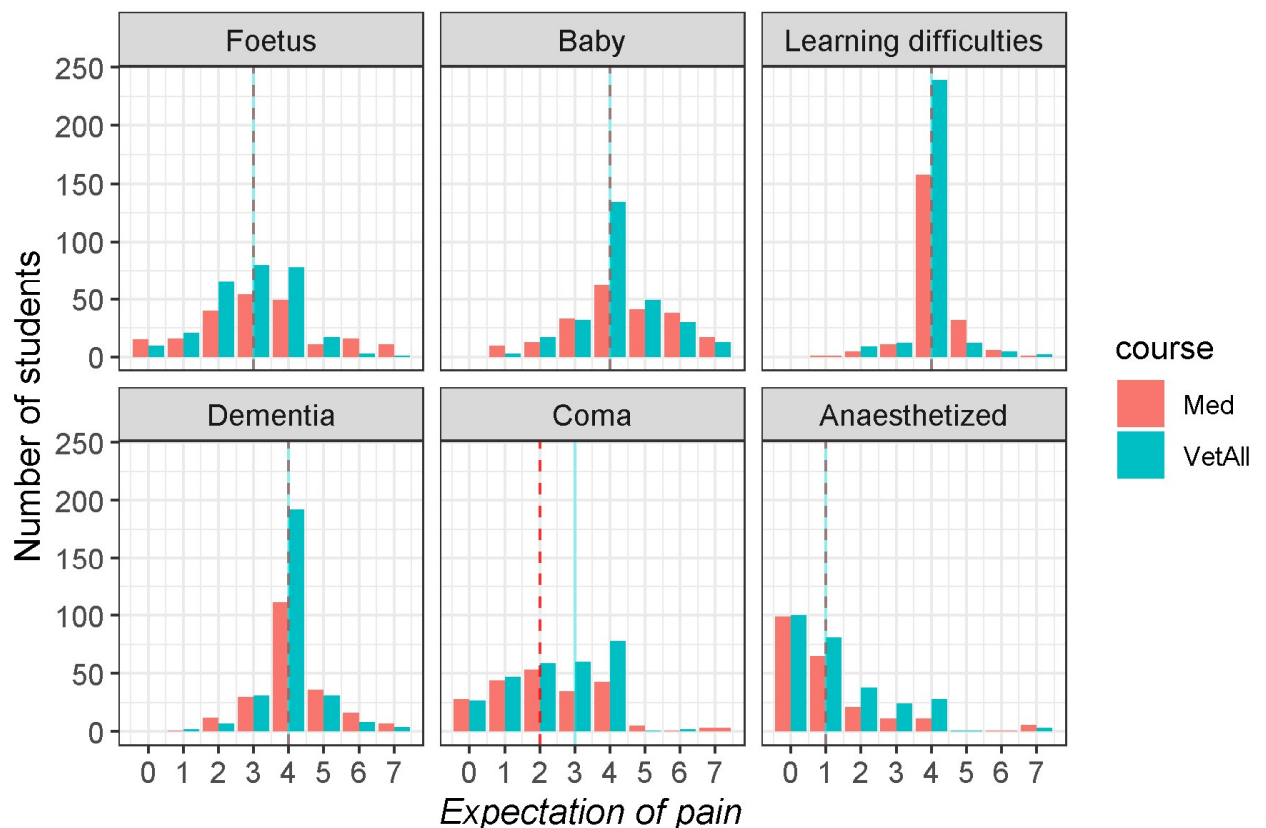


Figure 4-15. Medical (Med) and Veterinary (Vet) students rating of *EP* on a Likert scale of non-verbal patient groups [*Foetus* in last trimester (*Foetus*); Newborn baby (*Baby*); person with learning difficulties (*Learning difficulties*); person with dementia/ cognitive impairment (*Dementia*); person in a coma (*Coma*); anaesthetized person (*Anaesthetized*)], where 0 = unable to experience pain, 4 = comparable *EP* as a typical adult and 7 = significantly more *EP* than a typical adult. Red vertical dashed line denotes median expectation pain scores for medical students. Blue solid line denotes median scores for veterinary students.

4.12 Association between personal characteristics/ prior experience variables and veterinary student *EP* scores

4.12.1 Animal species

The model averaging analyses (see chapter 3, section 3.10) of the personal characteristics and prior experience variables revealed that male gender was associated with an increased rate of scoring the *EP* <4 for a *Horse*, *Rabbit*,

Pig, Cow, Sheep, Snake, Frog and Insect (OR>1.78) - though the association with the two latter patient species was not statistically significant (Table 4-10).

species	Characteristic variables	Odds Ratio
	-----	-----
Companion animals	<i>Chimpanzee</i>	
	<i>Dog</i>	Kept birds
		Worked on cattle or sheep farm
		Worked in kennel
		Cared for person with dementia
	<i>Cat</i>	Worked in cattle and sheep farm
		Care of person with communication difficulty
	<i>Horse</i>	Kept rabbits
		5 year vet course
		Male gender
	<i>Rabbit</i>	Kept cattle
		Worked in research laboratory
		Worked in animal rescue
		Male gender
		North American origin
		Rest of world origin
Production animals	<i>Pig</i>	Kept birds
		Kept cattle
		Male gender
		Experience of minor painful procedure
	<i>Cow</i>	Worked in kennel
		Worked in cattery
Laboratory Animal/ pet	<i>Rat</i>	Male gender
		Kept rodents
		Worked in pet shop
		Worked in kennels
		Worked cattery
		Worked in animal rescue centre
		Cared for person with learning disability
		Rest of world origin
		Age per decade increase
		North American origin
Wildlife/ Exotic pet	<i>Bird</i>	Kept rabbits
		Worked on cattle or sheep farm
		Worked in stables
		Cared for young children
		North American Nationality
		Rest of world origin
	<i>Snake</i>	Worked on cattle or sheep farm
		Cared for person with dementia
		5 year vet course
		Male gender
		Worked in a cattery
	<i>Fish</i>	Kept cattle
		Kept pigs
		Worked in pet shop
		Worked in cattery
		Worked in research laboratory
		North American origin
		Rest of world origin

Wildlife/ Exotic pet	<i>Insect</i>	Kept reptiles	1.91 (0.83-4.38)
		Worked on cattle or sheep farm	0.46 (0.21-0.98) *
		Worked in a pet shop	0.63 (0.28-1.46)
		Worked in a cattery	1.90 (1.02-3.52) *
		Cared for person with dementia	0.47 (0.22-1.00)
		Male gender	2.02 (0.81-5.02)
		Parent/ caregiver in clinical profession	2.07 (0.97-4.40)
		Self-reported pain threshold	0.73 (0.49-1.09)

Table 4-10. Odds ratio (OR) estimates (+ 95% confidence intervals) from model averaged 'best fit' multivariable general linear model outputs of which variables influence whether veterinary students rated expectation of pain in animals as less than an adult (<4). Only five students scored Chimpanzee as being less able to experience pain. * Statistically significant (OR).

Students who had previous experience working in kennels were less likely to score *Dog* with *EP* as less than a typical adult human (OR=0.45) (Table 4-10). Having worked in a cattery was associated with an increased likelihood of scoring *Rat*, *Snake*, *Frog* and *Insect* with lower *EP* (OR> 1.70). In contrast, students who reported having worked on cattle or sheep farm or worked in kennels were less likely to rate *EP* for *Snake*, *Frog* and *Insect* as lower than a typical adult human (OR<0.54).

Having worked in animal rescue was associated with a reduced likelihood of rating *EP* less than a typical adult for *Rabbit* (OR= 0.52). However, those students who originated from countries outside Europe or North America were more likely to rate *EP* as less than a typical adult for *Rat* and *Fish* (OR>2.87).

4.12.2.Non-verbal human

Veterinary students who had experience of caring for a non-verbal humans were more likely to score *Dementia*, *Coma* and *Anaesthetized* as *EP* < 4 (OR > 2.82) (Table 4-11).

Non-verbal patient type	Demographic variables	OR
<i>Expectation of Pain</i> less than an adult ($EP < 4$)		
<i>Foetus</i>	Pain threshold	0.74 (0.53-1.04)
	Age (per additional decade)	1.59 (0.98-2.56)
<i>Baby</i>	Cared for people with learning disability	0.58 (0.27-1.23)
	North American origin	0.48 (0.24-0.96)*
	Rest of world origin	0.63 (0.22-1.78)
<i>Learning difficulty</i>	Kept a pet rodent	1.91 (0.73-5.00)
	Cared for babies	3.23 (0.73-13.62)
	Cared for people with dementia	3.54 (0.12-1.04)
<i>Dementia</i>	Cared for babies	4.02 (1.15-14.05)*
	North American origin	0.80 (0.25-2.52)
	Rest of world origin	0.24 (0.08-0.70)*
	Age (per additional decade)	2.91 (1.08-7.81)*
<i>Coma</i>	Kept a horse	1.64 (0.87-3.11)
	Cared for people with dementia	3.99 (1.89-8.69)*
	Cared for people with communication diff	2.82 (1.14-6.96)*
	Male gender	1.79 (0.81-3.92)
	Age (per additional decade)	2.25 (1.43-3.55)*
	Parent/ caregiver in clinical profession	0.30 (0.14-0.68)
<i>Anaesthetized</i>	Age (per additional decade)	1.65 (0.94-2.89)
	Cared for people with dementia	3.21 (1.29-7.94)*
	Kept a pet dog	3.26 (0.93-11.45)
	Kept a pet rodent	2.07 (0.93-4.61)
	Parent/ caregiver in clinical profession	0.37 (0.12-1.15)

Table 4-11. Odds ratio (OR) estimates (+ 95% confidence intervals) from model averaged 'best fit' multivariable general linear model outputs of which variables influence whether veterinary students rated *EP* in different non-verbal patient groups as less than a typical adult (<4) * statistically significant (OR).

Older students, that is for each additional decade in age, students were more likely to score *Coma* and *Dementia* as $EP < 4$. In addition, Having a parent or caregiver in a clinical profession was associated with students scoring *Anaesthetized* as 'Unable to experience pain' (OR = 0.37). Although not statistically significant as the confidence interval crossed 1, having a parent or caregiver in a clinical profession was also present in the 'best fit models' for scoring $EP < 4$ in *Coma* and *Anaesthetized*; and scoring *EP* as zero in *Coma*.

Where students had originated from appeared to influence whether they rated *Baby* and *Dementia* as $EP < 4$, with students from North America less likely to rate *Baby* $EP < 4$ and students from outside Europe or North America less likely to rate *Dementia* $EP < 4$.

4.13 Association between personal characteristics/ prior experience variables and medical student EP scores

4.13.1 Animal species

Medical students who had experience of working in dog kennels and/ or stables were less likely to rate *Dog* as $EP < 4$ (OR < 0.65) (Table 4-12). Whereas, experience of working on a cattle/sheep farm was associated with an increased likelihood of scoring $EP < 4$ for *Cat*. Students who originated outside UK, Europe or North America (Rest of world origin) appeared frequently in the best fit models for *Cow*, *Bird*, *Snake*, *Fish* and *Insect*, but was only statistically significant for *Pig* and *Horse* where these students were less likely to rate $EP < 4$.

The age of medical students also frequently appeared in the best fit models including those for *Dog*, *Cat*, *Rabbit*, *Cow*, and *Bird*, but was only significant for *Pig* and *Rat* (OR > 3.89) (Table 4-12).

species	Characteristic variables	Odds Ratio
	<i>Chimpanzee</i>	Male gender 1.54 (1.23-2.26)*
Companion animals	<i>Dog</i>	<i>Worked in kennels</i> 0.65 (0.29-0.86)*
		<i>Worked in stables</i> 0.46 (0.17-0.97)*
		<i>Cared for people with dementia</i> 1.61 (0.94-2.76)
		<i>Experience of a minor procedure</i> 0.98 (0.55-1.74)
		<i>Age</i> 1.65 (0.60-4.45)
	<i>Cat</i>	<i>Worked on cattle/sheep farm</i> 1.87 (1.03-3.40)*
		<i>Cared for people with learning diff</i> 1.54 (0.92-2.57)
		<i>Experience of a minor procedure</i> 0.73 (0.41-2.29)
		<i>Age</i> 1.22 (0.42-3.50)
	<i>Horse</i>	<i>Male gender</i> 1.30 (1.12-3.51)
		<i>Rest of world origin</i> 0.44 (0.17-0.96)*

species		Characteristic variables	Odds Ratio
Production animals	Rabbit	<i>Worked in kennels</i>	1.32 (0.79-2.17)
		<i>Worked in stables</i>	0.93 (0.05-1.91)
		<i>Cared for people with dementia</i>	0.83 (0.54-1.30)
		<i>Experience of a minor procedure</i>	0.49 (0.27-0.88)*
		<i>Age</i>	2.53 (0.87-7.33)
	Pig	<i>Age</i>	3.89 (1.14-13.26)*
		<i>Kept pet dog</i>	1.43 (0.91-2.25)
		<i>Kept pigs</i>	3.93 (1.24-1.64)*
		<i>Male gender</i>	1.39 (1.24-1.64)*
		<i>Rest of world origin</i>	0.35 (0.14-0.87)*
		<i>Cared for people with dementia</i>	1.24 (0.66-2.28)
	Cow	<i>Kept dog</i>	1.45 (0.96-2.20)
		<i>Rest of world origin</i>	1.43 (0.81-2.52)
		<i>Experience of minor procedure</i>	0.66 (0.37-1.17)
		<i>Cared for people with dementia</i>	1.56 (0.99-2.20)
		<i>Male gender</i>	1.37 (1.17-2.61)*
		<i>Age</i>	1.76 (0.65-4.76)
Laboratory Animal/ pet	Rat	<i>Kept a horse</i>	1.51 (0.86-2.67)
		<i>Worked in kennels</i>	1.59 (0.87-2.90)
		<i>Cared for people with learning diff</i>	1.65 (0.96-2.84)
		<i>Rest of world origin</i>	0.51 (0.21-1.27)
		<i>Experience of a minor procedure</i>	0.65 (0.38-1.09)
		<i>Age</i>	4.96 (1.61-15.24)*
Wildlife/ Exotic pet	Bird	<i>Kept pet rabbit</i>	1.37 (0.90-2.07)
		<i>Cared for people with communication diff</i>	1.53 (0.96-2.47)
		<i>Rest of world origin</i>	1.37 (0.82-2.31)
		<i>Experience of minor procedure</i>	0.79 (0.67-4.23)
		<i>Age</i>	1.70 (0.68-4.23)
		<i>Rest of world origin</i>	2.08 (1.29-3.35)*
		<i>Experience of minor procedure</i>	0.71 (0.43-1.18)
	Fish	<i>Male gender</i>	0.72 (0.42-1.17)
		<i>Rest of world origin</i>	1.46 (0.89-1.62)
		<i>Parent/ caregiver in clinical profession</i>	0.58 (0.34-0.99)*
	Insect	<i>Self-reported pain threshold</i>	1.27 (0.95-1.70)
		<i>Rest of world origin</i>	1.40 (0.82-2.38)
		<i>Parent/ caregiver in clinical profession</i>	0.49 (0.27-0.91)*

Table 4-12. Odds ratio (OR) estimates (+ 95% confidence intervals) from model averaged 'best fit' multivariable general linear model outputs of which variables influence whether medical students rated expectation of pain in animals as less than an adult (<4). Only five students scored Chimpanzee as being less able to experience pain. * Statistically significant (OR).

Student gender appeared to be associated with how students scored *EP* in *Chimpanzee*, *Horse*, *Cow*, *Pig* and *Fish* with male students being more likely to score *EP*<4, apart from in *Fish* where male students were less likely to rate

$EP < 4$. However, this association was only statistically significant for *Cow* and *Pig* ($OR > 1.37$) (Table 4-12). Whether students had a parent or caregiver in a clinical profession had a statistically significant association with these students being less likely to score $EP < 4$ in *Fish* and *Insect* ($OR < 0.58$).

4.13.2 Non-verbal human

Students who had previous experience of working with people with dementia were more likely to score $EP < 4$ for *Foetus*, *Baby*, and *Anaesthetized* ($OR > 2.08$) - though the association with the latter patient group was not statistically significant (Table 4-13).

Non-verbal patient type	Demographic variables	OR
Expectation of <i>Pain</i> less than an adult ($EP < 4$)		
<i>Foetus</i>	Cared for people with dementia	2.09 (1.13-3.86)*
	Cared for people with a learning disability	1.96 (1.03-3.73)*
	Experience of a minor painful procedure	2.47 (1.21-5.04)*
	Age (per additional decade)	3.23 (0.69-15.06)
<i>Baby</i>	Cared for people with dementia	2.44 (1.19-5.01)*
	Parent in clinical profession	2.04 (1.01-4.11)*
	Experience of a minor painful procedure	1.73 (0.74-4.04)
	Pain threshold	1.29 (0.84-1.98)
<i>Learning difficulty</i>	Kept a pet cat	1.80 (0.89-3.65)
	Pain threshold	2.28 (1.06-4.90)*
	Male gender	0.26 (0.08-0.87)*
	Age (per additional decade)	0.07 (0.001-3.43)
<i>Dementia /</i>	Kept pet fish	0.36 (0.12-1.10)
	-	-
<i>Coma</i>	Pain threshold	0.87 (0.56-1.33)
	Experience of a minor painful procedure	1.67 (0.79-3.52)
<i>Anaesthetized</i>	Age (per additional decade)	18.85 (0.49-72.64)
	Cared for people with dementia	2.18 (0.77-6.16)
	Kept a pet cat	2.76 (0.71-10.74)
	Kept a pet rabbit	0.29 (0.10-0.83)*

Table 4-13. Odds ratio (OR) estimates (+ 95% confidence intervals) from model averaged 'best fit' multivariable general linear model outputs of which variables influence whether medical students rated EP in different non-verbal patient groups as less than a typical adult (< 4). * statistically significant (OR).

However, neither experience of working with people with dementia or any other personal characteristics were associated with the *EP* scores for people with *Dementia* (Table 4-13). Students who had either had previous experience of working with people with profound learning difficulties and/or having personal experience of a minor painful procedure prior to starting university were also more likely to rate the *EP* less for *Foetus* (OR>1.95). This association with a minor painful procedure and more likely to rate reduced *EP* in a patient type was also observed in at a non-statistically significant level for *Baby* and *Coma* (OR>1.66, Table 4-13).

Experience of keeping a pet rabbit was associated with students being less likely to score *EP*<4 for *Anaesthetized* (OR=0.29). The other apparent associations with pet keeping were non-statistically significant - experience of cats and more likely to score *EP*<4 for both *Baby* and *Anaesthetized* (OR>1.79); experience of fish and less likely to score *EP*<4 for people with *Learning Difficulties* (OR=0.36). Whilst having kept a dog was associated with being less likely to score *EP*=0 for *Foetus* (OR=0.25), this was non-statistically significantly associated with students *more* likely to score *EP*=0 and *Anaesthetized* (OR=1.55). In *Anaesthetized* there were also non-statistical associations with more likely to score *EP*=0 and age (OR=4.43), previous experience of working with people with dementia (OR=1.64) and less likely to score *EP*=0 having kept a rabbit (OR=0.54).

Having a parent in a clinical profession was associated with an increased likelihood of scoring *EP* for *Baby* as <4 (OR=2.04). In contrast, male students were less likely to score *EP* for *Learning Difficulties* as <4 (OR=0.26). An increased self-reported pain threshold of students was associated with being more likely to score *EP*<4 for *Learning Difficulties* (OR=2.28), and non-statistically significant associations with being more likely to score *EP*<4 for *Baby* (OR=1.29), but less likely to score *EP*<4 for *Coma* (OR=0.87). Non-statistically significant associations with the age of student and 3 patient groups were found - with students more likely to score *EP*<4 for *Foetus*

(OR=3.23), but less likely to score $EP < 4$ for *Learning Difficulties* or *Anaesthetized* (OR<0.09).

Associations were also observed between variables and the 3 patient groups for which some students scored $EP=0$. Students from a non British/Irish nationality were more likely to score $EP=0$ for *Foetus* (OR=6.78). Male students were more likely to score $EP=0$ for both *Coma* and *Anaesthetized* (OR>2.25). Those students who had cared for a *Baby* prior to starting their degree were more likely to score $EP=0$ for *Coma* (OR=4.78).

There were non-statistically significant associations with experience of a minor painful procedure and being more likely to score $EP=0$ for *Foetus* and *Anaesthetized* (OR>1.85), but less likely to score $EP=0$ in *Coma* patients in those students who had experienced a major painful procedure (OR=0.31).

4.14 Summary of results

The attitudes of students entering veterinary and medical school towards pain in animals and non-verbal humans varied depending on animals species or patient type, and were influenced by gender, upbringing, observing pain in others, and prior experiences – such as experience of a minor painful procedure or caring for others.

The median EP allocated to most of the animal species was equivalent to those animals being able to experience similar pain to an adult human. However, the range of EP values allocated by students was wide, indicating that attitudes varied between individuals. The EP scores varied least and were also highest for chimpanzee and dog, indicating a uniformity of attitude within the students when considering pain in these species. EP scores were lowest for *Snake*, *Fish* and *Insect*.

There was large variation in EP scores allocated to non-verbal humans by all students, ranging from 0 (*unable to experience pain to able*) to 7 (*experience significantly more pain than a typical adult*) – indicating that some students enter veterinary and medical school with the belief that certain non-verbal

humans are less capable, or even incapable, of experiencing pain when compared to an adult human. Whilst some students scored *EP* as comparable or even more than that of adults for all non-verbal patients, the majority of students rated *EP* in *Foetus* as <4, and over a quarter of students rated *EP* in *Baby* as less able to experience pain when compared to a typical adult human. A small number of students rated *EP* for *Foetus* equivalent to these patients being unable to experience pain. *EP* scores were lowest for *Anaesthetized*, *Coma* and *Foetus*.

EP scores given by individual students to different non-verbal patient groups varied, with *Coma* and *Anaesthetized* scoring lower compared to the other non-verbal groups. There were positive correlations for *EP* scores given by students for some combinations (e.g. *Foetus* and *Baby*, *Coma* and *Anaesthetized*), but not always (e.g. *Coma* and most other non-verbal groups). In addition, individual students scored *EP* in *Foetus* lower compared to *Baby* and *Learning Difficulties* or *Dementia*, but along with *Baby*, *Learning Difficulties* or *Dementia* scored *EP* higher compared to *Coma* and *Anaesthetized*.

When *EP* scores allocated by Veterinary and medical students were compared, veterinary students were more likely to rate *EP* higher in the majority of animal species. The median scores allocated by veterinary students were <4 for three animals (*Snake*, *Fish* and *Insect*). In comparison the medical student median *EP* score was < for five of the animal species included in the questionnaire. For the non-verbal humans types, medical students were more likely to rate *EP* higher in *Learning Difficulties*, but lower in *Anaesthetized*, when compared to veterinary students.

Male gender was associated with lower *EP* scores for many of the animal species. Previous experience of caring for various animals appeared in many of the 'best fit models' for how students rate *EP* in the animal species, but was only statistically significant for some, and appeared to have varied effects – sometimes being associated with higher *EP* scores and other times lower *EP* scores. Although gender and previous experience did appear to influence how

students rated *EP* in some animals, this was not a consistent finding across all animal species.

Gender also appeared in the 'best fit models' for *EP* scores of non-verbal humans, but again was not consistent. Experience of caring for a non-verbal humans was associated with students scoring lower *EP* for the non-verbal humans, although this varied and differed between veterinary and medical students. Previous experience of minor and major painful procedures did not appear to influence how students rated *EP* in various animal species.

Originating from a Country outside the UK or mainland Europe; and student age was statistically significant in the best fit models for some animal species and also non-verbal humans. Although this was not consistent and varied in whether the association was with higher or lower *EP* scores.

4.15 Discussion

Attitudes of students entering veterinary and medical training towards pain in animals and non-verbal humans were diverse and varied depending on animal species or non-verbal human type, and appeared to be influenced by previous experiences and gender.

Only three animals (*Snake*, *Fish* and *Insect*) had median *EP* scores < 4. Humans tend to demonstrate greatest empathy for species which appear phylogenetically similar to themselves, which may explain the lower *EP* scores allocated to these species which are further removed phylogenetically and have little resemblance to humans (Rae Westbury and Neumann, 2008, Prguda and Neumann, 2014) (see section 8.4).

Students rated *EP* in *Fish* low when compared to many of the other species, with the majority of students rating *EP* as less than that of an adult human. A recent study has found that people consider salmon to have lower mental abilities including reduced capability to feel pain compared to other vertebrates (Kupsala et al., 2013). The differences in how students rated *EP* in these

species may be attributed to their classification as having 'lower' sentience due to poorly developed cerebral cortex (Sneddon, 2004). This may be of concern as there is evidence to suggest that species with less developed cerebral cortex still have true nociception and may experience 'true pain' (Machin, 2001).

Previous work on attitudes to animal welfare and pain has shown that factors such as gender and pet ownership influence attitudes (Hemsworth et al., 2000, Vaisanen et al., 2008). There is evidence to show that pet ownership in childhood improves social development and promotes caring and compassionate attitudes.(Hawkins et al., 2017) There were associations between pet ownership/ or working with animals and *EP* ratings, with students who had experience of keeping or working with animals less likely to rate *EP*<4 in *Rabbit; Snake; Fish; Insect* and *Anaesthetized*. The remainder of the associations for owning or working with animals were associated with *lower EP* (*Dog; Cat; Pig; Rat; Baby; Anaesthetized*).

Similar to previous work that has identified men more likely to underestimate pain (Robinson and Wise, 2003, Wise et al., 2002)., there was a relationship between male gender and how students rated the *EP* in some animal species and non-verbal humans, with male students more likely to score *EP* <4 (*Learning Difficulties; Horse; Rabbit; Pig; Cow*) or *EP*<1 (*Coma* and *Anaesthetized*).

For a foetus in the last trimester almost two thirds of veterinary and medical students rated *EP* <4, that is less able to experience pain compared to a typical adult human. The gestational time point at which pain pathways become active is debated, but there is evidence that pain can be experienced by foetuses in the third trimester (Bellieni and Buonocore, 2012), which contradicts the perception of many of the students. With the advancement of minimally invasive foetal surgery it is now accepted that a foetus has ability to experience pain and foetal anaesthesia should be provided for surgery in utero (Graves et al., 2017) (see section 8.4).

The attitude toward foetal pain of the students in this study are of concern and concur with findings from previous studies which have found patient adverse attitudes towards neonatal and infant pain in some medical undergraduates (Wilson et al., 1992, Cohen and Bennett, 2006). Although the students in this study were early on in their training, education in neonatal and paediatric pain management seems to be scarce in medical undergraduate curricula (Mezei and Murinson, 2011, Poyhia et al., 2005) offering little opportunity to rectify erroneous beliefs and assumptions. Lack of appreciation of the ability of non-verbal patients to experience pain may explain why patients who cannot communicate verbally have been shown to be at risk of poor pain management in hospitals. (Feldt et al., 1998, Morrison and Siu, 2000).

Student age did not consistently appear to be important as an influence on attitude towards pain. This conflicts with previous work where medical students' attitude towards pain correlated with age (Niemi-Murola et al., 2007, Ung et al., 2016, Ali and Thomson, 2009) and years since graduation affected how qualified vets scored painful conditions in dogs (Bell et al., 2014). Age appeared as a potential predictor but was not statistically significant.

Previous studies investigating student attitude towards pain have been cross-sectional and have often recommended longitudinal studies to fully understand the influence of training and how attitudes change. (Kielland et al., 2009, Hellyer et al., 1999, Wandner et al., 2010).

Having experience with animals, for example on farms, stables, veterinary practices, is a requirement for entry to veterinary school. Similarly, people wishing to pursue a veterinary career often have an affinity for animals and as such a large number of the respondents had kept pets, that is 99.2% had experience of a pet ownership compared to less than half of the general population (Statista, 2018). This uniformity within the veterinary respondents may have reduced the effectiveness of the statistical models to tease out differences in *EP* scores based on pet ownership and experience with animals.

The poor response rate from the medical students may have created a bias within the data, as potentially only the students with an interest in pain may have completed the questionnaire. In addition the use of Likert-type questions can create inherent bias within the collected data as previous work has shown that the order of answer values (ascending or descending), the positioning of answers and whether the answers have anchor points can all effect how people respond to the questions (Hartley and MacLean, 2006).

4.16 Conclusions

On entering veterinary and medical school, students have diverse opinions and possible misconceptions regarding the expectations of pain in animals and non-verbal patients. The factors which influence first year student attitudes towards pain are complex and are unlikely to be due solely to age, gender, previous experience, or personal pain experience. The data presented in this chapter provides the baseline for a longitudinal study investigating the influence of undergraduate training on the attitudes towards and pain in animals and non-verbal humans.

The results highlight the need to devise effective teaching strategies to help develop the attitudes of veterinary and medical students on the capacity of animals and non-verbal humans to suffer pain. The variation in how students rated *EP* strengthens the existing case for more time allocation for developing helpful attitudes towards pain in veterinary and medical curricula. The results also highlight the need for more general discussions about pain in animals and non-verbal patients as well as basic physiology, psychology and pharmacology.

Although these results have identified factors which influence veterinary and medical student attitude towards pain, they do not delve deeply into what influences attitude. In particular, the students own perception of what has influenced the way they think about pain in animals and non-verbal humans has not been explored. In the next chapter qualitative analysis of interview

data will allow a deeper exploration of the factors which have influenced student attitude towards pain in animals and non-verbal humans.

Chapter 5 Influences on attitudes at the start of training (Qualitative)

5.1 Introduction

The previous chapter presented the results from the quantitative (QUAN) data gathered from the questionnaire completed by veterinary and medical students at the beginning of undergraduate training. The QUAN data provided evidence that, in this group of students, gender and previous experiences, such as caring for animals or non-verbal human (non-verbal humans) influenced attitude towards pain in animals and non-verbal humans (sections 4.10-4.13). This chapter presents the results of qualitative (QUAL) data gathered during interviews with veterinary and medical students at the start of their second year of undergraduate training. This chapter, along with the results from chapter 4, contribute to determining what factors influence development of attitudes towards pain in animals and non-verbal humans. The research question addressed is;

RQ1. What are the attitudes of veterinary and medical students entering University towards pain in animals and non-verbal humans, and what factors influence development of these attitudes?

In particular, this chapter examines the influences on attitude towards pain in animals and non-verbal humans that students perceive themselves. The data presented in this chapter will be re-examined later in this thesis (chapter 7) to determine if there has been a change in the factors which students perceive as influencing their attitude towards pain in animals and non-verbal humans.

5.2 Recap of relevant literature

In the previous chapter quantitative data showed that gender and previous experiences influence veterinary and medical student attitude towards pain in animals and non-verbal humans. There have been previous studies on medical student attitude to pain in general and/or specific types of pain, which

have found links between attitudes towards pain and gender, year of study and age (Bartley et al., 2015, Defrin et al., 2011, Fillingim et al., 2009, Robinson and Wise, 2003, Safdar et al., 2009, Wandner et al., 2012, Musey et al., 2014, Raftery et al., 1995, Boissoneault et al., 2016, Weisse et al., 2001, Edwards et al., 1999). In veterinary students quantitative research has shown that gender affect how students rate pain in cattle, with female student pain scoring specific conditions higher compared to male students (Kielland et al., 2009).

However, these previous studies have not investigated what has influenced veterinary and medical student attitude towards pain in animals or in non-verbal humans specifically when entering University. In addition, quantitative research on attitude to pain in veterinary and medical students have relied upon analysis of Likert-type questions, which only allow superficial understanding of what influences pain attitude. In this chapter the use of qualitative research techniques enabled a deeper exploration of the factors which influence veterinary and medical student attitude towards pain in animals and non-verbal humans.

There is a lack of qualitative studies investigating influences on attitude to pain. There has been one qualitative study investigating first year medical student attitude towards pain (Corrigan et al., 2011), which qualitatively analysed student reflective journals. Negative themes dominated the reflective journal entries about patients in pain which they had encountered during summer elective training – such as frustration, scepticism and distrust of patients. There has been one qualitative study investigating the influence of previous experience on the attitudes towards pain in nurses and nursing students, which found that at the start of training few had given much thought to pain in patients and their experiences of pain were often limited to specific incident-related events (Mackintosh-Franklin, 2014). Importantly, there are no studies which explore veterinary and medical students *own perceived influences* on their attitude towards pain in animals and non-verbal humans. The qualitative approach presented in this chapter will allow a deeper exploration of the

influences on attitude towards pain, particularly those perceived by the students themselves.

5.3 Overview of chapter

This chapter presents the following;

- 1) Description of students selected for interview from veterinary and medical students entering University in September 2012 (Table 5-1).
- 2) Results of thematic analysis of interview data collected during autumn semester 2013, entering 2nd year
- 3) Summary of major themes identified from thematic analysis.
- 4) Discussion and Interpretation of themes and integration with Quantitative data presented in chapter 4

5.4 Methods

Students who had given permission to be contacted about further research were contacted in autumn 2013. An interview guide was used as a starting point for dialogue and interviews took place at a location convenient for the participants.

Data from interviews was analysed after completion of all interviews, using an open thematic coding process and coding matrix were used as a visual aid to identify links and relationships between themes. Data was presented as tables of themes and constituent coding framework; and quotes with a *post script* unique identifier (e.g. V12_17.49) and quote number.

The data presented in this chapter was collected during November and December 2013 from veterinary and medical students in their first semester of second year (Table 5-1). A full description of the statistical methods can be found in section 3.10.

Academic year	2012 intake	2013 intake
Sept 2012 - July 2013	QUAN: Background & pain attitude Questionnaire V12_17 M12_17	
Sept 2013 – July 2014	QUAL: interviews V12_17 M12_17	QUAN: Background & pain attitude Questionnaire V13_18 M13_18

Table 5-1. Overview of study timeline. Qualitative data collection time point highlighted in Orange and red circle identify Qualitative data presented in chapter 5. Where study population denotes veterinary (V) and medical (M) students from intake year 2012 (2012_17).

5.5 Description of students involved in interviews

Twenty medical and 65 veterinary students gave permission to be contacted about further research when completing the initial questionnaire. After reviewing the data from the questionnaire 20 students (10 medical and 10 veterinary) were selected based on obtaining a purposeful sample of maximum variation, identifying those students who represent the widest possible range of personal characteristics. The positive response rate to initial email invite was poor, with only 6 students agreeing to be interviewed and ten students declining to be involved. Three further invite emails were sent to the remaining 4 students, which resulted in an additional 2 students agreeing to be involved in interviews (Table 5-2).

Unique i.d.	Gender	Age	Nationality	Experience caring animals	Experience caring for humans	Self-reported pain threshold
V12_17.49	Female	18	British	Dog; Cat; Horse; Fish; Cattle/sheep	-----	3
V12_17.1	Female	20	British	Dog; Cat; Fish; Cattle/sheep	Babies	3
V12_17.41	Female	20	Trinidad	Dog; Bird; Rodent	Babies; Children; Dementia	2
V12_17.4	Female	25	US citizen	Cat; Rabbit; Cattle/sheep	Children	-----
M12_17.26	Male	17	British	Rabbit; Fish	Dementia	3
M12_17.25	Female	19	British-Indian	-----	Children; Dementia; Learning difficulties	3
M12_17.22	Female	19	British	-----	Babies; Children	-----
M12_17.12	Male	18	British	Rabbit	Dementia; Communication difficulties	4

Table 5-2. Description of veterinary and medical students who participated in semi-structured interviews during autumn semester 2013. Personal characteristics of gender; age; Country or origin; Nationality; previous experience of caring for animals/ humans; and self-reported pain threshold are shown. Data on personal characteristics was gathered from questionnaire completed in autumn term 2012.

5.5.1 Veterinary students

All four veterinary interviewees were female, but Country of origin differed for two of the interviewees. The age of interviewees ranged from 18-25 years.

5.5.2 Medical students

There was a gender balance in the medical students (2 female, 2 male) who took part in interviews. All medical students originated from the United Kingdom. The age range for medical student interviewees was narrower than that of veterinary student interviews, being between 17-19 years.

5.6 Results of data analysis

5.6.1 Overview of coding framework

Thematic analysis of transcripts from the first interviews yielded major themes of *Empathy*, *Education* and *Personal-social* factors (Table 5-3).

Major themes	Themes	Codes
<i>Empathy</i>	<i>Recognising empathy in others</i>	Empathy with animals/ humans
		Lack of empathy
	<i>Student's own empathy</i>	Reflecting on their own empathy
<i>Education</i>	<i>Academic education</i>	Didactic education/ lectures
		Pre-University education
	<i>Clinical training</i>	Previous training/ work experience
		Observing clinical culture in vet/medical staff
		Hopes/ expectations of clinical training
<i>Personal-social factors</i>	<i>Upbringing</i>	Parent-child relationship
		Attitude of family and/or caregivers towards pain & observation of these people in pain
		Observation of pet animals/ farm animals
	<i>Culture</i>	Social/ community culture
		Depiction of pain in media
	<i>Student characteristics</i>	Own pain experiences
		What students understand about communication
		Beliefs about pain

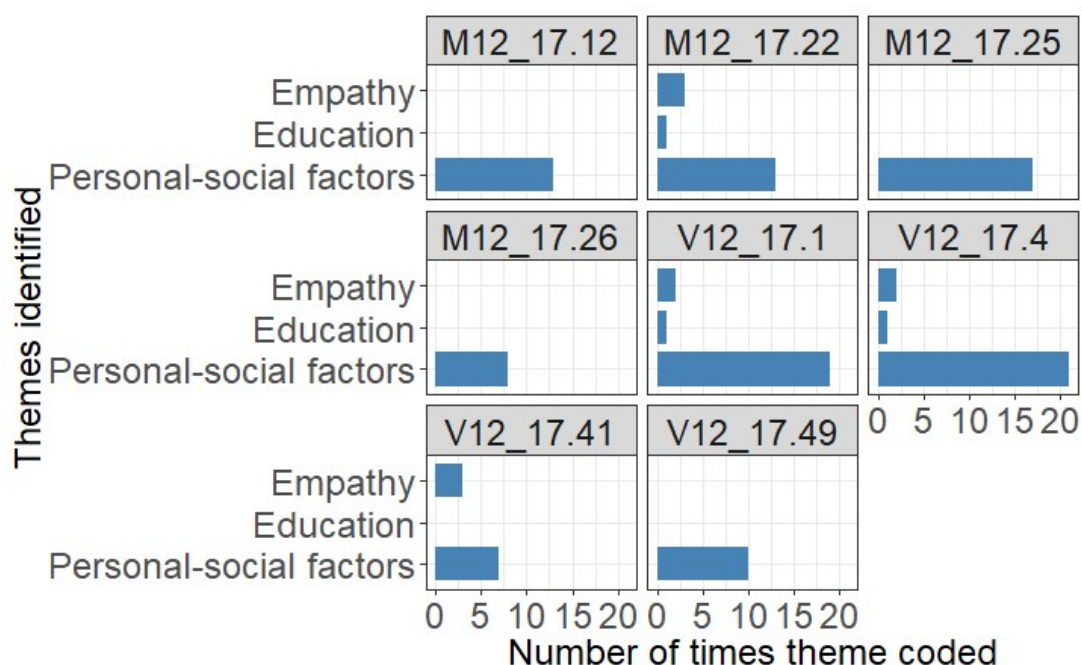
Table 5-3. Major themes and constituent themes derived from thematic analysis of 1st interviews with 4 veterinary and 4 medical students. Sub-themes included in the coding framework are defined. .

The major themes were constructed from themes and codes, and named to reflect the broad concepts which underpinned the themes they contained. *Empathy* and *Education* were names which occurred in the codes from the transcripts, and as such can be considered In vivo names. The theme of *Personal-social* factors was initially referred to as *Upbringing*, but after discussion and review of themes, was further developed to include external (*Upbringing* and *Culture*) and internal (*Student characteristics*) factors (Table 5-3).

5.6.2 Results of individual thematic analysis

Not all sub-themes were coded for each participant, in particular ‘Empathy’ and ‘Education’ were only present in the transcripts of one of the medical student, whereas ‘Empathy’ was present in three of the veterinary students (V12_17.1, V12_17.4, V12_17.41) (Figure 5-1).

Figure 5-1. Bar plot showing sub-themes identified in analysis of each



individual participant follow up interview transcript. Each panel heading identifies the students by the unique identification number (section 3.5)

The *Personal-social* major theme occurred frequently in all of the interview transcripts (section 5.7.3). The *Empathy* major theme was present and one of

the medical students (M12_17.22). The *Education* major theme was identified less commonly and in fewer students (Figure 5-1).

5.7 Detailed analysis of themes identified

5.7.1 Empathy

Three of the veterinary and one medical student talked about empathy in relation to pain. The term ‘empathy’ and ‘compassion’ were used interchangeably by the students, but for the context of reporting results in this chapter the term empathy is used. The students talked about empathy in the context of recognising that other people have different levels of empathy or express empathy differently. The students were also able to reflect on their own empathy and often demonstrated an awareness of the importance of empathy in the clinical care setting (Table 5-4).

Major themes	Themes	Codes
Empathy	Recognising empathy in others	Empathy with animals/ humans
		Others having conflicting levels of empathy
	Students own empathy	Reflecting on their own empathy

Table 5-4. Major empathy theme developed from themes identified in student transcripts through open thematic coding.

i. Recognising empathy in others

Some of the veterinary students talked about meeting people with different attitudes than themselves. They seemed to have an appreciation that people from different backgrounds may react differently when faced with animals or humans in pain, and also may have attitudes that conflict with their own. This view was expressed by veterinary students, rather than medical students and often centred on ethical issues, such as pain in farm animals; treatment of pain and the economics of treating pain in animals. One veterinary student described a friend from a farming background, saying;

When I met one of my friends who's a farmer's son, he's so un-empathetic. We had a talk about euthanasia. We were talking about a woman who wanted to put a healthy dog down. There was nothing wrong with it, she just got it from an ex-boyfriend, so perfectly healthy. I was getting upset, like 'how can this be ok' and then the friend that comes from a farm was like 'people do it all the time'. I've noticed that with other farm background people V12_17.41. (Quote 5-1)

Another veterinary student spoke about people from farming backgrounds responding differently to painful animals. They appreciated that for other students who had repeatedly seen pain in animals, pain had become a normal part of life and no longer elicited feeling of empathy for painful animals.

I think it's difficult for people -you've lived on farms and have seen it (pain), because to them that's just what it is. I don't know if they've lost touch with that (empathy), but it looks like that to me V12_17.4. (Quote 5-2)

Some students described how people they knew who had grown up on farms appeared to be less empathetic when faced with animals or humans in pain. For example, a student whose mother grew up on a farm noted

My mum grew up on a farm, you had to be tough. You did not cry over something. So you've hurt your hand; well bandage it up and keep moving. I think it's difficult for people who grew up on farms and have seen it (pain) because to them it's just part of life. V12_17.1. (Quote 5-3)

This student contrasted the attitudes of those with farming backgrounds to her own more emotional connection to animals, noting the significance of her urban upbringing in this difference.

"I think I treat every animal likes it's my own, so I get emotional sometimes. I think it's because I'm from a city and more used to pet animals than farm animals. I've noticed friends who have grown up on farms are so un-empathetic. If I get upset (about animals in pain) they are not concerned and say 'it happens all the time'. V12_17.4. (Quote 5-4)

ii. Students' own empathy

Students reflected on their own empathy and how they perceived that contributed to the way they responded to animals or other people in pain. For example, one of the students described themselves as 'compassionate' and often tried to put themselves in the perspective of others, including animals. They said;

I guess I tend to be anthropomorphic sometimes. but I think I'm just a compassionate person. I feel like I'm not attentive enough to other people's emotions, so in a way maybe I'm trying to compensate for that. So to think what would I do in that situation and I try do that for animals as well V12_17.41. (Quote 5-5)

One of the students reflected on whether the type of animal that was experiencing pain influenced how much empathy the observer would have. The student discussed the fact that some animals, such as dogs are more familiar and their behaviour is more akin to humans, compared to less common or removed species, such as reptiles.

They mused;

You probably would feel more empathy towards one animal in pain. Whether you thought they were both equal – if you thought the snake was in pain, you'd be like "oh well", but if the puppy was in pain, because it probably has a different way of showing that it's in pain, maybe a way that's slightly more human, that we can relate to. Whereas, I have no idea how a snake would feel pain. Whereas a puppy, probably you can understand M12_17.22. (Quote 5-6)

Another student spoke about their own responses to people in pain differing depending on the person's gender. They spoke about having less empathy for women than men, although the student demonstrated self-awareness and a realisation that pain is subjective and perceived differently by different individuals. The student said;

I think I'm harsher on females because I am a female, and I'm just like, 'god this is whining'. We have so many problems as the weaker sex that it just irritates me – you just need to handle that. But I also have to remind myself that just because I don't think that was painful, doesn't mean that to them it wasn't, so I'm always trying to check myself and be like you know, that might not have been a big deal for me, but it is for them. V12_17.4. (Quote 5-7)

There was an overlap with this theme and the theme of culture (page 178), where students described how their expectation of pain expression differed between genders.

5.7.2 Education

There were two types of education that students mentioned during the interview; formal academic education, such as further education before entering University or whilst in University; and also their experience of clinical training (Table 5-5).

Major themes	Themes	Codes
Education	Academic education	Didactic education/ lectures
		Pre-University education
	Clinical training	Previous training/ work experience
		Observing clinical culture in vet/medical staff
		Hopes/ expectations of clinical training

Table 5-5. Major theme of Education and constituent themes

i. Academic education

Students verbalized that their formal education had little influence on their attitudes towards pain in others. They also described feeling there was disconnection between the science-based teaching of pain and the real implications of pain in humans, with little time allocated in formal lectures to the mental and physical effects of pain. Two of the students said they had not been taught about how pain affects patients on an individual level and described worrying about whether they would be able to deal with patients in pain in the future.

So far when we've talked about pain it has been very 'sciency', like this is the method behind pain, rather than the fact that pain is actually a thing that does impact people's lives, so it's easy to be "oh it's just pain" and forget about the fact that it effects people. M12_17.22. (Quote 5-8)

This student showed an awareness that the mental effect of pain on the individual patient and those involved in patient care was just as important as understanding the physiology of pain.

The student reflected on this saying;

We've just been taught that pain is subjective and the physiology of noiceptors or whatever. Stuff like that. And it's not really related to human situations. Um, and I don't know if it changes when you get into hospitals and you can actually see patients, but I guess it's really important not to just stick with science, because medicine is about people, and if you don't understand and aren't able to read people then it's going to be really hard to do your job in the future. So I guess not just focusing on science, um but also relating it back in to patients and maybe that does happen more when you are in hospital and you do have patients you can see. But, I don't know. M12_17.22. (Quote 5-9)

A veterinary student also expressed similar views about the veterinary pain education concentrating on physiology and anatomy, without giving students an understanding of how this effects individual animals. The student said;

*It's never said that lameness in this animal will be like x pain in you. You know, trying to make you understand the equivalent pain in you. I don't think that's ever done. I think it would be great if they could relate that to us. Like "lameness in a cow would be like if you broke your leg". Give us something tangible to compare to ourselves, I'd do better if I could relate it back to me. Sometimes it's easy for people to go "well its **an** animal", you know like, um.... It's not complaining V12_17.4. (Quote 5-10)*

ii. Clinical training

The veterinary students were able to recall their experience of clinical training whilst 'seeing practice' before entering University. The medical students had experience of working in clinical settings, such as nursing homes, before entering University. One student reflected that whilst on

placement at a dairy farm she thought a cow was in a lot of pain, but her concerns were dismissed by staff who said 'you always get lame cows'. Similarly, other veterinary students describe being concerned about seeing animals in pain when on work placements, but remembered their concerns being dismissed.

"When I worked on a dairy farm; it was obvious that some of the cattle were in extreme pain. You could tell from the way they moved. And it sucked because you had to move them, like they had to get milked, you had to push them. One had ankle chains to keep its legs together, 'cause it kept trying to do the splits. And so you're trying to push these cows, and they're like 'please leave me alone'. I pointed it out, I said there's this sore cow and they were like 'yeah, well you always have lame cows'." V12_17.4. (Quote 5-11)

One medical student reflected that whilst on placement at a nursing home she thought a patient was in a lot of pain, but had dismissed her concerns because other members of staff were unconcerned about the patient's condition, and she felt that the qualified nursing staff would be more capable of recognising pain than her. This student had shown empathy and an ability to recognise that the patient may be in pain, but had doubted her initial assessment of the patient when her assessment was challenged by health care staff, which the student viewed as senior to her in the health care training hierarchical. This experience was echoed by another medical student who said;

We had this clinical placement last week and we had to take a history and examine a patient, yeah and then there was this guy (qualified doctor) who was doing it with me and I thought the lady was in quite a lot of pain, but he thought it was fine. M12_17.22. (Quote 5-12)

This student was able to recognise and reflect on the fact that the qualified person who was supervising him had a different perception of the amount of

pain the patient was in. The student conveyed a sense of doubt in the judgement skills of the qualified person and realising that their own judgements about pain were valid.

5.7.3 Personal-social factors

The themes of *Upbringing*, *Culture* and *Student characteristics* were commonly coded in all student transcripts. This led to the development of a major theme called *Personal-social factors*, which encompassed the codes which referred to people, relationships and/ or circumstances encountered outside of the educational setting; as well as student characteristics, such as communication concerns (Table 5-6).

Major themes	Themes	Defining sub-themes
Personal-social factors	Upbringing	Parent-child relationship
		Attitude of family and/or caregivers towards pain & observation of these people in pain
		Observation of pet animals/ livestock and/or non-verbal people
	Culture	Social/ community culture
		Depiction of pain in media
	Student characteristics	Own pain experiences
		What students understand about communication
		Beliefs about pain

Table 5-6. The major theme of Personal-social factors and constituents themes and sub-themes.

i. Upbringing

Both veterinary and medical students described the attitudes of their parents and or caregivers as having an influence on how their own attitude towards pain in animals and other humans has developed. Students frequently recounted stories of how adult carers had responded to their small childhood injuries – and described these in vivid detail. Students recalled memories of being in pain as a young child and being dismissed by caregivers when they

had shown signs of pain. One student described how her parent, who was in the medical profession, was more dismissive of pain – saying that because her mother had medical knowledge she knew when pain was ‘serious’ or not, explaining that people without medical knowledge may think pain will lead to worsening of the disease;

I think because my mum was a nurse, so that she's got the health care knowledge. Maybe people think if there is pain it must be really bad. And like making more of a big deal about it because they don't realise actually, it's going to be fine. So if you know it's going to be fine, then you're like "oh I'm in pain, but it doesn't matter" whereas if you don't know that you're going to think that the pain is going to lead to something worse. M12_17.22. (Quote 5-13)

This minimizing of the severity of pain reiterates the experiences of the students who recalled clinical staff dismissing their own judgements that animals or human patients they were observing were in pain.

Another frequent theme that emerged from the initial interviews with students was the impact of having observed pet animals and/or other humans in pain, and how this had led to development of the students own opinions of pain. Students often described having seen other people in pain including family members and/ or friends. They reflected on how this had influenced their own attitude to pain, for example one student talked about seeing people in pain generally, saying;

What has influenced me? (pause) I think mostly, I know before I said there weren't many people, but there are people in pain all around, you see them, so I think observation and then contemplation on that, definitely a fairly major influence. But I wouldn't necessarily say that any particular person or animal, I wouldn't say there was a

particular influence. Just more of a general, what you pick up. M12_17.26. (Quote 5-14)

Other students recalled seeing their family members experiencing pain and particularly remembered how others appeared to deal with the pain. The students who recalled this detail often remarked that they felt that observing family/ caregivers in pain had influenced their own attitude towards their own pain and how they responded to others in pain.

Students described having seen animals in pain and said this had greatly influenced their own attitude to pain, both in how they themselves dealt with physical pain and how they might respond to seeing another in pain in the future. The veterinary students had spent time working with animals, often on farms or with commercial production animals, before applying for the veterinary undergraduate program. These students recounted stories of observing animals in pain and conveyed their own distress in seeing these animals. One student said;

I remember seeing a really bad calving once. It sticks in my mind because it was a really big calf and they had to cut it out of the mother, but she had been straining for ages, like, really tired and obviously in a lot of pain. And she'd kind of given up. V12_17.1. (Quote 5-15)

The veterinary students who talked about seeing painful animals conveyed a sense of being unable to help/ intervene. Another veterinary student described working with horses and seeing a painful farriery procedure and the effect it had on the animal. They said;

There was one horse I saw where the farrier literally just shaved off the very front portion of its hoof. And it was lame on all four and you could tell from the way it was standing that it was in such agony, because it couldn't do anything. V12_17.49. (Quote 5-16)

Some veterinary students spoke about their own pets and times when they had seen their own pets in pain. They spoke about their perception that changes in animal behaviour could be an indicator of pain, but that pain behaviour aren't always the same and can differ between animals. For example;

When one of our dogs got neutered, she cried a lot, like the whole night. But my other dog broke its leg and just went really quiet and reserved and didn't show any signs of pain.

V12_17.41. (Quote 5-17)

ii. Culture

Two of the four interviewees talked about having different expectations of pain expression in women and men with both of these students expecting men to be more tolerant of pain. One of the male students complained about a female flatmate 'whingeing' about being in pain and used this as an of women being less tolerant of pain, he said;

One of my flatmates is always whingeing about the tiniest thing, but to be fair I've got a higher pain threshold than her....Whether it's a misconception or whatever, but females may have lower pain thresholds. M12_17.12 . (Quote 5-18)

Some students talked about how men are viewed in terms of displaying signs of pain. For example, one student talked about the pressure on men to appear masculine and not express their emotions. This student said;

A certain role is expected of a woman. So guys are very unlikely to express what they feel. So even if my best friends, you could tell that they were in pain, but they won't tell you. Even if they knew I wouldn't tell anybody, they hide it. It's just like the masculine identity. It's considered to be the wrong thing. Um, even with physical pain guys are not allowed to cry M12_17.25. (Quote 5-19)

Another student reflected on how the view of men had changed and talked about modern-day men being more expressive. They spoke about the traditional view of men and how this had altered, with men more likely to express pain. They said;

Then men had to be, like, strong men and deal with pain. But now you get things like man flu, where men make more of a big deal of things than women do. My dad always makes more of a big deal out of things than my mum. So I guess maybe like, when you think about it traditionally men are supposed to be like strong men – feel no pain. But actually, in reality I think that nowadays there's not that much of a difference. Maybe I'm just being sexist, but my dad always seems to moan more than my mum. And I think like, that's if you watch the adverts for cold remedies, and I know that's not pain, but it always seems to be like, the men dying. M12_17.22. (Quote 5-20)

iii. Student characteristics

The medical students expressed concern that recognising pain would be difficult in patients who are unable to communicate verbally. One student talked about not being able to tell if certain non-verbal patients were experiencing pain. They said;

It's really easy to think I'll be able to tell by body language, but if you don't know someone well then maybe their body language would be different from what you'd expect. I watched this film the other day and it's about this guy who can't move anything, he can only blink one eye. But he can still feel things they think. If that's the case, then how would you even know that someone was in pain? Or if someone is in a coma, can they still feel pain? I wouldn't know how you tell in that situation. M12_17.26. (Quote 5-21)

This conveyed a sense of doubt in whether it was possible to recognise pain in non-verbal humans, where clinical staff have to rely on forms of non-verbal communication. Students who had experience of working with non-verbal humans, for example in nursing homes, had enhanced insight into how non-verbal humans communicate and seemed to have a deeper understanding of the value of non-verbal communication. One student described their experience of working with non-verbal children and what they had learnt about how non-verbal humans communicate pain. They said;

If they are in pain they tend to be more angry rather than crying because if I'm in pain I end up crying. But I've also noticed in non-verbal, uh people that I've come across they get agitated. M12_17.25. (Quote 5-22)

This ties in with comment from a veterinary student who recognised that animals can display behaviour changes as a sign of pain and this is the way in which animal patient communicate (page 178).

When asked about why pain occurs many students spoke about the protective function of pain, describing pain as beneficial for survival. One of the veterinary students said;

It's natural for any animal to have a pain response because it wants to get away from danger. If it didn't it would sit there and get eaten by predators. So it has to have, you know, a pain or fear response in order to get away and make itself safe. I think if you didn't have a pain receptor, you wouldn't know that you were in trouble and that something was seriously wrong. And in a lot of animals cases it's you need to get out of this situation V12_17.4. (Quote 5-23)

Similarly, the medical students described pain as a mechanism for avoiding further damage to tissue and allow healing. One medical student used an example of pain in response to a thermal burn, which then prompts the person

to remove their hand from further damage. This student also talked about pain having potential benefits, saying;

It's the classic you burn yourself on the hob and then you lift your hand off. Um, but yeah I think... in some ways it helps you know you're alive, still going. Um I think there are benefits to it and maybe these aren't really thought about, sometimes. Obviously, there are definite problems with pain as well, but I think, probably there are benefits M12_17.26.

(Quote 5-24)

5.8 Comparison of themes in veterinary and medical student transcripts

There was very little difference in the type of themes identified in the veterinary and medical student transcripts. The majority of themes and codes identified in both groups of students fell into the Major-theme of *Personal-social* factors, with the other major themes of *Empathy* and *Education* accounting for less quantity of coding within the transcripts. Students talked at length about situations and/or circumstances relating to pain in the context of their own childhood, recounting stories in detail which often involved family member and/or pets. Often students were able to recall where they were, who was with them and how they felt, when describing situations where they had seen another human or animal in pain. In particular, students were able to recall how they perceived the adults looking after them had reacted to pain. In contrast the description of educational experiences relating to pain were not described in detail by students, with students less able to recall any formal teaching about pain. This may, in some way explain the difference in the volume of codes for these major themes (Figure 5-1).

5.9 Summary of results

The students who took part in the interviews identified factors that they perceived as contributing to their own attitude towards pain in animals and non-verbal humans. Open thematic coding of the interviews with particular focus on influences on attitude to pain resulted in three broad major themes of *Empathy*, *Education* and *Personal-social* factors. Often students spoke about influences on attitude to pain in broad terms, which were not restricted to only pain in animals and non-verbal humans.

Students spoke about empathy, both in themselves and others, as an influence on attitude to pain. Some students described their own empathy as varying depending on the gender of the person in pain. This overlapped with the cultural influences which suggested that culture influenced how pain in different genders was perceived. This cultural aspect of influence on attitude to pain was evident in the coding of many of the medical students transcripts.

Education emerged as a theme from the coding of the interview data. However, students spoke infrequently of formal education when discussing influences on attitude to pain.

Some students spoke of their educational experiences whilst gaining experience prior to University applications, for example when 'seeing practice' or working in care homes. The opportunity to work in a clinical setting had allowed students to observe the attitude of veterinary and/or medical care staff to pain in animals and people, thereby introducing them to the clinical culture surrounding pain. These students described the attitudes of clinical staff towards pain in patients, often as dismissive of the pain experience or minimizing the severity or importance of pain. This theme of the influence of clinical culture overlapped with coding from the education theme, as the students had the opportunity to observe veterinary and medical staff due to the educational aspect of 'seeing practice' in veterinary and medical practices before entering University.

Within the major theme of *Personal-social* factors, *Upbringing* and *Culture*, in particular the attitude of parents or caregivers towards the students' own pain, and observation of animals and other humans in pain, were key factors influencing the development of their attitudes towards pain. During interviews both veterinary and medical students described the attitudes of their parents and or caregivers as having an influence of how their own attitude towards pain in animals and other humans has developed. Students frequently recounted stories of how adult carers had responded to small childhood injuries – and described these in vivid detail. Students described learning about pain expression through observation of family members in pain.

5.10 Discussion

Semi-structured interview data enabled an examination of what students perceived had influenced their attitudes towards pain before entering University. These results demonstrate that *Empathy*, *Education* and *Personal-social* factors all contribute to influencing veterinary and medical student attitudes towards pain in animals and non-verbal humans. Although there have been quantitative studies investigating various aspects of student attitude towards pain (Kielland et al., 2009, Mich et al., 2010), this is the first study to look at influences with a qualitative lens.

A previous study on psychology students reported that the empathy of students was linked to how they rated pain in observed subjects in a video – although cause and effect are unclear (Green et al., 2009) (Chapter 2, section 2.10.1). The veterinary and medical students in this study talked about importance of empathy in recognition of pain in both animals and non-verbal humans, often articulating memories where they perceived others had lacked empathy. The relationship between veterinary and medical student empathy and their attitude towards pain in animals and non-verbal humans is explored in next chapter.

Quantitative studies have described a negative effect of training on attitude towards pain, however it is difficult to tease out the inevitable concurrent

ageing effect in these studies (Hellyer et al., 1999, Mich et al., 2010, Ung et al., 2016) (Chapter 2, section 2.11). Whilst *Education* was identified as a theme emergent from this interview data, it is apparent that students perceived formal education as having a superficial effect on their own attitude development.

There has been a lack of studies to investigate the influence of background on attitude to pain, but one quantitative study has eluded to a link between upbringing and/or back ground and attitude towards pain, reporting that number of siblings was linked to attitude to pain in veterinary students (Kielland et al., 2009) (section 2.9.2). These interviewees were not asked specifically about sibling relationships, but family members emerged as being an important influence to pain attitude. All students identified their own upbringing as an important influence and often recalled memories of how their own parents/caregivers had reacted when in pain. In particular the attitude of parents or caregivers towards the students' own pain, and observation of parent/caregivers to others in pain, were key factors influencing the development of their attitudes towards pain. Previous research on the impact of parents on child development has shown that parental emotional invalidation is linked to reduced empathy and influences how people respond to others in pain in the future.(Arnett et al., 2018). In addition, some of the interviewed students had observed family members tolerating or coping with painful conditions, and said this had influenced how they respond to others in pain. This confirms the theory put forward by psychologists (Goubert et al., 2011), who suggested that observational learning was a crucial factor in the development of attitude towards pain (section 2.9.2).

The influence of the parents and/ or caregiver attitude towards pain can be considered family culture, which permeates throughout childhood and informs the attitude development as children grow and mature (Petty, (1997)). In this context, adults within the family become 'role models' and serve to demonstrate appropriate responses to social situations – including how to react to pain. This is passed down from one generation to the next – becoming

family folklore and can differ between families. Students who had relatives or friends from a farming background, described situations in which they had observed other peoples reaction to animals in pain and verbalised impression that pain was an accepted 'normal' part of life within the farming culture.

Society and culture has also influenced the students' attitude towards pain which is apparent in the attitude of some students towards the variation in pain tolerance between genders. Some students even described the media as contributing to the perception that one gender is more able to tolerate pain than the other. As students were exposed to clinical situations, they became aware of clinical culture often through observation of clinical staff reactions to pain in animals or non-verbal humans. Some students recalled feeling that their concerns about animals or non-verbal humans in pain were minimized or dismissed by clinical staff. Although some students reflected on the soundness of the judgements about pain made by clinical staff, most students described accepting the judgement of clinical staff, even if they conflicted with those of the student. This is evidence of students at the start of the veterinary/ medical training journey, learning to disregard pain in patients by observation of those in a clinically senior position.

Culture, both within the family and the wider society culture appeared to influence the student's attitude towards pain in animals and non-verbal humans. It has been suggested that the dynamics within medical education can be described a 'family system' as many of the patterns of behaviour within medical education mimic those of a family;

“Like parents who raise their children as they themselves were raised, each generation teaches as they were taught, and the patterns are loyally perpetuated.”
(McKegney, 1989)

A tendency to dismiss patient pain as 'normal' or not serious in the context of the clinically setting, may inhibit rather than promote development of empathy. A 'disconnect' in empathy may contribute to deterioration of empathy as students progress through training (Mangione et al., 2002, Quince et al.,

2016a, Stratton et al., 2008). A deterioration in empathy may particularly impact animals and non-verbal humans as they depend on clinical staff to empathize with them in order to recognise pain, rather than verbally communicating their own pain experience to clinical staff. There is potential for students to enter veterinary or medical school with attitudes to pain which are biased towards disbelieving or dismissing patient pain, and stem from attitudinal behaviour they have learnt from adult 'role models', which may be reinforced by clinical 'role models'. This may have negative effects on patients who are unable to verbally quantify their own pain experience, such as animals and non-verbal humans, which are already at risk of inadequate pain management (Curtiss, 2010, Walker, 2014, Alexander and Manno, 2003, Bradbury et al., 2016, Becker et al., 2013, Bell et al., 2012).

In any interview process the quality of the data gathered is largely determined by the skill and experience of the interviewer. As such it is important to reflect on the researcher impact on the data (section 3.11.2). Although interview technique was researched and practice interviews had taken place, lack of experience of interview technique may have affected the quality of the data gathered (see section 8.8.2).

The number of students interviewed was small due to the difficulty in recruiting volunteers and the time constraints. Although there is no optimum number to include in interview, ideally a researcher should continue to interview until a point of 'knowledge saturation' is reached, that is no new information or concepts are found from subsequent interviews (Glaser and Strauss, 1966). It has been suggested that theoretical saturation can be reached within 12 interviews, but this can vary depending on the interviewer, interviewees and subject (Elsie Baker and Edwards, 2012, Guest et al., 2006). This involves a process of transcribing and analysing data for each interview, before embarking on the next interview. Due to time constraints all the interviews had to take place in the autumn term of 2013, which did not allow time for transcribing and analysing data between each interview.

5.11 Conclusion

This study is the first to identify empathy, education and personal-social factors as influencing attitude towards pain in animals and non-verbal humans, in veterinary and medical students at the start of their undergraduate training. It emerged that childhood memories of observing animals or other humans in pain; and/ or the attitude of adult 'role models' to pain are likely to be deeply embedded and inform the attitude of veterinary and medical students in the future. As such, It is likely that less helpful attitudes towards pain which are linked to these childhood memories will prove difficult to change.

The results highlight the need for more general discussions about pain in animals and non-verbal patients as well as basic physiology, psychology and pharmacology. Attitudes which favour dismissing or down-playing the pain of animals and non-verbal humans within the clinical setting, may explain why patients who cannot communicate verbally have been shown to be at risk of poor pain management in hospitals (Feldt et al., 1998, Morrison and Siu, 2000).

It is important that veterinary and medical educators recognise that student attitudes towards pain can be varied and some students may harbour attitudes which tend to dismiss or minimize pain in animals and non-verbal humans. This highlights the need for undergraduate education to correct any unhelpful attitudes that may be detrimental in providing adequate pain management in animals and non-verbal patients. Ideally pain education should address the variation in attitudes to pain and establish positive 'role models' who would advocate for treatment of pain in animals and non-verbal humans, as well as teaching the physiological and pharmacological aspects of pain. Analysis of themes discovered, with particular emphasis on the relationship between themes and the relevance to the research question, has allowed a deeper exploration of the significance of the themes. A discussion of the themes and how they relate to the findings in chapter 4 will be covered in chapter 8.

Chapter 6 Empathy, and its relationship with assessment of pain in animals and non-verbal humans.

6.1 Introduction

The previous chapters presented data on veterinary and medical student attitudes towards pain in animals and non-verbal humans (NVH) when starting their undergraduate training, as well as exploring the factors which had influenced these attitudes. Empathy emerged as a theme in the factors which students perceived as influencing their attitude towards pain in animals and non-verbal humans (chapter 5). It is recognised that empathy is beneficial when approaching patient pain management (Banja, 2006). This may be particularly true in animals and non-verbal humans who rely on non-verbal behavioural expressions of pain, requiring the observer to appreciate the pain experience of these patient types (Craig et al., 2010).

This chapter builds on the work of the previous chapters by investigating the influence of empathy on veterinary and medical student attitude to pain in animals and non-verbal humans. Specifically, data is presented on third and fourth year veterinary and medical student empathy, and the relationship between student empathy and recognition of pain in animals and NVH. Third and fourth year students were selected as they have completed at least half of the undergraduate training and would be familiar with the concept of pain assessment.

This chapter aligns to the second research question, described in chapter 1.

RQ2. Is there an association between veterinary and medical students' empathy and their attitude towards pain in animal and non-verbal humans?

6.2 Recap of relevant literature

Observing pain in another activates the same neural pathways as when experiencing pain (Lamm et al., 2008, Moriguchi et al., 2007, Morrison et al., 2004, Singer et al., 2004, Valentini, 2010) and it is accepted that empathy is needed to appreciate pain in another human (Banja, 2006, Craig et al., 2010, Goubert et al., 2005) (section 2.13). Investigations into the influence of doctor empathy on pain management in patients has suggested that improved doctor empathy improves the outcome for patients in pain by enhancing a doctor's ability to appreciate the pain experienced by the patient (Banja, 2006, Gleichgerrcht and Decety, 2014, Goubert et al., 2005, Green et al., 2009, Passik et al., 2007, Tait, 2008). Physician empathy has been identified as an important element of the doctor-patient relationship, enabling a doctor to understand the experience of the patient (Shapiro et al., 1993).

There has been interest in the trajectory of empathy in medical students and identifying ways of optimising the development of an empathetic attitude towards patients (Bangash et al., 2013, Benabbas, 2016, Chen et al., 2007, Chen et al., 2015, Chibnall et al., 2014, Costa et al., 2016, Hojat et al., 2002, Hojat et al., 2001, Hojat et al., 2004, Hojat et al., 2009, Jeffrey and Downie, 2016, Khademalhosseini et al., 2014, Kliszcz et al., 1998, Stratton et al., 2008). There is also growing interest in empathy and effects of training in veterinary students (Schoenfeld-Tacher et al., 2015, Schoenfeld-Tacher et al., 2017), and in the clinical veterinary setting, there has been interest in the impact of empathy and compassion fatigue on the mental well-being of veterinary practitioners (Cohen, 2007, Dowling, 2018).

There has been little research into empathy for animals, but moral philosophers have suggested that there is a link between empathy for humans and empathy for animals (Serpell, 1994) and a significant but weak correlation between human-orientated and animal-orientated empathy in people living in Scotland has been reported (Paul and Podberscek, 2000).

No previous studies have investigated the relationship between student empathy and their assessment of pain in animals or non-verbal humans. An understanding of the influence of empathy on students' ability to assess pain in animals and NVH may aid future developments in pain education for both veterinary and medical students.

6.3 Overview of chapter

This chapter presents the data on the following:

- QUANT data on Empathy Quotient scores of veterinary and medical students half way through training.
- QUANT data on student pain scoring, using Numerical Rating Score and FLACC scores, of animal and NVH patient depicted in the six videos.
- Analysis of relationship between EQ scores, and pain scoring (NRS and FLACC scores).
- Discussion

6.4 Methods

An online version of the EQ questionnaire was developed (section 3.7). Six video clips were created using archived footage from television documentaries or original footage of clinical patients (section 3.8) [Figure 6-1, Figure 3-11].



Figure 6-1. Stills of animals (a lamb after non-surgical castration; a dog after laparotomy; and a cat before surgery) depicted in video which veterinary and medical students were asked to pain score.

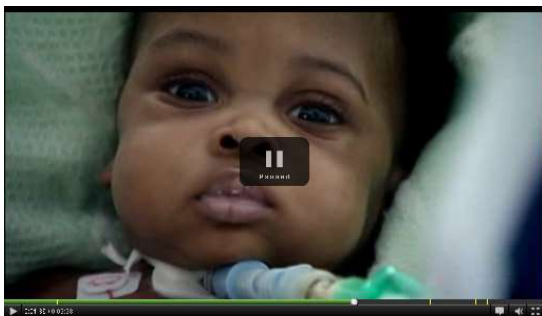


Figure 6-2. Stills of non-verbal human patient (an 18-month-old infant; and an elderly dementia patient; baby before surgery) depicted in videos which veterinary and medical students were asked to pain score.

The patients depicted in the videos were not graded in terms of their pain severity, but were reviewed by two experienced specialist veterinary anaesthetists and a medical general practitioner. Based on these opinions the severity of pain depicted in the videos were (least pain to most pain); *Cat* → *Baby* → *Small dog* → *Infant child* → *Lamb* → *Elderly person*.

Email invitations to complete the EQ questionnaire and pain scoring of the six video's using the Numerical Rating Score (NRS) and the Face Limb Activity Crying and Consolability (FLACC) score.

The statistical methods used in this chapter are described in the following chapter 3, section 3.10.

The QUANT data described in this chapter was collected from 3rd year (V2013_18, GEP2014_18 & M2013_18) and 4th year (V2012_17 & M2012_17) students during the 2015-16 academic year (Table 6-1).

Academic year	2012 intake	2013 intake
Sept 2015 – July 2016	QUAN: Empathy questionnaire & Pain scoring videos	QUAN: Empathy questionnaire & Pain scoring videos
Study population	V2012_17 M2012_17	V2013_18 M2013_18 GEP2014_18

Table 6-1. Table describing data collection timeline of project. Data collection phase which is presented in this chapter are shown in bold text.

6.5 Description of respondents

One hundred veterinary and 76 medical students completed the Empathy Quotient (EQ). Of these students 74 veterinary and 43 medical students also completed the pain scoring questionnaire (Numerical Rating Score (NRS) and Face Limb Activity and Consolability (FLACC) scores for the six videos.

This represented 29% of veterinary students (V2012_17, V2013_18, G2014_18) and 10% of medical students (M2012_17, M2013_18). Mean age

of all student who completed both EQ and pain scoring questionnaire was 22.1 ± 2.5 (range 19 – 33 years) with a statistically significant difference between veterinary (22.67 ± 3.00) and medical (21.32 ± 1.24) students ($p = 0.001$) [*ttest*].

There was a gender bias in respondents towards females in veterinary students, with 48 (63%) female medical compared to 91 (91%) female veterinary students. There was no difference in gender between students in first year (section 4.5) and third year ($P = 0.63$). The proportion of female students who completed the study reflected the gender balance of the third and fourth year veterinary and medical students, where overall female students accounted for 84.8% and 57.6% respectively.

6.5.1 Students with linked background questionnaire data

Empathy quotient scores were able to be linked to previous background questionnaire data in 29 veterinary and 31 medical students. Within these students there was a gender imbalance with 45 female and 15 male students, which reflects the gender balance of the combined veterinary and medical student cohort.

6.6 Empathy scores of veterinary and medical students

Mean EQ score was 42.1 ± 10.07 (range 13 – 64), with no statistically significant difference between veterinary (41.63 ± 10.93) and medical (42.79 ± 8.85) students ($p = 0.43$, Figure 6-3) [*Ttest*].

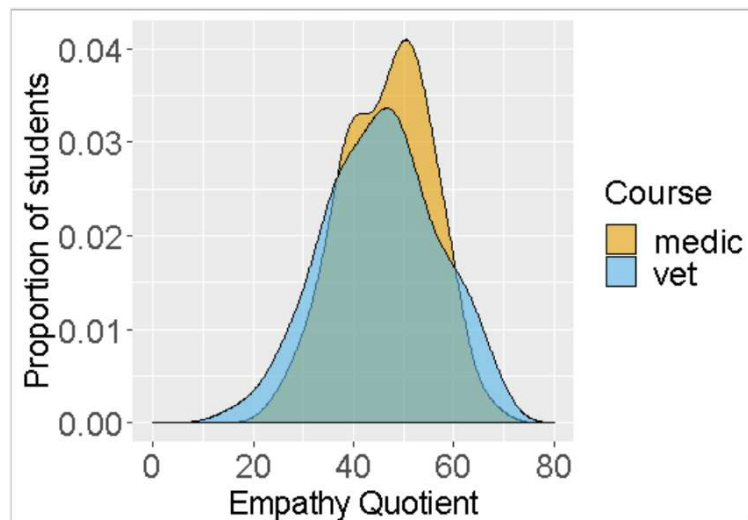


Figure 6-3. Density plot of Empathy Quotient scores, where Y axis represents proportion of 76 medical (Med) and 100 veterinary (Vet) students.

6.6.1 Influence of gender and age on EQ scores

There was a statistically significant difference in empathy scores between female (44.88 ± 8.34) and male (39.21 ± 8.68) medical students ($p = 0.007$), but no statistically significant gender difference was evident between female (41.66 ± 10.92) and male (41.33 ± 11.67) veterinary students ($p = 0.93$, Figure 6-4) [*Ttest*]. There was a non-significant weak negative correlation between age and EQ for veterinary students, and ($r_s = -0.07$, $p > 0.55$) and non-

significant weak positive correlation for medical students ($r_s = 0.04$, $p = 0.73$) [Spearman] (Figure 6-5).

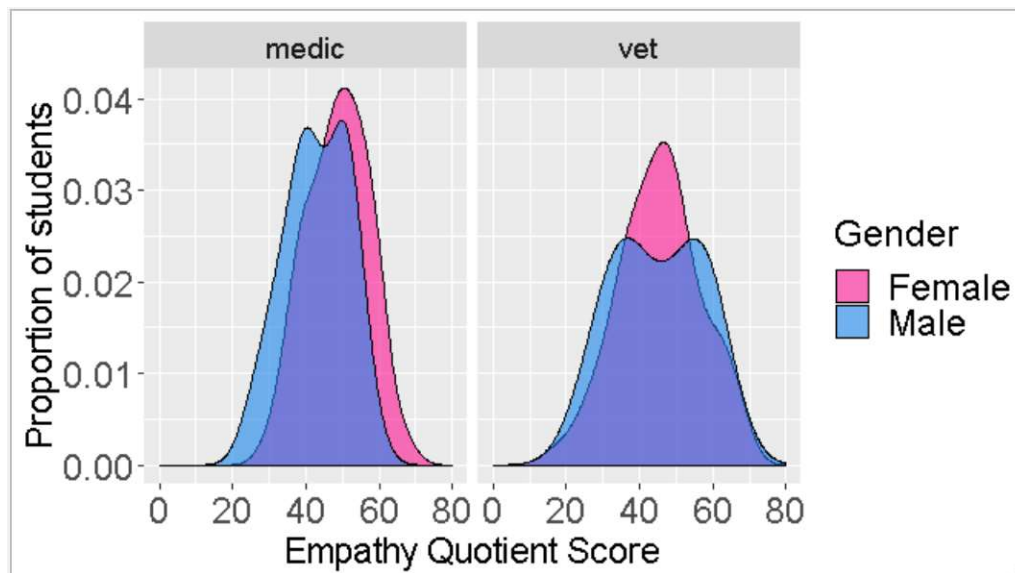


Figure 6-4. Density plot of Empathy Scores for male and female medical (Med) students; and male and female veterinary (Vet) students, where Y-axis represents proportion of 76 medical and 100 veterinary students.

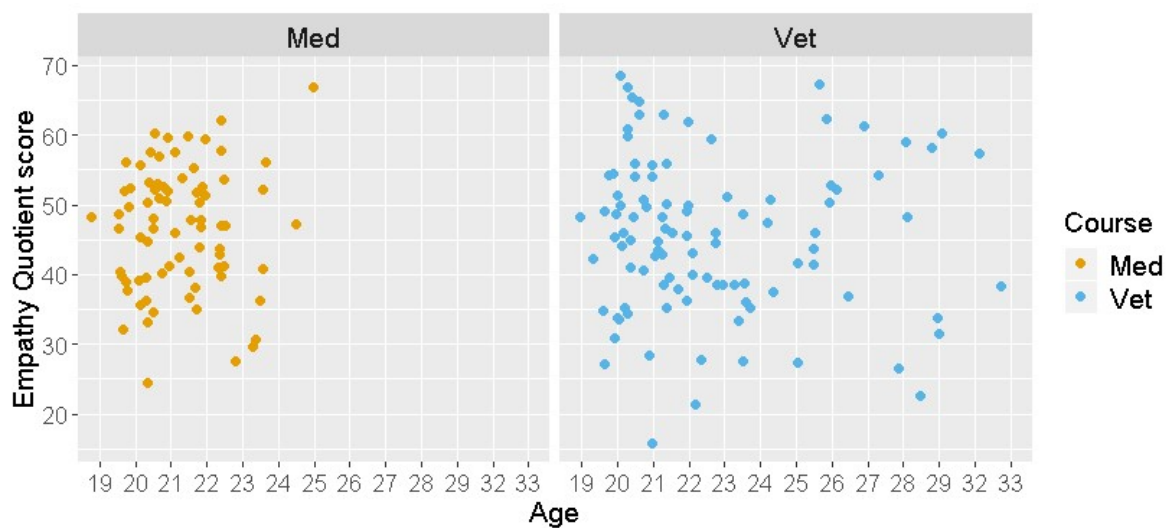


Figure 6-5. Scatterplot of age and Empathy Quotient score for third and fourth year medical (Med) and veterinary (Vet) students.

6.7 Associations between empathy scores and student personal characteristics/prior experience

Students who had experiencing of keeping a pet cat and/ or experience of working in a stables were more likely to score higher on the Empathy Quotient ($glmP$, Estimate > 1.193). Having experience of working in a veterinary practice was associated with scoring lower on the Empathy Quotient (OR = 0.833) [Table 6-2, Figure 6-6].

Characteristics and/or personal traits	Estimate	CI
Kept a cat	1.193	1.090-1.306*
Worked in veterinary practice	0.833	0.738-0.941*
Worked in stables	1.225	1.098-1.366*
Worked in animals rescue centre	0.901	0.805-1.009

Table 6-2. Estimates (+ 95% confidence intervals CI) from model averaged 'best fit' multivariable general linear model outputs of which student characteristics and /or personal trait influence empathy quotient scores in veterinary and medical student

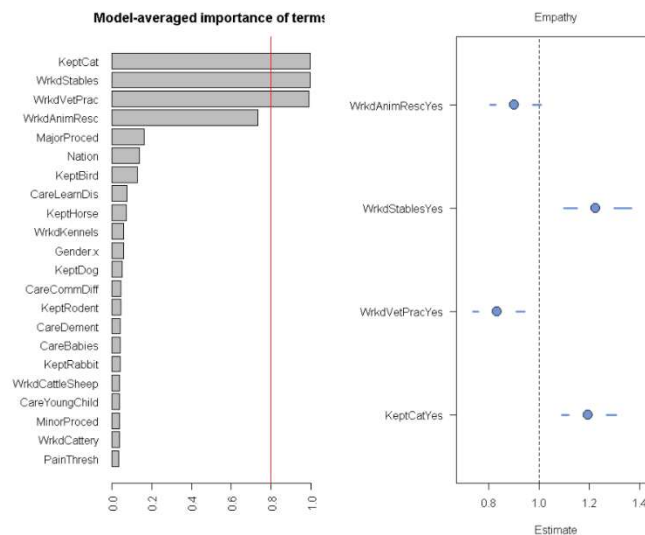


Figure 6-6. Model-averaged terms output (left hand panel) and estimate plot (right hand panel) for general linear model with Poisson errors analyses of associations between student personal characteristics and Empathy Quotient scores.

Having experience of working in a stables (OR = 1.225) and experience of having kept a cat (OR = 1.193) was associated with scoring higher on the Empathy Quotient [Table 6-2, Figure 6-6]. There was a non-significant association with working in an animal rescue centre and scoring lower on the Empathy Quotient.

6.8 Numerical Rating Scores

The median NRS scores awarded to *Infant child*; *Elderly person* and *Baby* were the same for both veterinary and medical students ($P>0.23$), although the range of scores differed (Table 6-3).

Video	NRS [Median (IQR)]	
	Veterinary	Medical
<i>Infant child</i>	6 (2-10)	6 (1-9)
<i>Elderly person</i>	7 (2-9)	7 (2-10)
<i>Baby</i>	2 (0-8)	2 (1-9)
<i>Small dog</i>	6 (1-9)	5 (1-9)
<i>Lamb</i>	2.5 (0-8)	2 (0-9)
<i>Cat</i>	2 (0-8)	1.5 (0-7)

Table 6-3. Median and interquartile ranges (IQR) for Numerical Rating Score (NRS) scores allocated by 100 veterinary students (Vet) and 76 medical students (Med) to patients in video (*Infant child*; *Elderly person*; *Baby*; *Small dog*; *lamb*; *Cat*).

More students assessed the *Elderly person* as being in greater pain, with 77% of students rating the pain in this patient as above 5. In contrast the *Baby* was assessed as being in least pain with only 9% of students rating pain in this patient above 5 (Figure 6-7).

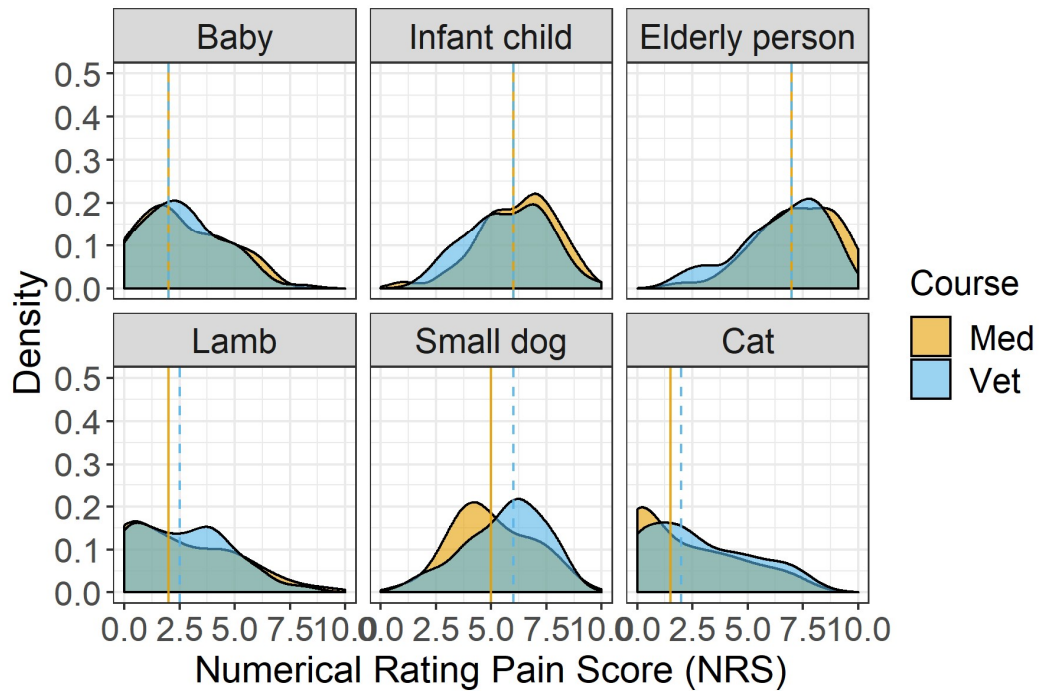


Figure 6-7. Density of Numerical Rating Scores (NRS) allocated to videos depicted Baby; Infant child; Elderly person; Lamb; *Small dog* and Cat, by veterinary (Vet) and medical (Med) . Vertical median line for Vet (dashed blue) and Med (solid yellow) shown.

Although there was a trend for students to rate pain in *Elderly person* as high, the range of NRS scores was wide. There was no statistically significant differences between NRS allocated for the six videos by veterinary and medical students ($p > 0.09$) [Figure 6-7], or between male and female students ($p > 0.28$) (Figure 6-8) [*Ttest*]. There was no statistically significant association of course, gender or age on NRS scores allocated to any of the patients in the videos (*Baby, Infant child, Elderly person, Lamb, Small dog* and *Cat*) ($p > 0.06$) [*glm*].

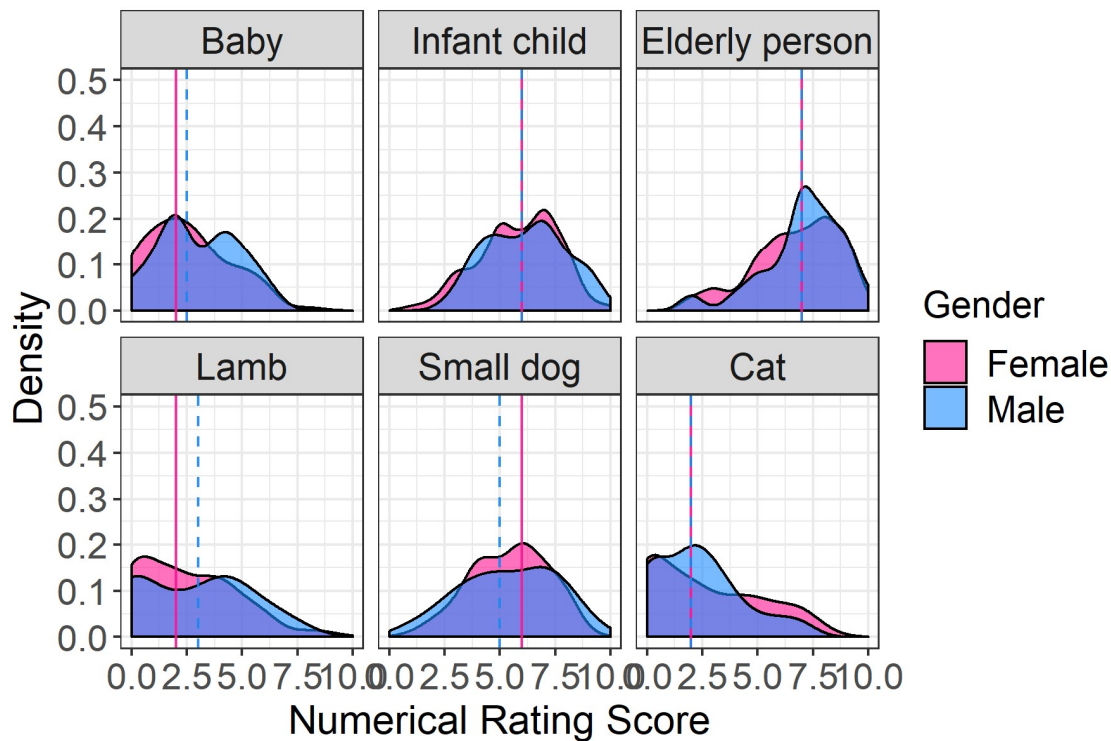


Figure 6-8. Density of Numerical Rating Scores (NRS) allocated to videos depicted Baby; Infant child; Elderly person; Lamb; *Small dog* and Cat, by Female and Male students. Vertical median line for female (solid pink) and male (dashed blue) shown.

6.9 FLACC scores

The FLACC scores allocated by students displayed medians of *Baby* 0 (IQR 0 - 2); *Infant child* 3 (IQR 2 - 5); *Elderly person* 8 (IQR 7 - 9); *Lamb* 1 (IQR 0 - 2); *Small dog* 3 (IQR 2 - 4) and *Cat* 0 (IQR 0 - 2) [Table 6-4].

Video	FLACC [Median (IQR)]	
	Veterinary	Medical
<i>Infant child</i>	3 (0-6)	4 (0-6)
<i>Elderly person</i>	8 (2-10)	8 (2-10)
<i>Baby</i>	0 (0-5)	1 (0-5)
<i>Small dog</i>	3 (0-8)	2 (0-6)
<i>Lamb</i>	1 (0-5)	1 (0-5)
<i>Cat</i>	0 (0-5)	0 (0-6)

Table 6-4. Median and interquartile ranges (IQR) for modified Face Limb Activity Crying and Consolability (FLACC) scores allocated by 100 veterinary students (Vet) and 76 medical students (Med) to patients in video a (infant child); b (elderly person); c (*Small dog*); d (lamb); e (baby) and f (cat).

The majority of students (81%) rated pain in *Elderly person* greater than 5. In contrast less than 12% of students rated pain in *Infant child*, *Small dog*, *Cat* and *Baby* as greater than 5. In contrast to the NRS scores, fewer students rated pain in *Infant child* and *Small dog* above 5. There was no statistically significant difference between FLACC scores allocated by medical and veterinary students to *Baby*, *Elderly person*, *Lamb*, *Small dog*, or *Cat* ($p > 0.10$). However a statistically significant difference was found between FLACC scores allocated by medical and veterinary students to the *Infant child* ($p = 0.03$) [Figure 6-9].

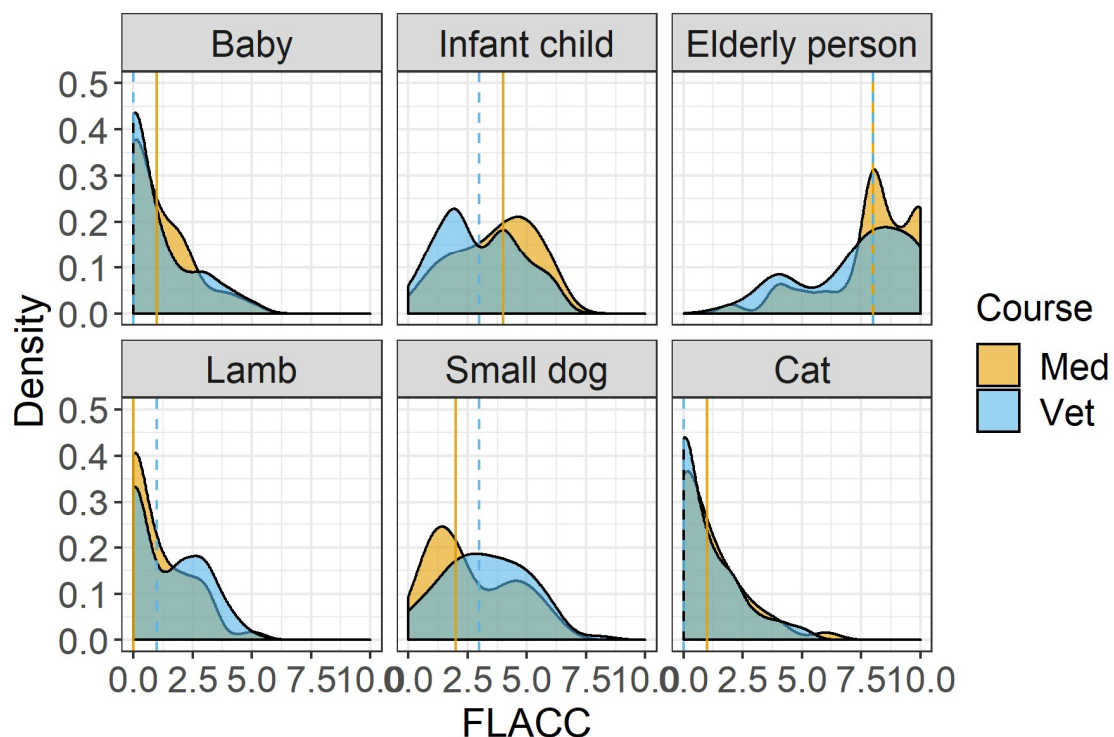


Figure 6-9. Density of modified Face Limb Activity Crying and Consolability (FLACC) allocated to videos depicted *Baby*; *Infant child*; *Elderly person*; *Lamb*; *Small dog* and *Cat*, by medical (Med) and veterinary (Vet) students. Vertical median line for Vet (dashed blue) and Med (solid yellow) shown.

There was no statistically significant differences between FLACC scores allocated to all six videos by male and female students ($p > 0.05$) [Figure 6-10].

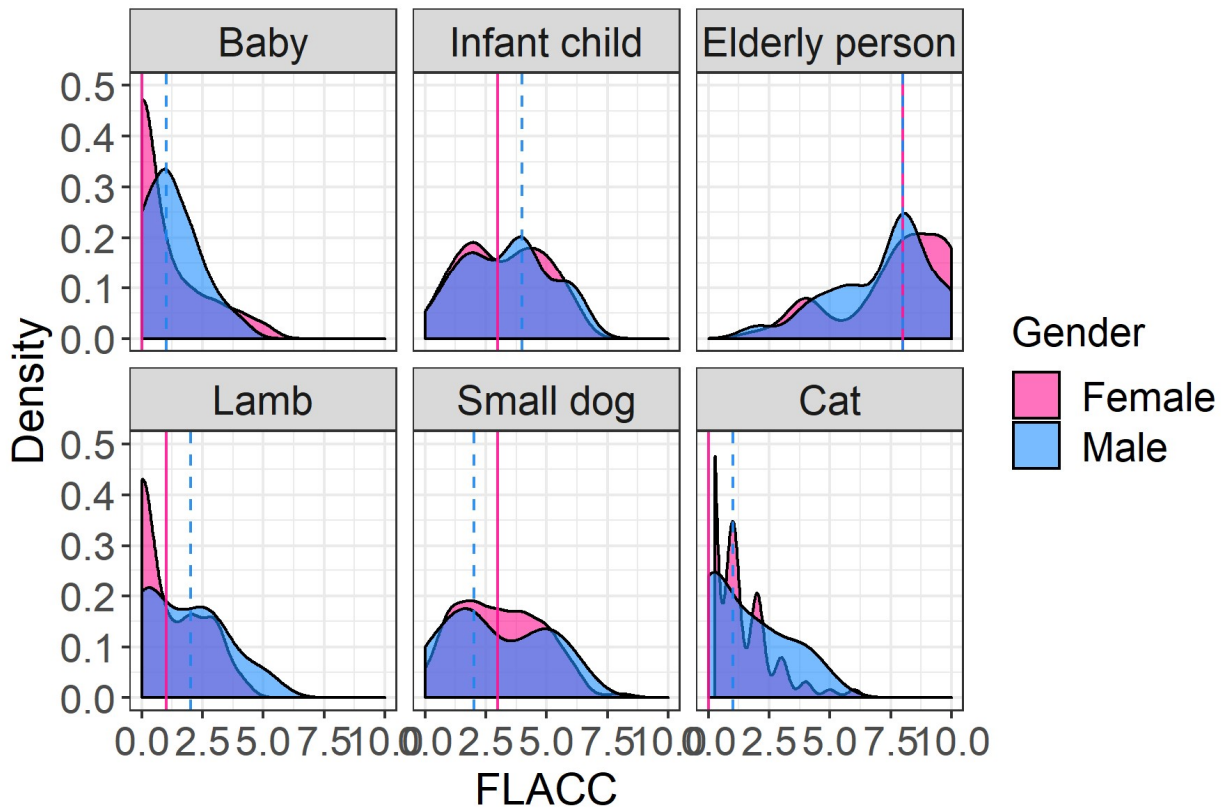


Figure 6-10. Face Limb Crying and Consolability (FLACC) pain scores allocated to videos depicted *Baby*; *Infant child*; *Elderly person*; *Lamb*; *Small dog* and *Cat*, by Female and Male students. Vertical median line for female (solid pink) and male (dashed blue) shown.

There was no statistically significant association of course, gender or age on FLACC scores allocated to the *Baby*, *Elderly person*, *Small dog* and *Cat* ($p > 0.06$) [glmp].

However, there was an statistically significant association between course and FLACC scores for the *Infant child*, with veterinary students more likely to give lower scores ($p = 0.041$), and a statistically significant association between both course and gender, and FLACC scores for the *Lamb* was evident, with veterinary ($p = 0.04$) and male ($p = 0.02$) students more likely to give higher scores than medical and female students, respectively (Figure 6-11).

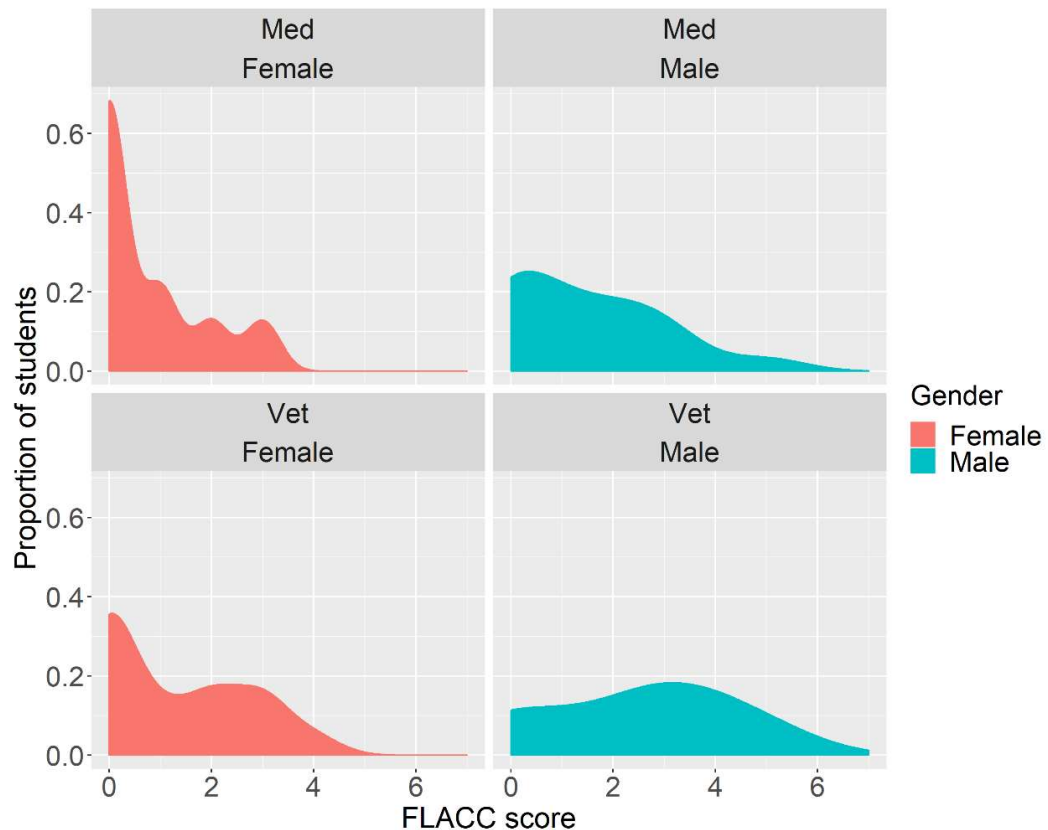


Figure 6-11. Density plot of FLACC scores allocated to *Lamb* for female (left hand side panels) and male (right hand side panels), medical (top panels) and veterinary (bottom panels) students.

6.10 Comparison between NRS and FLACC scores

NRS and FLACC scores allocated by all students were positively correlated to each other for five of the videos (*Baby*; *Infant child*; *Small dog*; *Lamb*; *Cat*, $r_s = 0.30 - 0.63$, $p < 0.001$) [Figure 6-12].

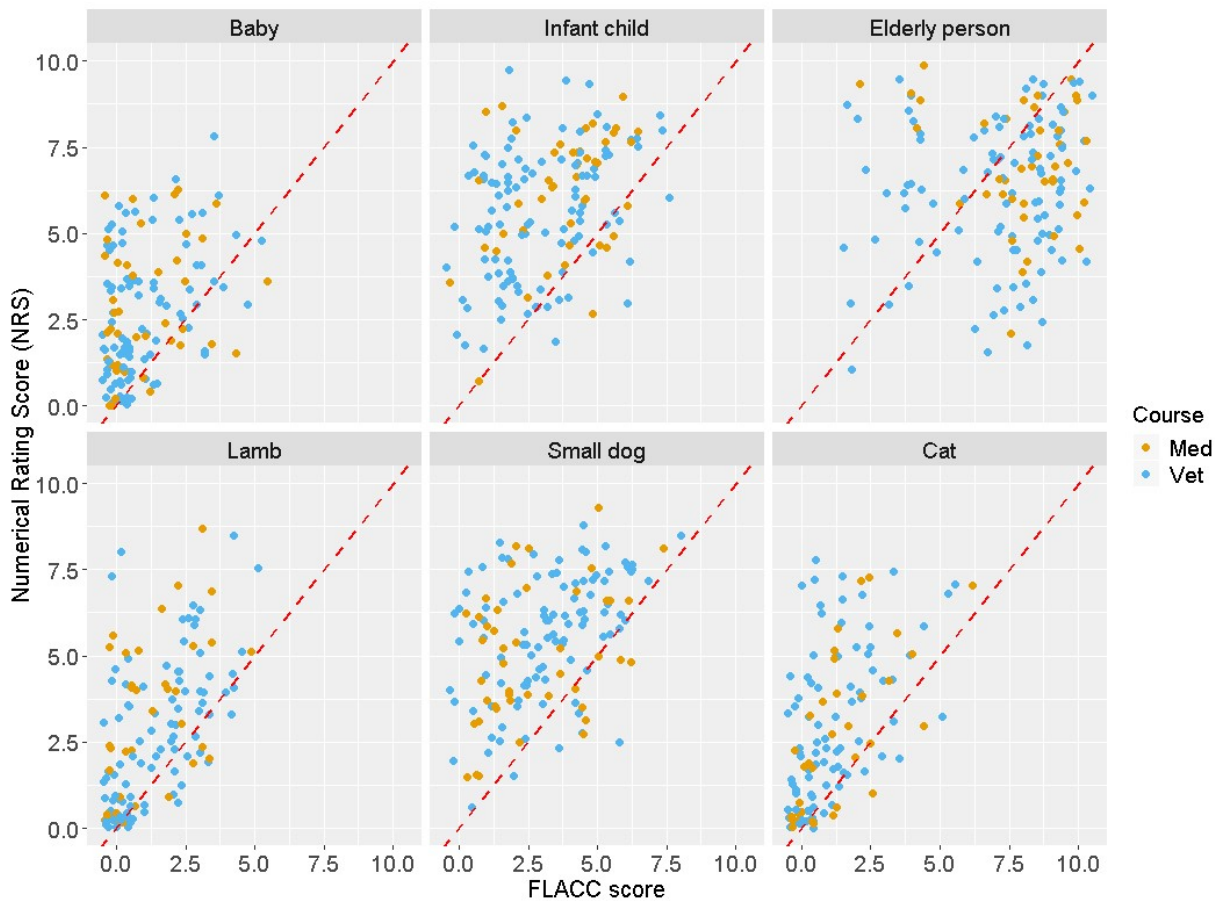


Figure 6-12. Scatterplot showing relationship between Numerical Rating Scores (NRS) and of modified Face Limb Activity Crying and Consolability (FLACC) allocated by veterinary (Vet) and medical (Medic) students to videos depicting *Baby*; *Infant child*; *Elderly person*; *Lamb*; *Small dog* and *Cat*. The dotted red line represents a positive correlation of $r_s = 1$.

Correlations between NRS and FLACC scores was strongest for *Lamb* ($r_s = 0.62$), *Small dog* ($r_s = 0.41$) and *Cat* ($r_s = 0.63$), and weakest for *Baby* ($r_s = 0.29$) and *Infant child* ($r_s = 0.31$). There was no statistically significant correlations between NRS and FLACC scores for *Elderly person* ($r_s = 0.02$, $p = 0.96$). When data from veterinary and medical students was analysed separately, there was no statistically significant correlation between NRS and FLACC scores allocated to *Infant child* by medical students ($r_s = 0.28$, $p = 0.06$).

When NRS and FLACC scores allocated by female and male students were considered separately, there were statistically significant correlations between NRS and FLACC scores allocated by female students for *Infant child* ($r_s = 0.31$, $p < 0.01$); *Small dog* ($r_s = 0.41$, $p = < 0.01$); *Lamb* ($r_s = 0.57$, $p < 0.001$); *Baby* ($r_s = 0.32$, $p < 0.001$) and *Cat* ($r_s = 0.62$, $p < 0.001$) [Figure 6-13].

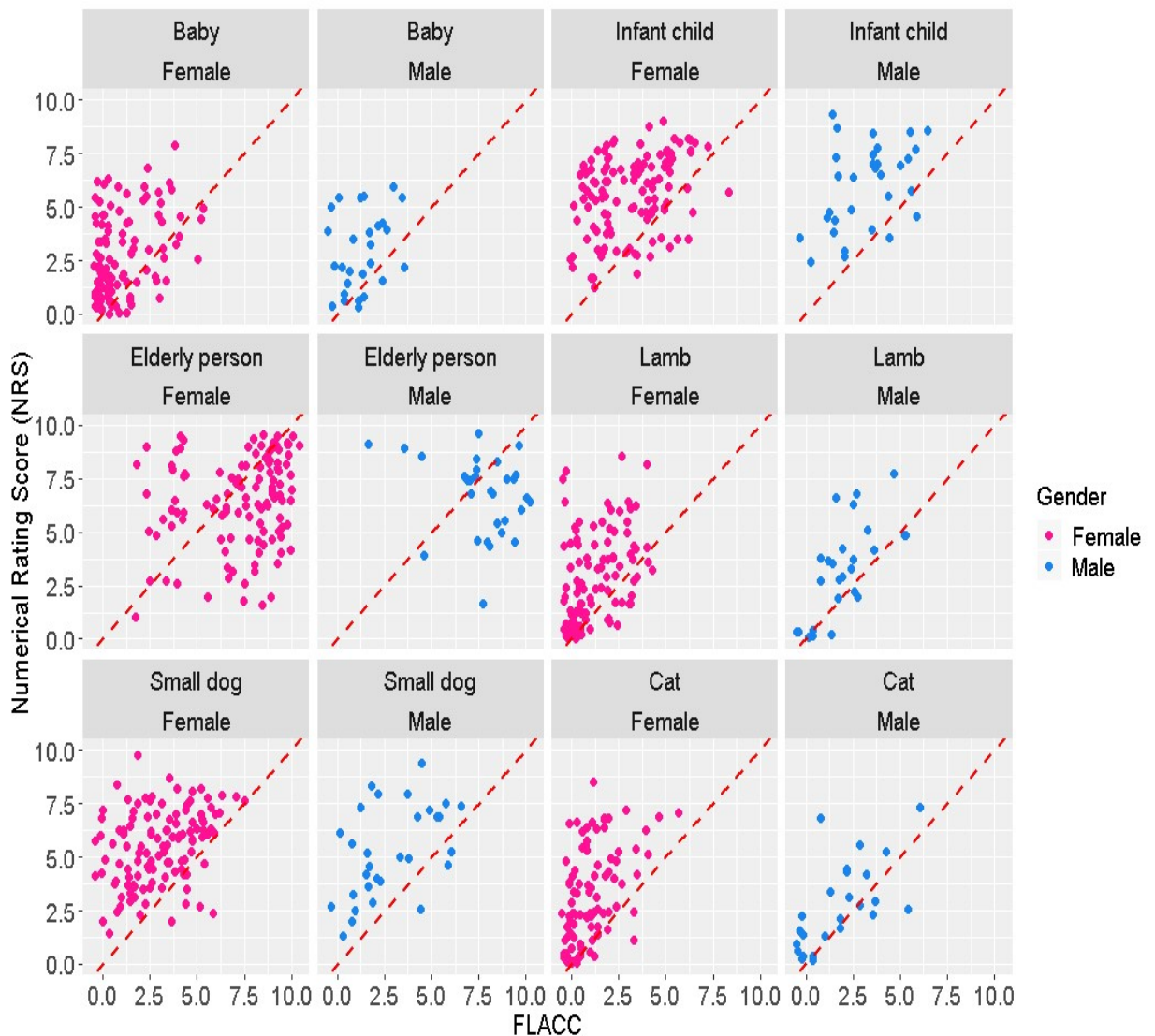


Figure 6-13. Scatterplot showing relationship between Numerical Rating Scores (NRS) and of modified Face Limb Activity Crying and Consolability (FLACC) allocated by Female (pink) and Male (blue) students to videos depicting *Baby*; *Infant child*; *Elderly person*; *Lamb*; *Small dog* and *Cat*. The dotted red line represents a positive correlation of $r_s=1$.

For male students there were statistically significant correlations between NRS and FLACC scores for three of the patients, namely *Small dog* ($r_s = 0.45$, $p = 0.037$); *Lamb* ($r_s = 0.79$, $p < 0.001$) and *Cat* ($r_s = 0.62$, $p < 0.001$).

There were no statistically significant correlations between NRS and FLACC scores allocated to *Elderly person* by either female ($r_s = 0.059$, $p = 0.57$) or male ($r_s = -0.38$, $p = 0.07$) students.

6.11 Correlation between EQ scores and NRS scores

There was no statistically significant correlations between NRS scores allocated by either veterinary or medical students, or each students EQ score ($r_s < 0.19$, $p > 0.3$) [Figure 6-14] [Spearman].

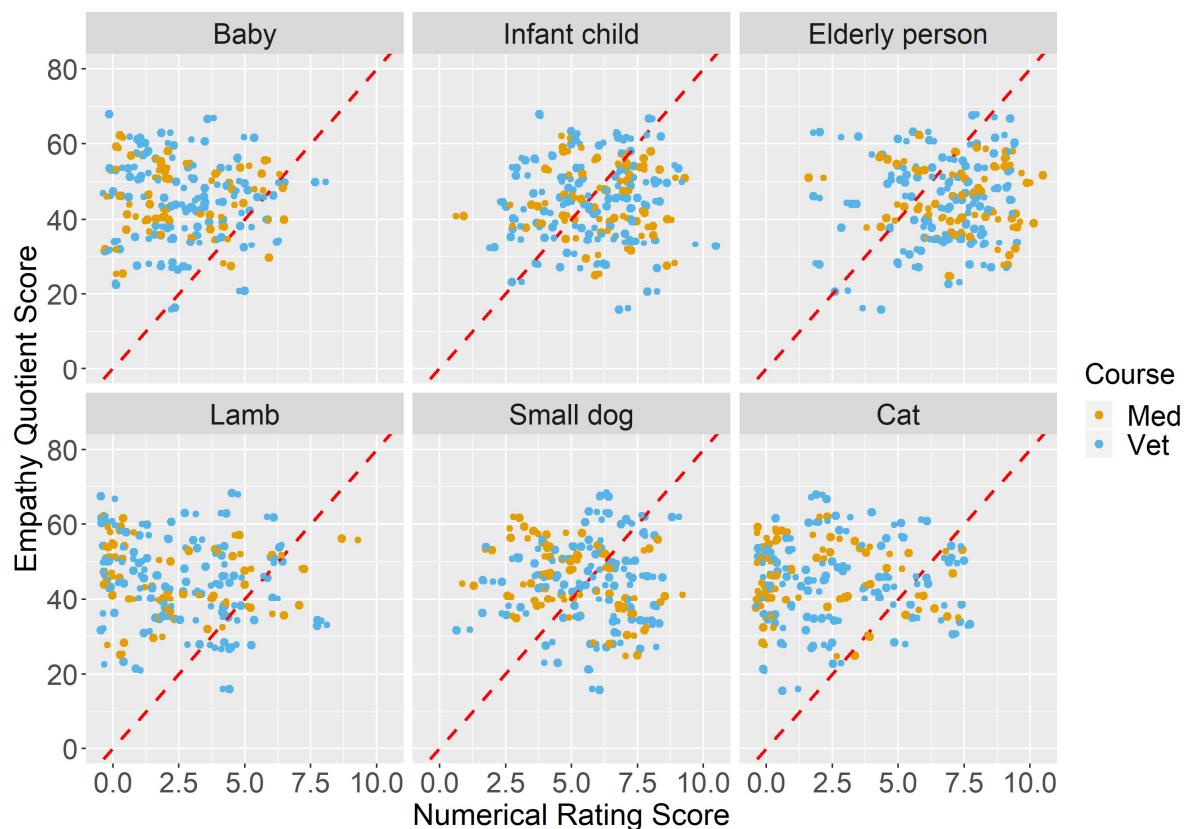


Figure 6-14. Scatterplot of Total Empathy Score of veterinary and medical students, and each students NRS score allocated to videos depicting Baby; Infant child; Elderly person; Lamb; *Small dog* and Cat. The dotted red line represents a positive correlation of $r_s = 1$.

When data from female and male students was considered separately, there was a statistically significant negative correlation between male student EQ scores and the NRS scores they allocated to *Small dog* ($r_s = -0.50$, $p = 0.013$) [Figure 6-15].

There were no other statistically significant correlations between NRS scores allocated by female students ($r_s < 0.1$, $p > 0.08$) and male students ($r_s < 0.19$, $p > 0.26$), and each students EQ scores [*Spearman*].

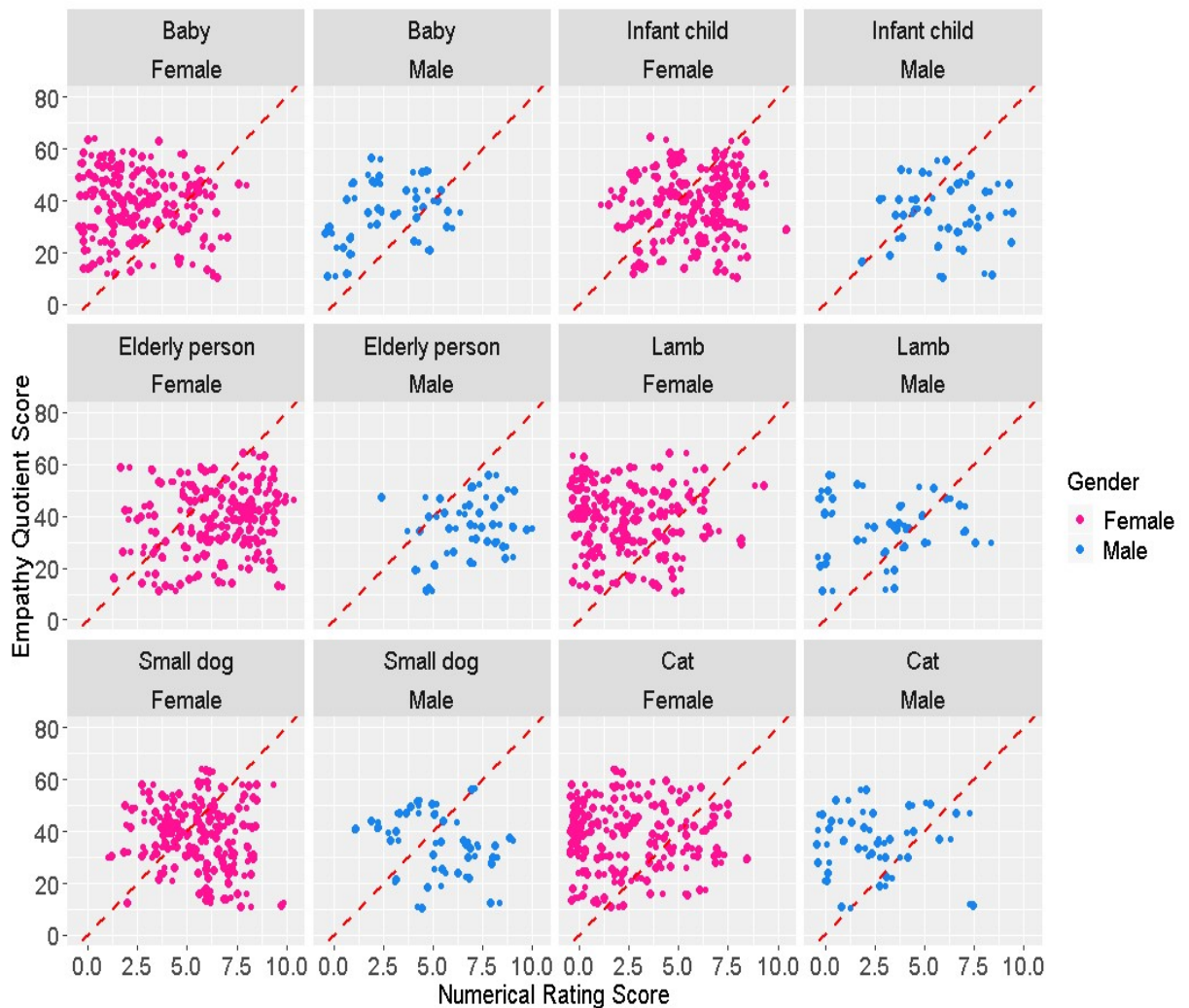


Figure 6-15. Scatterplot of female and male student Total Empathy Score and each students NRS score allocated to video depicting *Baby*, *Infant child*, *Elderly person*, *Lamb*, *Small dog* and *Cat*. The dotted red line represents a positive correlation of $r_s=1$.

There were no statistically significant associations between student EQ scores and how the rated pain using NRS for patients depicted in the videos ($p > 0.19$).

6.12 Correlation between EQ scores and FLACC scores

There was a statistically significant weak positive correlation between student EQ scores and FLACC scores they allocated to Infant child ($r_s = 0.19$, $p = 0.03$). There were no other statistically significant correlations between student EQ scores and FLACC scores allocated to the remaining five patients ($r_s < 0.15$, $p > 0.11$) [Figure 6-16] [Spearman].

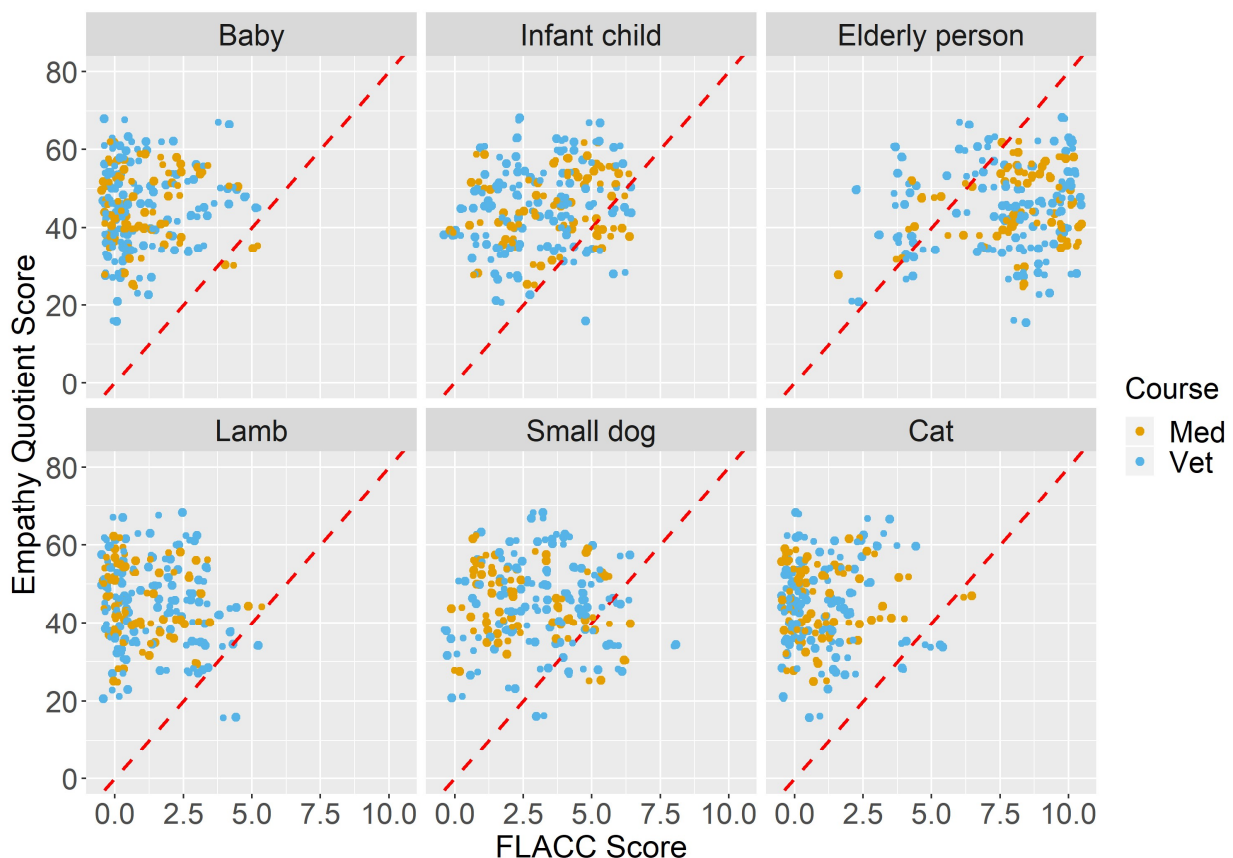


Figure 6-16 Scatterplot of veterinary and medical student Total Empathy Score, and each students FLACC score allocated to videos depicting *Baby*; *Infant child*; *Elderly person*; *Lamb*; *Small dog* and *Cat*.

When veterinary and medical students were analysed separately there was no statistically significant correlation between Empathy Quotient scores and FLACC scores allocated to the patients in the videos ($r_s < 0.28$, $p > 0.06$).

When data from female and male students were analysed separately, there was a statistically significant weak positive correlation between female students EQ scores and the FLACC scores they allocated to *Infant child* ($r_s = 0.224$, $p = 0.028$) [Spearman] (Figure 6-17).

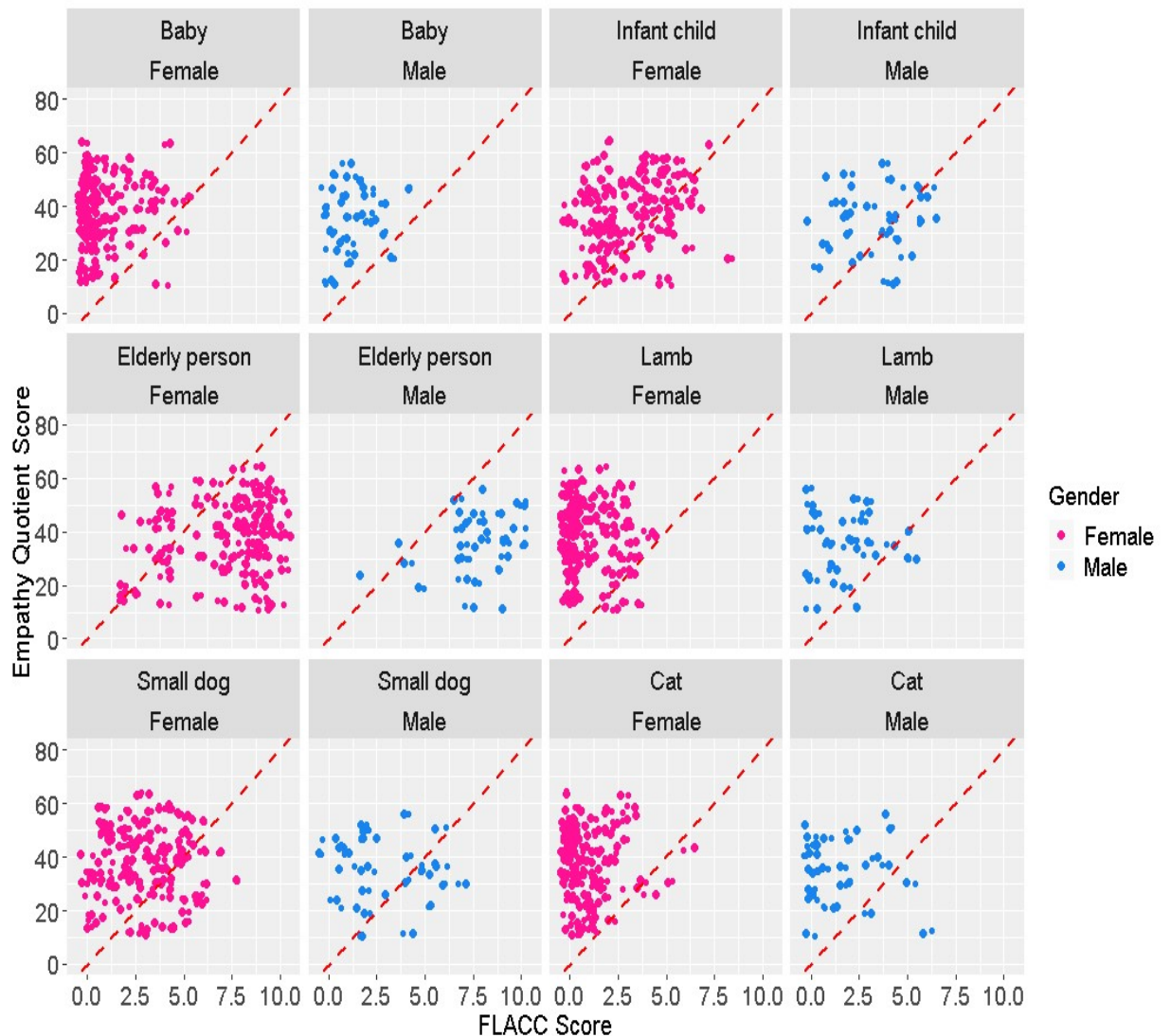


Figure 6-17. Scatterplot of Female and Male student Total Empathy Score, and each students FLACC score allocated to video depicting *Baby*; *Infant child*; *Elderly person*; *Lamb*; *Small dog* and *Cat*.

There were no other statistically significant correlations between EQ scores and FLACC scores allocated by either female ($r_s < 0.12$, $p > 0.22$) or male students ($r_s < 0.29$, $p > 0.17$).

There was a statistically significant association between student EQ scores and the FLACC scores they allocated to *Lamb* ($p = 0.031$) students who scored higher on the Empathy Quotient more likely to give a lower FLACC score [glm]. There were no other associations between students EQ scores and the FLACC scores they allocated to the other five patients depicted in the videos ($p > 0.062$).

6.13 Discussion

This chapter presented the data on veterinary and medical student empathy and its influence on their assessment of pain in animals and non-verbal human (NVH) patients. There appeared to be wide variations in NRS and FLACC scores allocated by students for different patients depicted in videos, and also for each individual patient in each video, although this was variation in scores was not analysed.

There were statistically significant correlations between NRS and FLACC scores for five of the patients depicted in the videos, although correlations varied from weak ($r_s = 0.3$) to moderate ($r_s = 0.62$). However there was no statistically significant correlation between NRS and FLACC scores for *Elderly person*. In contrast to previous studies (Robinson and Wise, 2003), gender did not influence NRS scores allocated to observed patients in this group of students.

No statistically significant correlation was found between veterinary and medical students EQ scores and the NRS scores they allocated to any of the patients in videos. This conflicts with findings from a previous study which found a strong positive correlation between the Personal distress subscale of the Interpersonal Reactivity Index (IRI) empathy scale and the pain intensity rated from clips showing the facial expression of patients. (Gleichgerrcht and Decety, 2014).

There was no significant difference in empathy scores between veterinary and medical students, as measured by the EQ, which were comparable with

previously reported mean empathy scores in control adults of 42.1 ± 10.6 (Baron-Cohen and Wheelwright, 2004) [Figure 6-18].

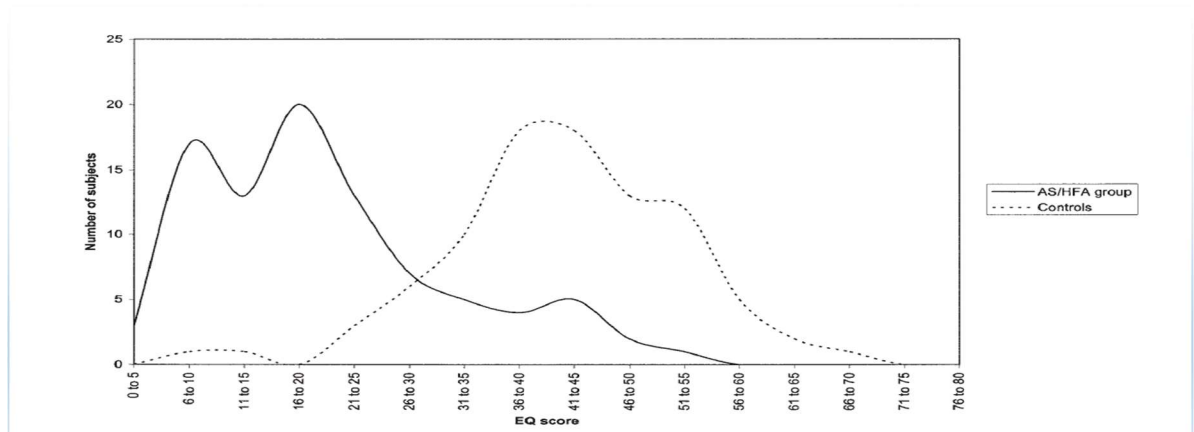


Figure 6-18. Plot showing EQ scores from control population (dotted line). Reproduced from (Baron-Cohen and Wheelwright, 2004).

Female medical students had significantly higher empathy scores compared with male medical students, which is in agreement with the findings of other studies on medical students and the general population (Lamm et al., 2011). Cohen et al (Cohen and Bennett, 2006) found an association between female students and their scores on the 'emotional response' subscale of an empathy scoring system and there is evidence that neural mechanisms underlie gender differences in empathy (Han et al., 2008). Many previous publications also suggest female clinicians have enhanced attitudes related to compassion (Bertakis et al., 1995, Roter et al., 2002). Whilst there was no such difference observed in the veterinary students in this part of the study, only nine veterinary students were male resulting in a female bias.

There was a statistically significant negative correlation between male students EQ scores and the NRS scores they allocated to *Small dog* ($p = 0.013$), indicating that male students with higher EQ scores allocated lower pain scores to *Small dog*.

There was also a weak statistically significant correlation between student EQ scores and the FLACC scores allocated to *Infant child*, and there was a difference in how female and male students scored pain in the *Infant child*. Differences in how students scored pain in the patients depicted in the videos may be influenced by a number of factors. Previous research has shown that assessment of pain by an observer is influenced by the age, gender and ethnicity of the observed person (Tait and Chibnall, 2014, Trawalter et al., 2012, Pillai Riddell and Craig, 2007, Hoffman et al., 2016, Hirsh et al., 2009).

Unconscious bias refers to learnt stereotypes and assessments of people which are influenced by factors such as age, gender and the ethnicity of the observed person (Backhus et al., 2019). Any or all of the potential unconscious biases may have influenced how veterinary and medical students scored pain in the *Infant child*. In recent years there has been acknowledgement of the impact of unconscious bias on the decisions clinicians make about patient management, including those concerned with pain (Dehon et al., 2017, Haider et al., 2011, Lewis et al., 2015, Chodosh et al., 2004).

Although the NRS is considered the gold standard for pain assessment in people who can communicate their own pain experience, it is inadequate for those who are unable to verbally communicate as it depends on the patient communicating their own perceived level of pain. The NRS was used in this study as it was easily applicable to both animals and humans, and has been used extensively in the veterinary and medical literature. The FLACC was chosen as an objective pain assessment tool in this study as it has been shown to be reliable in various non-verbal humans, (Voepel-Lewis et al., 2010, Merkel et al., 1997) and shares many of the domains found in the commonly used animal pain assessment tools.

There were correlations between the NRS and FLACC scores allocated by students to patients in five of the videos. In contrast, there was no correlation between the NRS and FLACC scores students gave to the Elderly person. The Elderly person was vocal and displayed behaviours associated with dementia, such as incoherent speech, screaming, and disorientation. Previous studies

have also found pain assessment in patients with severe dementia or cognitive impairment to be sub-optimal, resulting in these patients receiving less analgesia when compared to patients with normal cognitive function (Feldt, 2000).

The video clips of human patients were edited from television hospital documentaries as obtaining consent to use video footage of painful human patients proved difficult. Where possible, background music and voice-over was removed from the clips during the editing process, however, some background music did remain in edited clips for Baby and Infant child, although the influence this had on allocated NRS and FLACC scores is undetermined. The number of times the students watched each video before completing the NRS or FLACC pain scoring is unknown, so the influence of repeated viewing of each video is unknown.

The questionnaires were sent via e-mail without incentive for completion. This may explain the low response rate from medical students which was lower than previously cited for mailed questionnaires (Thrusfield, 2007), yet still greater than recent estimates of response rates to online questionnaires (Rubsamen et al., 2017). A limitation of the current study was the relatively small sample size for comparison of empathy scores with NRS and FLACC scores due to many students not completing all of the pain assessment section, however approximately two thirds of respondents *did* complete all parts of the study (see section 8.8.2).

In addition, accurate assessment of moderate pain is more difficult than assessment of severe pain, so there is more interrater variability of pain scores when assessing moderate pain (Ashley et al., 2005). There is the possibility that the pain levels of some of the patients depicted in the videos could have been interpreted as moderate levels of pain, which may have contributed to differences observed in how veterinary and medical students scored pain in *Infant child* and *Lamb* (see section 8.8.2).

The EQ was chosen for this part of the study because it is a well-regarded measure of empathy that has good cross-cultural validity and high internal validity, with a reported Cronbach's alpha of 0.65 (RStudio Team and 2016) (section 3.7). The EQ was originally developed for use in diagnosing autism and high functioning Asperger's, but is also brief, easy to use, measures both cognitive and affective elements of empathy, and is sensitive to a lack of empathy (Baron-Cohen and Wheelwright, 2004). However the choice of EQ as an empathy measure would have influenced the results obtained (sections 6.13 & 8.7).

Pain is a unique sensory and emotional experience, which can illicit different empathetic responses compared to other empathetic triggers, and some researchers argue that general measures of trait empathy may not be sufficiently sensitive to pain specific empathetic responses to another's pain. An Empathy for Pain Scale (EPS) was developed which used four scenarios describing humans in pain to gauge context-specific empathy. However, EPS demonstrated a lack of correlation between scores for the empathic concern subscale and NRS allocated to videos of people in pain (Giummarra et al., 2014). As empathy is complex and has many differing facets, it is possible that the use of a different empathy scoring tool would have yielded different results (see section 8.7).

Empathy is a complex multidimensional construct and is important in providing good patient care. A recent review identified empathy in medical education as an important theme and highlighted the need to nurture empathy in medical students (Roche and Harmon, 2017). Whilst this part of the study has not found a link between empathy scores and how medical and veterinary students visually assessed pain, it is still not known if empathy influences the motivation to relieve pain in patients (see section 8.9). This motivation to alleviate pain in others, which is sometimes called 'empathic concern' (Craig et al., 2010), is important to nurture in both medical and veterinary students and more research is needed to understand how empathic concern can be promoted during training.

In order to optimize medical student teaching of pain assessment in non-verbal patients, it is important to understand how internal assessor factors may influence pain assessment in these patients. In this study, student empathy levels were not associated with visual assessment of pain in non-verbal humans and animals using NRS and a behavioural pain assessment tool. The finding should prove useful to a broad range of clinicians teaching pain-related subjects to health-care professionals as it provides reassurance to medical and veterinary educators that any teaching of behavioural pain assessment methods seems unlikely to be influenced by inherent student empathy.

The results from this chapter suggest that empathy, as measured using the Empathy Quotient, did not influence how students assess pain in subjects who cannot verbally communicate, suggesting that more work is required to clarify if any element of the empathy construct is involved in assessment and appreciation of pain in others, particularly in patients unable to communicate their own levels of pain such as animals and NVH.

Further work should explore ways to improve student training with respect to pain assessment and promotion of positive attitudes, particularly towards patients who are unable to communicate their own pain experience. Questions remain about what influences attitude and motivation to alleviate pain in non-verbal patients, and more importantly, whether undergraduate training is beneficial or detrimental to attitude. The following chapter examines veterinary and medical student attitude towards pain as they progress through training and evaluates the influences on these attitudes.

Chapter 7 Changes in attitude towards pain in animals and non-verbal humans during undergraduate training.

7.1 Introduction

The previous chapter examined the relationship between student empathy and their assessment of pain in animals and non-verbal humans, and concluded that there is no link between student empathy as measured by the Empathy Quotient, and attitude to pain in animals and non-verbal humans. Preceding chapters examined the attitude to pain in animals and non-verbal humans, and looked for demographic factors and student characteristics which influence those attitudes (Chapters 4 & 5). The findings from these earlier chapters indicate that attitude varies with animal species and non-verbal human type, and certain demographic factors (gender), and student characteristics (previous experience; empathy; education; personal-social factors).

This chapter will revisit student attitude towards pain in animals and non-verbal human patients as they progress through undergraduate training, and examine what factors students perceive have influenced their own attitude towards pain during training. Specifically, this chapter presents quantitative (QUAN) data on attitude towards pain in various animal species and non-verbal human from questionnaires completed half-way, and at the end of training. Qualitative (QUAL) data on student's perception of influencing factors on attitude to pain, from interviews conducted at the end of training is also presented. Along with the data from chapter 4 and 5, this chapter answers the following research question:

RQ3. Do attitudes of veterinary and medical undergraduates towards pain in animals and non-verbal humans change during training, and what influencing factors are they exposed to during training?

7.2 Recap of relevant literature

There has been previous work investigating whether attitudes towards pain change during undergraduate training in veterinary and medical students (Hellyer et al., 1999, Kielland et al., 2009, Ung et al., 2016, Ali and Thomson, 2009) (section 2.11.1). The evidence seems to suggest that as students' progress through training they are less likely to advocate analgesia and/ or have a less helpful attitude towards pain in patients. However all previous work has relied on cross year comparison to determine whether attitudes change, rather than following the same students through training in a longitudinal research model. There have also been interventional education studies investigating attitude to pain, for example Ameringer et al (2012) investigated the influence of education on medical undergraduate's attitude towards paediatric pain and Weinstein et al (Weinstein et al., 2000) attempted to investigate medical students' knowledge and attitudes towards pain and opioids, before and after training. Both studies found that educational interventions improved attitudes towards pain. However, studies from medical education have shown that pain education, particularly in non-verbal human pain is often lacking at undergraduate level (Briggs et al., 2011, Chang et al., 2000). It is suggested that poor understanding and inadequate treatment of non-verbal human pain is due to insufficient education in the subject (Saroyan et al., 2008) and Watt-Watson et al (2009) found that undergraduate pain teaching was often informal and took place on clinical placements. A study of undergraduate pain curricula across health disciplines found that pain education varies across disciplines and interdisciplinary learning is minimal (Briggs et al., 2011) (section 2.15). The authors recommended greater integration of pain content in undergraduate programmes and interdisciplinary approaches to the topic.

7.3 Overview of chapter

This chapter presents the results of a longitudinal research approach to investigate whether the attitudes of veterinary and medical students change as they progress through training, and whether factors which influence their attitudes also change. The results may aid in future development of pain curricula in both veterinary and medical education.

This chapter presents the following:

- QUAN data on third and final year student rating of *Expectation of Pain (EP)* for animals and non-verbal humans.
- A comparison of how students rated *EP* of animals and non-verbal human in first, third and final year.
- QUAL data from repeated interviews which were conducted during second semester of final year of undergraduate training.
- A comparison of themes identified from first and final interviews.
- Summary of both QUAN and QUAL results
- Discussion of the results in the context of the research question 3.

7.4 Methods

An online questionnaire on *Expectation of pain* in various animal species and non-verbal human types was distributed to veterinary and medical students. The QUAN data from this questionnaire was collected from veterinary and medical students (V13_18, GEP14_18 and M13_18), in semester 1 of third year (academic year 2015-16) and semester 2 final year of training (academic year 2017-18). Data was analysed and compared to previous QUAN data

described in chapter 4, looking for changes in attitude. The QUAL data was gathered by re-interviewing the same veterinary and medical students who were previously interviewed at the start of second year (V12_17 and M12_17) (Table 7-1).

Academic year	2012 intake	2013 intake
Sept 2015 – July 2016	QUAN: Empathy questionnaire & Pain scoring videos	QUAN: Empathy questionnaire & Pain scoring videos
Study population	V12_17 M12_17	QUAN: Repeat pain attitude questionnaire V13_18 M13_18 GEP14_18
Sept 2016 – July 2017	QUAL: interviews	
Study population	V12_17 M12_17	
Sept 2017 – July 2018		QUAN: Repeat pain attitude questionnaire V13_18 M13_18 GEP14_18
Study population		

Table 7-1 Table describing data collection timeline of project. Data collection phase which is presented in this chapter are shown in red ovals.

These students were contacted in autumn 2016. An interview guide was used as a starting point for dialogue and interviews took place between January 2017 and March 2017, at a location convenient for the participants.

Data from interviews was analysed after completion of all interviews, using an open thematic coding process and coding matrix was used as a visual aid to identify links and relationships between themes. Data was presented as tables of themes and constituent coding framework; and quotes with a *post script* unique identifier (e.g. V12_17.49) and quote number.

7.5 Description of third year questionnaire respondents

A total of 55 third year veterinary students and 23 medical students completed the online follow-up questionnaire on animal and non-verbal human *expectation of pain (EP)*. Response rates were 31% and 8% for veterinary and medical students respectively. The mean age of veterinary and medical students who responded was (mean $\pm$ sd [range]) 22.36 $\pm$ 2.78 (20 – 34) and 21.60 $\pm$ 1.47 (19 – 24), respectively. There was still a gender bias evident in the veterinary student respondents with only 4 male veterinary students completing the follow-up *EP* questionnaire in during 2016.

7.6 Description of final year questionnaire respondents

A total of 14 final year veterinary students and 10 medical students completed the online follow-up questionnaire on animal and non-verbal human *expectation of pain (EP)*. When the data from the final year questionnaire was checked it was noted that all 10 medical students were in their sixth year of training, i.e. they had taken an intercalated degree year after third year of medical school. As such these students were originally in the M12_17 year group, but had joined the M13_18 after completing their intercalating year. Response rates were low, being 8% and 3% for veterinary and medical students respectively. As the response rate was low the results for final year veterinary and medical students are presented combined.

7.7 Description of students with linked data

7.7.1 First year data linked to third year data

From the data collected in third year, only 30 veterinary students supplied a student number enabling their data to be linked to the previous questionnaire completed in first year (Chapter 4). Within the medical students only 2 supplied student number which allowed linking of the first and third year data. For this reason veterinary and medical student data was combined for comparison of first year and third year data.

Female students accounted for 29 of the 32 students. The mean age of the students at the time of collecting the data in third year was 23.5 years (range 21-30) and the majority of students originated from the UK/ Eire or North America.

7.7.2 First year data linked to final year data

Ten students, comprising of 7 veterinary and 3 medical students, provided a student number when completing the final year questionnaire, allowing the data from first and final year to be linked. The medical students were in their sixth year of training, due to taking an intercalated study year, when completing the final year questionnaire. The veterinary students were all in their fifth year of training when completing the final questionnaire. Female students accounted for 6 of the 10 students. The mean age at the time of collecting the data in final year was 24.1 years (range 22-32) and the all but 2 students originated in the UK/Eire, with the remaining 2 originating in Asia. Descriptive results are presented as the number of students where first year and final year data can be linked is low.

7.7.3 First, third and final year linked data

Only one student supplied a student number when completing the all questionnaires in first year, third year and final year questionnaire which allowed all their data to be linked. Therefore no results are presented for data linked in first, third and final year.

7.8 Expectation of pain ratings for animals

7.8.1 Third year veterinary students

The median scores allocated to *Chimpanzee* was 4 [range (4-5)]. The median for *Dog* and *Pig* was also 4, although the range was greater (3-5) and for *Rat*, *Bird*, *Cow*, *Sheep* and *Snake* the range was greater again whilst the median remained the same [4 (2-5)]. The median for *Fish* was 3 (1-5) and for *Insect 2* (0-4).

The percentage of veterinary students who rated animals as less able to experience pain when compared to an adult human (that is $EP < 4$ on the Likert scale) varied depending on the species, with the percentage of veterinary students that scored EP below 4, being greatest for *Insect*, *Fish*, *Snake* and *Bird*. Over a quarter of Vet students rated EP below 4 in *Rat*. In comparison, fewer students scored *Cow*, *Horse*, *Cat* and *Dog* with lower EP . Ratings of less than 4 on the Likert scale were lowest for *Chimpanzee* (0%) and highest for *Insect* (73%) [Table 7-2].

			Median EP rating (range)	N (%) rating $EP < 4$
Animal species	Primates	<i>Chimpanzee</i>	4 (3-5)	0
	Companion animals	<i>Dog</i>	4 (2-5)	2 (4%) *
		<i>Cat</i>	4 (2-4)	5 (9%)
		<i>Horse</i>	4 (2-5)	6 (10%)
		<i>Rabbit</i>	4 (2-5)	6 (10%)
	Production animals	<i>Pig</i>	4 (2-4)	7 (13%)*
		<i>Cow</i>	4 (2-5)	9 (17%)
	Laboratory/ pet animals	<i>Rat</i>	4 (2-5)	15 (27%)
	Wildlife/ exotic pets	<i>Bird</i>	4 (2-5)	21 (39%)*
		<i>Snake</i>	4 (2-5)	24 (44%)
		<i>Fish</i>	3 (1-4)	30 (55%)
		<i>Insect</i>	2 (0-4)	40 (73%)*

Table 7-2. Median *Expectation of Pain* (EP) scores and percentage of 55 veterinary third year students who rated EP of animal species as 'less than that of an average' adult human ($EP < 4$). Students were asked to rate EP on a 0 to 7 Likert scale, where 0 = unable to experience pain; 4 = pain experience comparable to a typical adult human; and 7 = greater pain experience than a typical adult human. * 54 veterinary students.

No veterinary students scored primates, companion animals or production animals as $EP=0$. Two (4%) veterinary students rated *Insect* as being unable to experience pain, a score of 0 on the Likert scale (Figure 7-1).

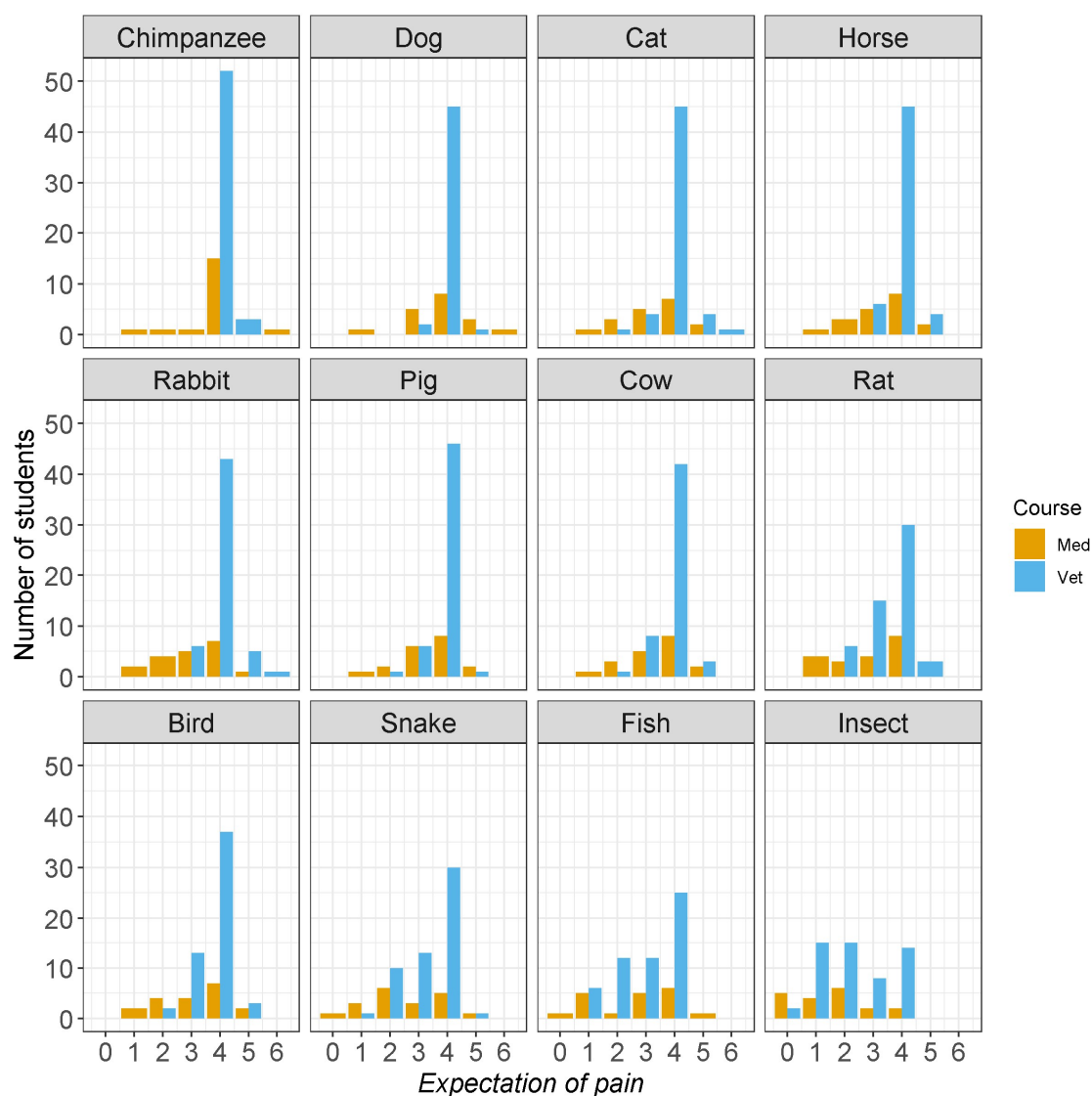


Figure 7-1. Barplot of *Expectation of Pain* (EP) scores allocated by third year veterinary (green) and medical (red) for 12 animal species. Students were asked to rate EP on a 0 to 7 Likert scale, where 0 = unable to experience pain; 4 = pain experience comparable to a typical adult human; and 7 = greater pain experience than a typical adult human.

7.8.2 Third year medical students

Medical students scored *EP* for *Chimpanzee* and *Dog* as 4 (range 1-6). Similarly the median *EP* score for *Cat*, *Rabbit*, *Horse*, *Pig*, *Cow* and *Sheep* was also 4 but the range more narrow (1-5). *Rat*, *Bird* and *Frog* all had a median *EP* score of 3 (1-5), with *Snake* and *Fish* receiving a median *EP* score of 2 (range 0-5). *Insect* scored the lowest *EP* and had a median score of 1.5 (range 0-4).

More medical students compared to veterinary students rated animals as less able to experience pain (*EP* <4) (Table 7-3).

			Median <i>EP</i> scores (range)	N (%) rating <i>EP</i> <4
Animal species	Primates	<i>Chimpanzee</i>	4 (1-6)	3 (15%)
	Companion animals	<i>Dog</i>	4 (1-6)	6 (32%) [#]
		<i>Cat</i>	4 (1-5)	9 (47%) [#]
		<i>Horse</i>	4 (1-7)	9 (47%) [#]
		<i>Rabbit</i>	4 (1-5)	11 (55%)
	Production animals	<i>Pig</i>	4 (1-5)	9 (47%) [#]
		<i>Cow</i>	4 (2-5)	10 (53%) [#]
	Laboratory/ pet animals	<i>Rat</i>	3.5 (1-5)	10 (50%)
	Wildlife/ exotic pets	<i>Bird</i>	3 (1-5)	11 (55%)
		<i>Snake</i>	2.5 (0-5)	13 (68%) [#]
		<i>Fish</i>	2 (0-5)	12 (63%) [#]
		<i>Insect</i>	1.5 (0-4)	17 (85%)

Table 7-3 Median *Expectation of Pain (EP)* scores and percentage of 20 medical third year students who rated *EP* of animal species as 'less than that of an average' adult human (*EP* < 4).

The percentage of medical students who rated animals as *EP* < 4 varied depending on the species, being greatest for *Insect*, *Fish*, *Snake* and *Bird*. Over a quarter of Vet students rated *EP* below 4 in *Rat*. In comparison, fewer students scored *Cow*, *Horse*, *Cat* and *Dog* with lower *EP*. Ratings of less than 4 on the Likert scale were lowest for *Chimpanzee* (15%) and highest for *Insect* (85%). *Snake* and *Fish* were rated as *EP*= 0, i.e. unable to experience pain by one medical student, whereas five medical students rated *Insect* as unable to experience pain (Figure 7-1).

7.8.3 Final year veterinary and medical students (combined data)

The median scores allocated to *Chimpanzee* was 4 [range (3-7)]. The median for *Dog, Pig, Horse, Cow, Sheep* was also 4, although the range was less (3-4) and for *Cat* and *Rabbit* the range was greater but the median remained the same [4(3-6)] (Table 7-4).

			Median <i>EP</i> rating (range)	N (%) rating <i>EP</i> <4
Animal species	Primates	<i>Chimpanzee</i>	4 (3-7)	1 (4%)
	Companion animals	<i>Dog</i>	4 (3-5)	1 (4%)
		<i>Cat</i>	4 (3-6)	1 (4%)
		<i>Horse</i>	4 (3-5)	1 (4%)
		<i>Rabbit</i>	4 (3-6)	3 (12.5%)
	Production animals	<i>Pig</i>	4 (3-4)	2 (8%)
		<i>Cow</i>	4 (3-4)	3 (12.5%)
	Laboratory/ pet animals	<i>Rat</i>	4 (2-5)	3 (12.5%)
	Wildlife/ exotic pets	<i>Bird</i>	4 (2-5)	8 (33%)
		<i>Snake</i>	4 (1-4)	11 (46%)
		<i>Fish</i>	3 (1-4)	13 (54%)
		<i>Insect</i>	2 (0-4)	18 (75%)

Table 7-4. Median 'Expectation of Pain' (*EP*) scores and percentage of 14 veterinary and 10 medical third year students who rated *EP* of animal species as 'less than that of an average' adult human (*EP* < 4).

For *Rat, Bird* and *Snake* the median was the same but the range greater [4 (2-5)]. The medians for *Frog* and *Fish* were 3 (1-5) and for *Snake* 2 (0-4). The number of students who rated animals as less able to experience pain when compared to an adult human (that is *EP* < 4 on the Likert scale) varied depending on the species. The number of students that scored *EP* below 4, was greatest for *Fish* (13 students), *Frog* (11 students), *Snake* (11 students) and *Bird* (8 students). Three students rated *EP* < 4 in *Rat, Rabbit, Pig, Cow* and *Sheep*. However, all veterinary students rated *EP* > 4 for *Dog, Cat, Rabbit, Rat, Chimpanzee* and *Horse*.

In comparison to third year data where a small number of students rated *EP* in *Snake*, *Fish* and *Insect* as 0, none of the students scored any of the animal species (primates, companion animals, production animals, laboratory animals or wildlife/exotic animals) as *EP*=0, that is being '*unable to experience pain*'.

7.8.4 Comparison of *EP* ratings in 1st and 3rd year for animal species (linked data)

There was no difference in median *EP* scores allocated in 1st and 3rd year, although the range of scores allocated by students in 3rd year was narrower for all species, except *Horse* and *Cow* where the range remained between 2-5. For all species except *Bird*, *Chimpanzee* and *Pig*, more students rated *EP* = 4 (comparable to typical adult human) in 3rd year, compared to the 1st year ratings. For *Bird* the number of students rating *EP* =4 remained the same between 1st year and 3rd year. For *Chimpanzee* and *Pig* fewer students rated *EP*= 4 when in 3rd year compared to their ratings in first year (Figure 7-2).

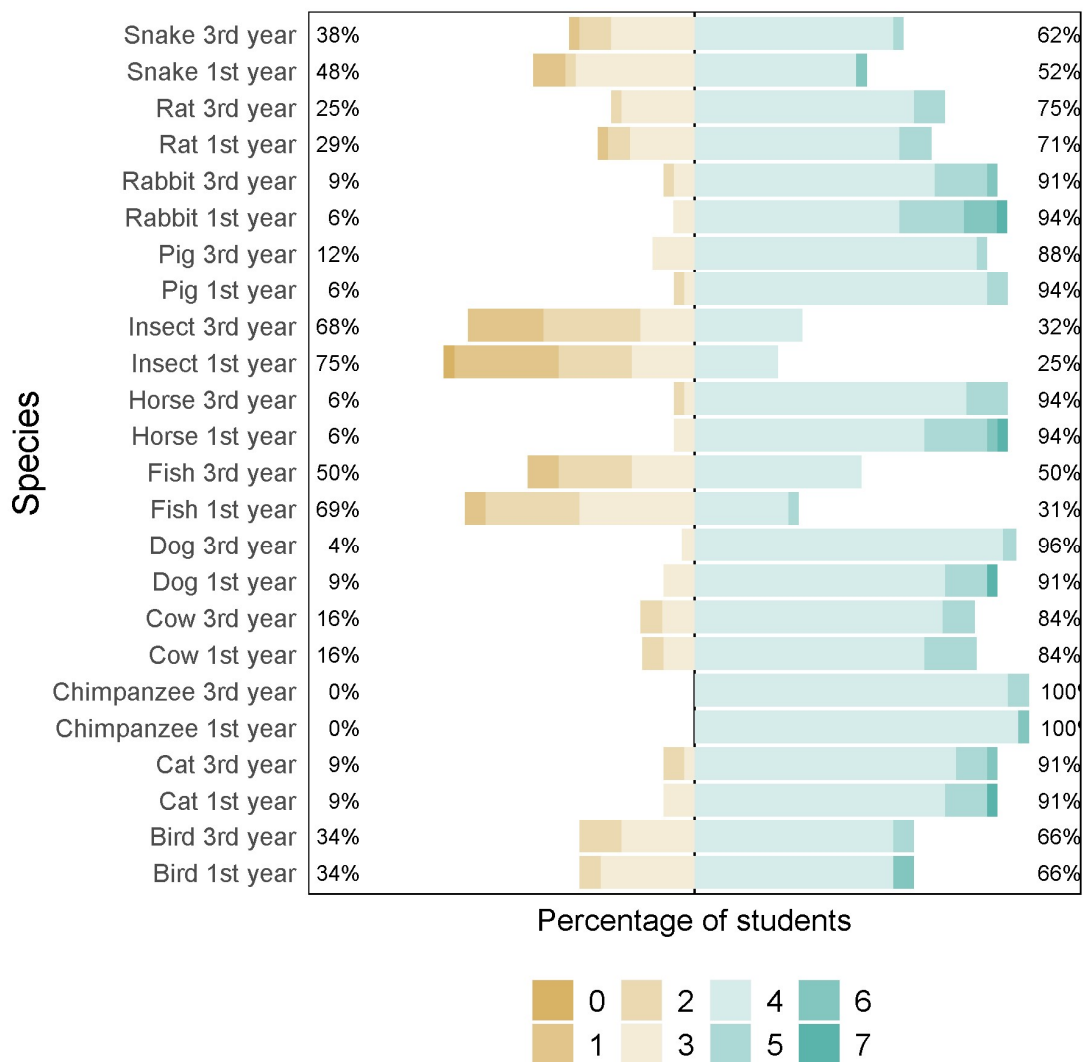


Figure 7-2. Likert plot of *Expectation of pain (EP)* rating for *Bird, Fish, Insect, Rat, Snake* given by students when entering University (1st year) and by same students half way through training (3rd year). Where *Expectation of pain* is graded as, 0 = unable to experience pain (deep green), 4 = comparable EP as a typical adult (light green) and 7 = significantly more EP than a typical adult (deep yellow). [Only students with EP scores in both 1st and 3rd year included]

There was no statistically significant difference between EP scores allocated by students in 1st year and 3rd year for the majority of animal species [(p > 0.097), Test: Mann-whit] (Figure 7-3).

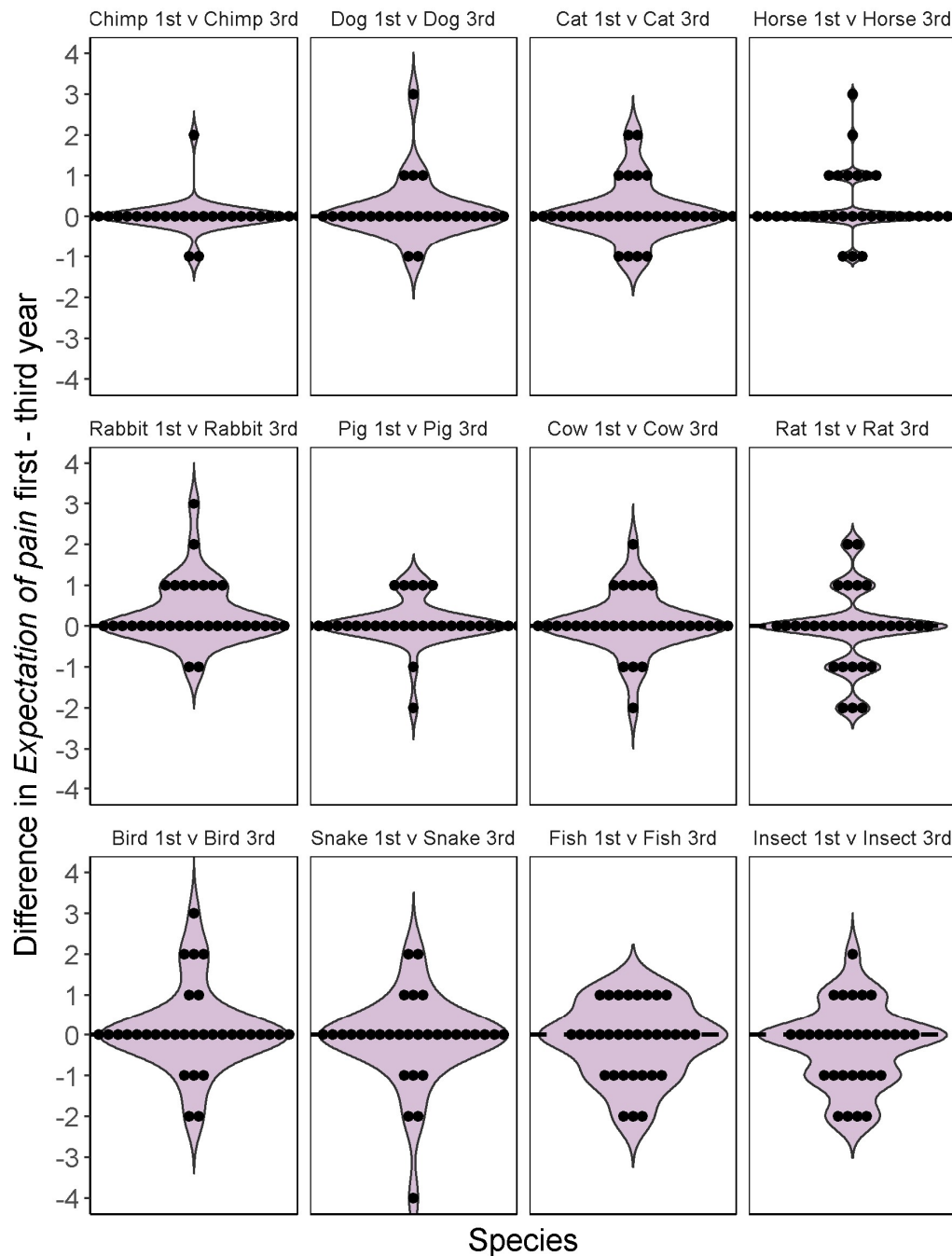


Figure 7-3 Comparison of scoring of *Expectation of pain (EP)* rating for *Chimpanzee, Dog, Rabbit, Rat, Frog, Bird, Horse, Pig, Cow, Sheep, Insect* and *Snake* given by veterinary students when entering University (1st) and by same students half way through training (3rd). [Only students with linked data in both 1st and 3rd year included]

There was a statistically significant difference in *EP* scores allocated to *Rabbit* by students in 1st and 3rd year, with students more likely to give lower *EP*

scores in 3rd year compared to their scores in 1st year [($p = 0.033$), Test: Mann-whit]. The *Rabbit* violin plot (*Rabbit* 1st vs *Rabbit* 3rd, Figure 7-3) shows more density dorsally, indicating a positive number for the calculation of 1st year *EP* minus 3rd year *EP* - visually demonstrating that those students scored *EP* for *Rabbit* lower in 3rd year than in 1st year.

For the majority of the other species there was no change in how students scored *EP* in 3rd year compared to 1st year, evident as a concentration of density at zero on the violin plots. For *Bird*, *Snake*, *Fish* and *Insect* violin plots (lower row of panels, Figure 7-3), there are greater changes in how students scored *EP* in 3rd year compared to 1st year, demonstrated by greater density above and below the zero line.

The number of students who rated Pig as less able to experience pain compared to a typical adult increased between 1st and 3rd year (Table 7-5). For *Dog*, *Rabbit*, *Rat*, *Snake*, *Fish* and *Insect* fewer 3rd year students rated *EP* <4 compared to when they had been in 1st year. For all other species there was no change in the number of students rating *EP* < 4, between 1st and 3rd year.

Patient type / species			1st year rating <i>EP</i> < 4	3rd year rating <i>EP</i> < 4
			N	N
Animal species	Primates	<i>Chimpanzee</i>	0	0
	Companion animals	<i>Dog</i>	3	1
		<i>Cat</i>	3	3
		<i>Horse</i>	2	2
		<i>Rabbit</i>	3	2
	Production animals	<i>Pig</i>	2	4
		<i>Cow</i>	5	5
	Laboratory	<i>Rat</i>	10	8
	Wildlife/exotic	<i>Bird</i>	11	11
		<i>Snake</i>	16	12
		<i>Fish</i>	22	16
		<i>Insect</i>	24	22

Table 7-5. Number of students (N) rating *Expectation of pain* <4 (less able to experience pain compared to a typical adult human) for 32 students when first entering University (1st year rating) and in third year of undergraduate training (3rd year rating).

7.8.5 Comparison of *EP* ratings from 1st year and final year questionnaire

The number of students who rated *EP* < 4 in *Chimpanzee*, *Horse* and *Bird* remained the same between first and final year of training. For the other animals species included in the questionnaire the number of students rating *EP*<4 was less in final year compared to first year.

The greatest reduction in number of students rating *EP*<4 occurred in *Rat* (Table 7-6).

Patient type / species			1st year rating EP < 4	Final year rating EP < 4
			N	N
Animal species	Primates	<i>Chimpanzee</i>	1	1
	Companion animals	<i>Dog</i>	3	1
		<i>Cat</i>	4	1
		<i>Horse</i>	3	3
		<i>Rabbit</i>	3	1
	Production animals	<i>Pig</i>	4	2
		<i>Cow</i>	3	2
		<i>Rat</i>	6	2
	Wildlife/exotic	<i>Bird</i>	4	4
		<i>Snake</i>	7	5
		<i>Fish</i>	8	6
		<i>Insect</i>	9	8

Table 7-6. Number of students (N) rating Expectation of pain <4 (less able to experience pain compared to a typical adult human) for 10 students when first entering University (1st year rating) and in final year of undergraduate training (final year rating).

7.9 Expectation of pain ratings for non-verbal humans

7.9.1 Third year veterinary students

The median scores for *EP* allocated to *Baby*, *Learning Difficulties* or *Dementia* were 4 [range (2-5)], with the median *EP* scores for *Foetus* and *Coma* being 3 (0-5). The lowest median *EP* score was allocated to *Anaesthetized*. The percentage of veterinary students who rated *EP* less than 4, was greatest for *Foetus*, *Coma* and *Anaesthetized* and lowest for *Learning difficulties* (Table 7-7).

		Median <i>EP</i> scores	N (%) rating <i>EP</i> <4
Paediatric	Foetus in last trimester (<i>Foetus</i>)	3 (0-5)	33 (60%)
	New-born baby (<i>Baby</i>)	4 (2-7)	7 (12%)
Vulnerable adults	Person with profound learning difficulties (<i>Learning difficulties</i>)	4 (3-6)	3 (5%)
	Person with dementia / cognitively impairment (<i>Dementia</i>)	4 (2-5)	8 (14.5%)
Hospitalized patients	Person in a coma (<i>Coma</i>)	3 (0-5)	34 (62%)
	Anaesthetized person (<i>Anaesthetized</i>)	1 (0-6)	45 (82%)

Table 7-7. Median 'Expectation of Pain' (*EP*) scores of various non-verbal human (NVH) patients and percentage of 55 veterinary students who rated *EP* less than that of a typical adult. Students scored *EP* on a 0 to 7 Likert scale, where at 0 (unable to experience pain) and 4 (equivalent pain experienced to a typical adult) and 7 (significantly greater pain experienced compared to a typical adult).

No veterinary students rated *Learning difficulties* or *Dementia* as *EP*= 0, but *Coma* and *Anaesthetized* were rated as unable to experience pain by 3(5%) and 14 (25%) veterinary students respectively. One veterinary student rated *Foetus* and *Baby* as *EP*=0 (Figure 7-4).

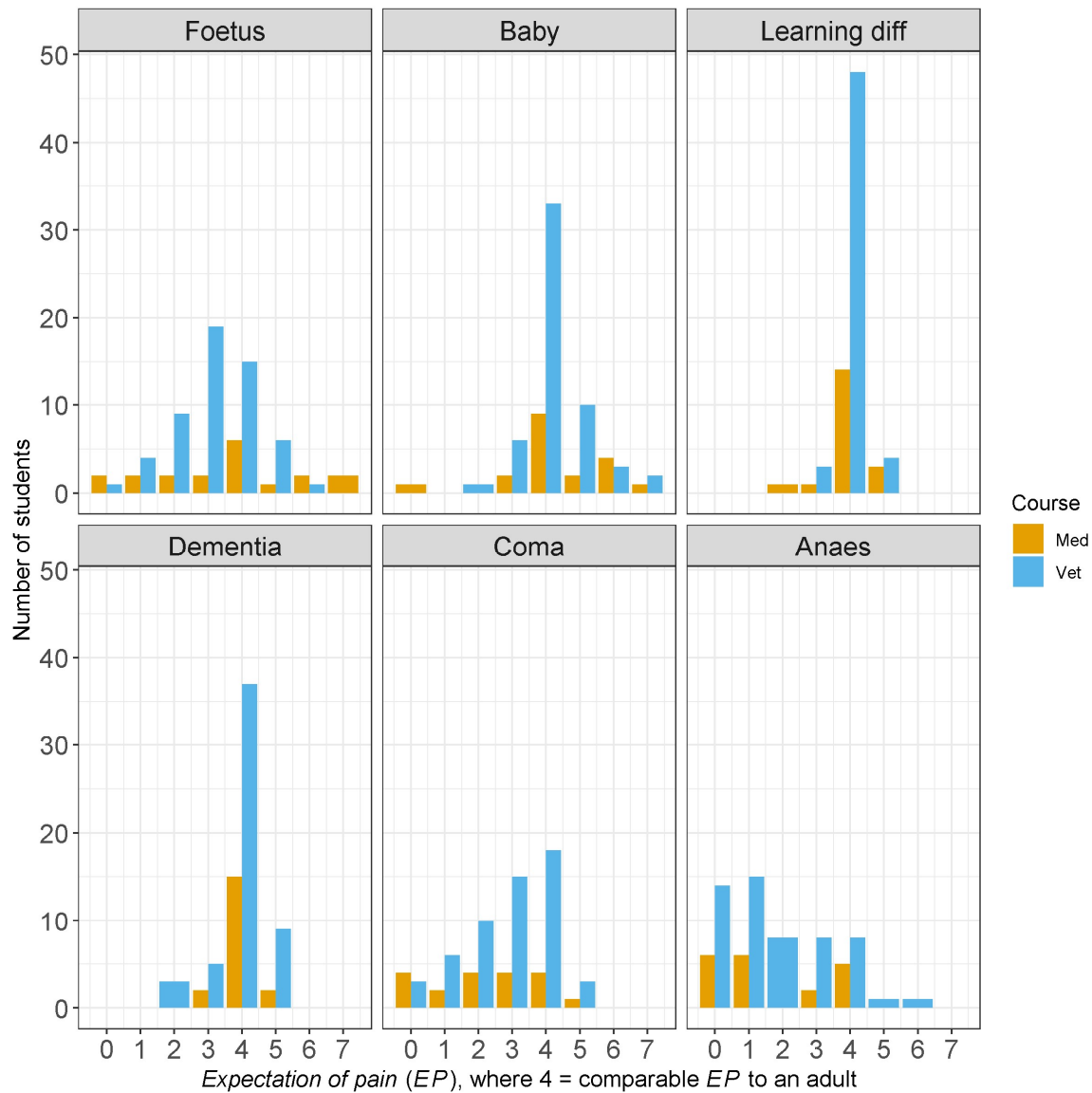


Figure 7-4. Barplot of *Expectation of Pain (EP)* scores allocated by third year veterinary (green) and medical (red) for 12 animal species. Students were asked to rate *EP* on a 0 to 7 Likert scale, where 0 = unable to experience pain; 4 = pain experience comparable to a typical adult human; and 7 = greater pain experience than a typical adult human.

7.9.2 Third year medical students

The median scores for *EP* allocated to *Baby* and Vulnerable adults (*Learning Difficulties*; *Dementia*) were 4, although the range of scores was greater for *Baby* (range 0-7) compared to *Learning Difficulties* and *Dementia* (range 2-6). The lowest median score of 0 (range 0-4) was allocated to *Anaesthetized*.

More than half of medical students rated *EP* less than 4 in Hospitalized patients (*Coma* and *Anaesthetized*) compared with very small numbers rating Vulnerable adults as less than 4 (Table 7-8).

		Median <i>EP</i> score (range)	N (%) rating <i>EP</i> <4
Paediatric	<i>Foetus in last trimester (Foetus)</i>	3 (0-7)	8 (40%)
	<i>New-born baby (Baby)</i>	4 (0-7)	3 (15%)
Vulnerable adults	<i>Person with profound learning difficulties (Learning difficulties)</i>	4 (2-6)	2 (10%)
	<i>Person with dementia / cognitively impairment (Dementia)</i>	4 (3-6)	2 (10%)
Hospitalized patients	<i>Person in a coma (Coma)</i>	2 (0-5)	14 (70%)
	<i>Anaesthetized person (Anaesthetized)</i>	0 (0-4)	14 (70%)

Table 7-8 Median *Expectation of pain (EP)* scores and percentage of 20 medical students who rated *Expectation of pain* of various non-verbal human (NVH) patients as less than that of a typical adult. Students scored *EP* on a 0 to 7 Likert scale, where at 0 (unable to experience pain) and 4 (equivalent pain experienced to a typical adult) and 7 (significantly greater pain experienced compared to a typical adult)

More medical students rated *Foetus*, *Baby*, *Coma* and *Anaesthetized* as *EP* = 0 compared to veterinary students (Figure 7-4). *Coma* and *Anaesthetized* were rated as unable to experience pain by four and six students, respectively.

7.9.3 Final year veterinary and medical students (combined data)

The median *EP* score for *Baby*, *Dementia* and *Learning difficulty* was 4 (range 4-6). *Foetus* and *Coma* both had a median *EP* scores of 3, although *Foetus* had a wider range of scores (0-6) compared to *Coma* (0-4). The lowest *EP* scores were allocated to *Anaesthetized* with a third of students rating *EP* as 0, equivalent to unable to experience pain.

The number of students who rated non-verbal humans as less able to experience pain when compared to an adult human (that is *EP* < 4 on the Likert scale) varied depending on the type of patient (Table 7-9).

Non-verbal humans		Median <i>EP</i> score (range)	N (%) rating <i>EP</i> <4
Paediatric	Foetus in last trimester (<i>Foetus</i>)	3 (0-6)	16 (66%)
	New-born baby (<i>Baby</i>)	4 (3-6)	4 (17%)
Vulnerable adults	Person with profound learning difficulties (<i>Learning difficulties</i>)	4 (4-6)	0
	Person with dementia / cognitively impairment (<i>Dementia</i>)	4 (4-6)	0
Hospitalized patients	Person in a coma (<i>Coma</i>)	3 (0-4)	20 (83%)
	Anaesthetized person (<i>Anaesthetized</i>)	1 (0-4)	22 (92%)

Table 7-9. Median 'Expectation of Pain' (*EP*) scores and percentage of 14 veterinary and 10 medical students who rated *EP* of various non-verbal human (NVH) patients as less than that of a typical adult. Students scored *EP* on a 0 to 7 Likert scale, where at 0 (unable to experience pain) and 4 (equivalent pain experienced to a typical adult) and 7 (significantly greater pain experienced compared to a typical adult)

The number of students that scored *EP* below 4, was greatest for Anaesthetized (22 students), Coma (20 students) and Foetus (16 students). No students rated *EP* as less than 4 in *Learning difficulties* or *Dementia*. One student rated *EP* as 'unable to experience pain' in *Foetus*.

7.10 Review of findings from initial *EP* questionnaire

The median *EP* allocated to most of the animal species was *EP* = 4 , but the range of *EP* values allocated by students was wide (sections 4.5-4.9). The *EP* scores varied least and were also highest for *Chimpanzee* and *Dog*. *EP* scores were lowest for *Snake*, *Fish* and *Insect*.

The majority of students rated *EP* in *Foetus* as <4, and over a quarter of students rated *EP* in *Baby* as less able to experience pain when compared to a typical adult human. A small number of students rated *Foetus* as *EP*=0. *EP* scores were lowest for *Anaesthetized*, *Coma* and *Foetus*.

7.10.1 Comparison of *EP* scores in 1st and 3rd year for Non-verbal humans (linked data)

The median *EP* scores did not change between 1st and 3rd year for any of the non-verbal human patient types, being *EP* = 1 for *Anaesthetized*; *EP*= 3 for *Foetus* and *Coma*; *EP*=4 for *Baby*, *Learning difficulties* and *Dementia*. The range of *EP* scores for *Learning difficulties* appeared narrower in the 3rd year compared to 1st year, although this was not tested statistically (Figure 7-5).

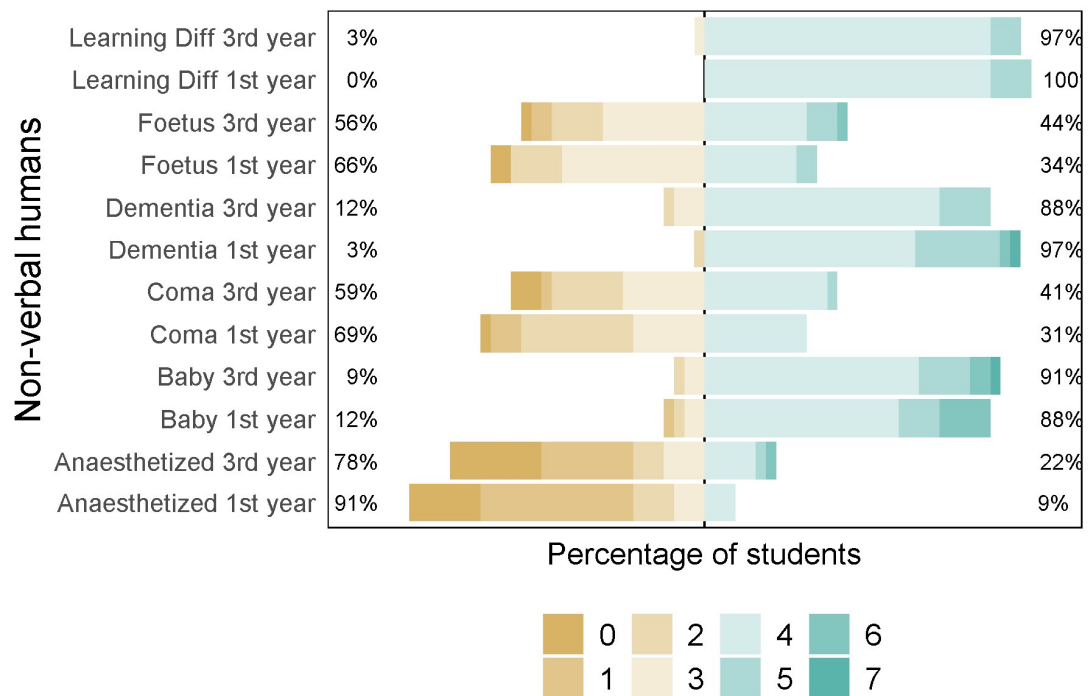


Figure 7-5. Likert plot of Expectation of pain (*EP*) rating for Non-verbal human patients [*Foetus*; *Baby*; *Dementia*; *Learning Difficulties*; *Coma*; *Anaesthetized*] given by veterinary students when entering University (1st year) and by same students half way through training (3rd year). Where *Expectation of pain* is graded as, 0 = unable to experience pain (deep green), 4 = comparable *EP* as a typical adult (light green) and 7 = significantly more *EP* than a typical adult (deep yellow). [Only students with linked data in both 1st and 3rd year included]

There was a statistically significant differences in how students allocated *EP* scores for *Learning difficulties* in 1st and 3rd year [(p = 0.034), Test: Mann-whit] with students more likely to rate *EP* lower in 3rd year compared to 1st year. The violin plots for *Foetus*, *Coma* and *Anaesthetized* (*Foetus* 1st v *Foetus* 3rd; *Coma* 1st v *Coma* 3rd; *Anaes* 1st v *Anaes* 3rd; Figure 7-6) show greater density

above and below the zero line indicating that individual students did change how they rated *EP* in these non-verbal human types in 3rd year compared to how they had rated them in 1st year.

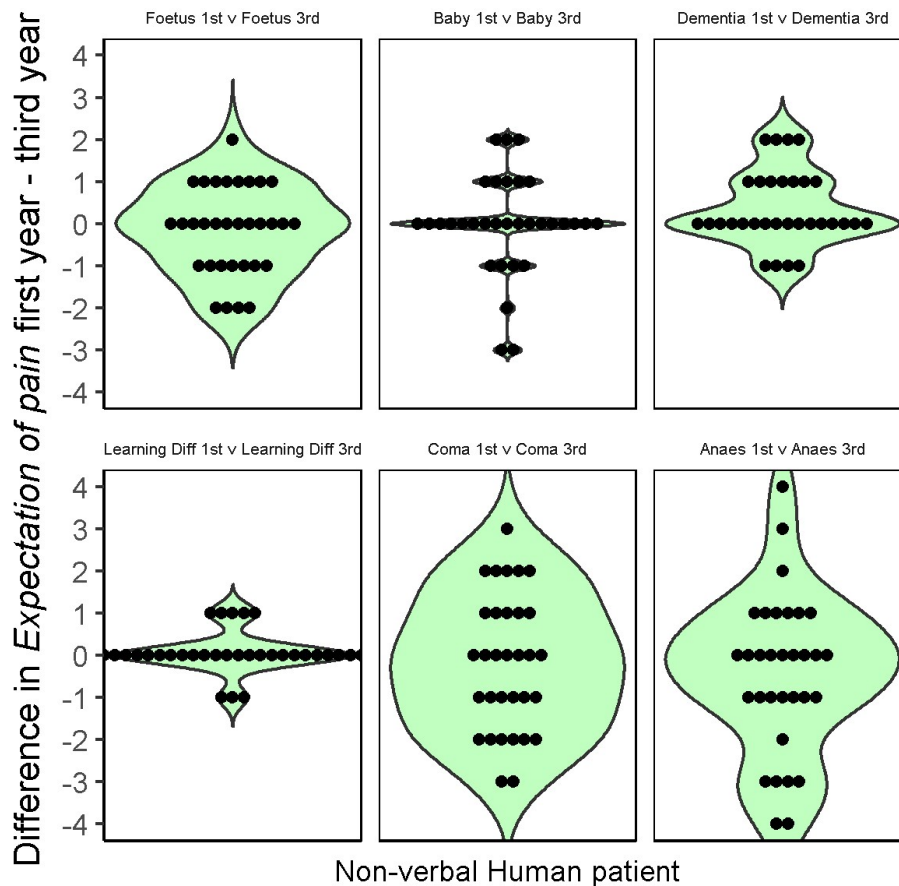


Figure 7-6. Violin plot showing differences between Expectation of Pain (*EP*) for Non-verbal human patients [*Foetus*, *Baby*, *Dementia*, *Learning Difficulties*, *Coma* and *Anaesthetized* person] given by veterinary students on entering University (1st) and half way through training (3rd) [Only students with linked data in 1st and 3rd year included]

There were no other statistically significant differences in how students rate *EP* in 1st and 3rd year for the remaining non-verbal human patient types [($p > 0.20$), Test: Mann-whit]. In terms of number of students rating certain non-verbal humans as less able to experience pain compared to a typical adult human, more student did so for *Learning difficulties* and *Dementia* in 3rd year compared to 1st year. For all other non-verbal human types (*Foetus*, *Baby*,

Coma and *Anaesthetized*) less students rated $EP < 4$ in 3rd year compared to 1st year (Table 7-10).

Patient type / species			1 st year students rating EP <4	3 rd year students rating EP <4
			N	N
Non-verbal humans	Children	<i>Foetus</i>	21	18
		<i>Baby</i>	4	3
	Vulnerable adults	<i>Learning difficulties</i>	0	1
		<i>Dementia</i>	1	4
	Hospitalized patients	<i>Coma</i>	22	19
		<i>Anaesthetized</i>	29	25

Table 7-10. Number of students (N) rating *Expectation of pain* <4 (less able to experience pain compared to a typical adult human) for 32 students when first entering University (1st year rating) and in final year of undergraduate training (3rd year rating).

7.10.2 Comparison of EP scores in 1st and final year for Non-verbal humans (linked data)

For *Baby* no students in final year rated $EP < 4$, whereas 3 students had in 1st year (Table 7-11). For *Foetus* 1 less student rated $EP < 4$ in final year compared to 1st year. The number of students who rated $EP < 4$ was the same in 1st and final year for *Learning difficulties*, *Dementia*, *Coma* and *Anaesthetized*.

Patient type / species			<i>1st year rating EP <4</i>	<i>Final year rating EP <4</i>
			N	N
Non-verbal humans	Children	<i>Foetus</i>	8	7
		<i>Baby</i>	3	0
	Vulnerable adults	<i>Learning difficulties</i>	0	0
		<i>Dementia</i>	0	0
	Hospitalized patients	<i>Coma</i>	10	10
		<i>Anaesthetized</i>	10	10

Table 7-11. Number of students rating Expectation of pain <4 (less able to experience pain compared to a typical adult human) for 10 students when first entering University (1st year rating) and in final year of undergraduate training (final year rating).

7.11 Follow up qualitative interviews

7.11.1 Description of interviewees

Of the original eight interview participants (chapter 5) only six were able to take part in follow-up interviews during their final year of undergraduate training (Table 7-12).

Unique ID	Gender	Age at time of follow up interview	Country of origin	Nationality
V12_17.1	Female	25	Wales	British
V12_17.4	Female	30	USA	US citizen
V12_17.49	Female	23	UK	British
M12_17.12	Male	23	England	British
M12_17.22	Female	24	UK	British
M12_17.25	Female	24	UK	British

Table 7-12. Description of six participants of follow up interviews conducted during spring semester 2017

These six students consisted of 3 veterinary and 3 medical students. As the aim of the follow-up interviews was to assess if the factors that students perceive have influenced their attitude to pain in animals and non-verbal humans changed during training, it was decided not to try and recruit new interview participants to replace the two students who could not take part in the follow-up interviews.

The semi-structured interview schedule focused on participant's attitude towards pain, whether they perceived there had been a change in their own attitude and their own impression of what had influenced their attitudes towards pain in animals and non-verbal human. Although the interview schedule contained question prompts, the flexible structure meant that participants were able to talk about any aspect of attitude or experience of pain that they wished. As such the resultant interview material varied between students, with some interviews more focused on retrospective aspects and others articulating their thoughts about the future.

7.11.2 Overview of coding framework

Thematic analysis of the interviews conducted during the final year of undergraduate training revealed a number of codes which were included in the coding framework. Further themes were developed after reviewing the codes and identifying common links which captured the content and context of the codes. Major themes were constructed from the themes that had emerged from coding of the interview data. This led to development of major themes which described the overarching ideas revealed from the interview analysis (Table 7-13).

Major themes	Themes	Sub-theme/ codes
Perception of change	Empathy	Observing less caring attitudes in qualified staff
		Other students appearing to care less about patients
		Examples of change in empathy towards colleagues.
		Self –reflection on how their own empathy may have changed and/ or the influence on pain attitude.
	Improved competency	Better understanding of pain behaviours
		Improved ability to communicate with human patients/ carers.
Education	Non-clinical learning	Expectation of pain experience depending of patient type/ familiarity with patient
		Didactic teaching/ lectures/ formal teaching of pain
	Clinical/ experiential learning	Observation of pain in clinical patients
		Veterinary/ medical clinical training during undergraduate
		Hidden clinical curriculum regarding pain

Table 7-13. Coding framework developed during thematic analysis of follow up interviews conducted during final year of undergraduate training for veterinary and medical students.

7.11.3 Analysis of coding

Not all sub-themes were coded for each participant, in particular ‘Recognising pain due to better communication’ and ‘attitude of family’ were only present in the transcripts of two medical students, whereas ‘Observation of animals in pain whilst ‘seeing practice’ at veterinary hospitals/practices’ was only found in the transcripts of two of the veterinary students (Figure 7-7, Figure 7-8).

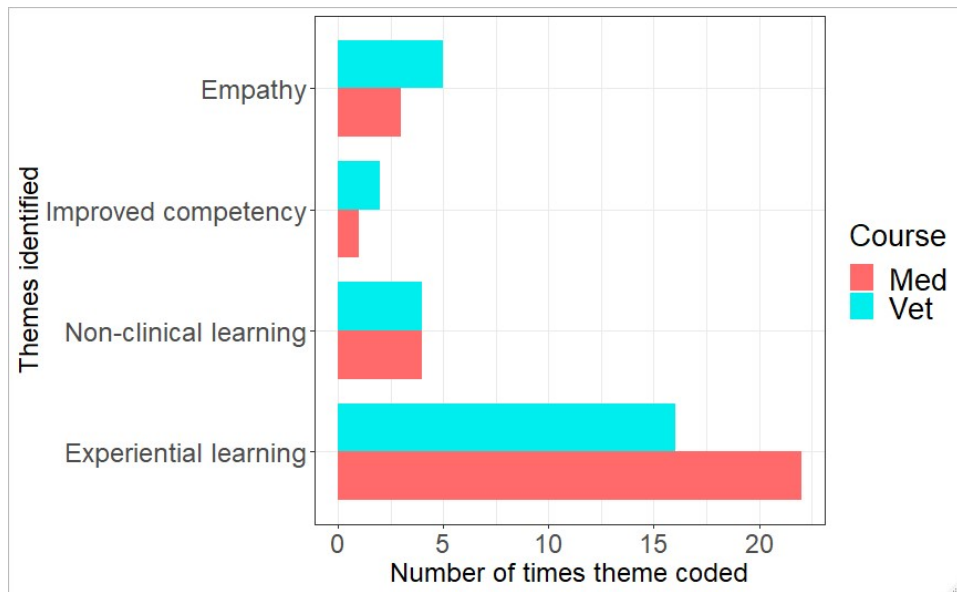


Figure 7-7. Bar plot showing sub-themes identified (y –axis) from analysis of follow-up interview data and number of times each sub-theme was identified (x-axis), for 3 veterinary (Vet) and 3 Medical (Med) students. The magnitude of number of times each theme was coded does not represent the relative importance of the theme and is not intended to quantify the thematic coding.

When each individual participant was considered separately, there were some sub-themes that were consistent across all participants and other sub-themes that were not consistently identified during thematic analysis of the transcripts (Figure 7-8).

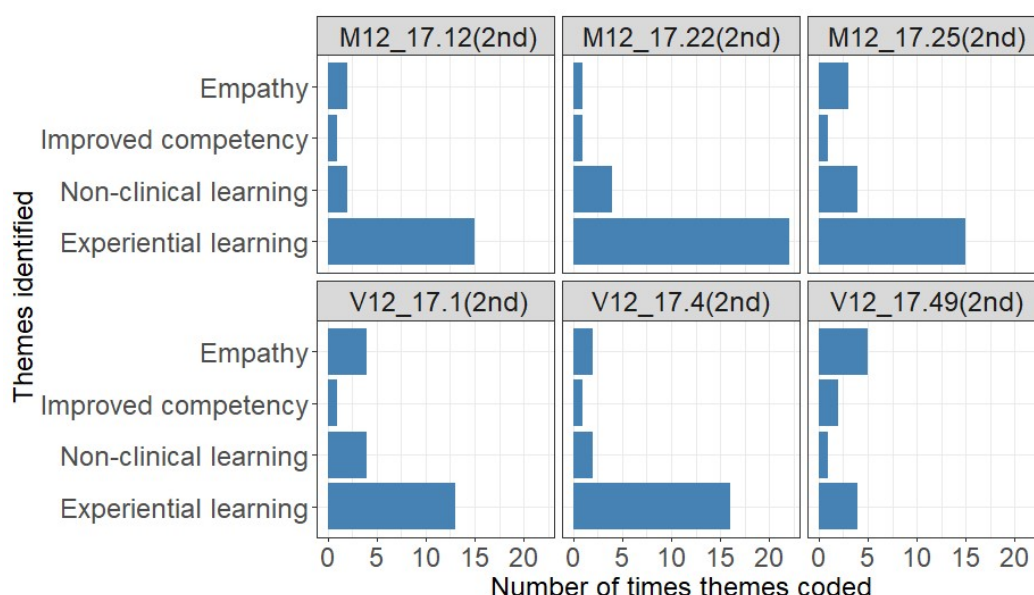


Figure 7-8. Bar plot showing sub-themes identified in analysis of each individual participant follow up interview transcript. Each panel heading identifies the students by the unique identification number as described in Table 7-12.

All participants articulated *Training* and *Clinical culture* as influencing their attitudes towards pain, whilst the majority of students also described *Observation* of either human patients or animals as having an effect on their attitudes.

7.11.4 Review of findings from 1st interviews

Thematic analysis of transcripts from the 1st interviews yielded major themes of Empathy, Observational learning, Education and Personal-social factors (Table 7-14).

Major themes	Themes	Codes
Empathy	Recognising empathy in others	Empathy with animals/ humans
		Lack of empathy
	Students own empathy	Reflecting on their own empathy
Education	Academic education	Didactic education/ lectures
		Pre-University education
	Clinical training	Previous training/ work experience
		Observing clinical culture in vet/medical staff
		Hopes/ expectations of clinical training
Personal-social factors	Upbringing	Parent-child relationship
		Attitude of family and/or caregivers towards pain & observation of these people in pain
		Observation of pet animals/ farm animals
	Culture	Social/ community culture
		Depiction of pain in media
	Student characteristics	Own pain experiences
		What students understand about communication
		Beliefs about pain

Table 7-14. Themes and constituent sub-themes derived from thematic analysis of 1st interviews with 4 veterinary and 4 medical students.

The attitude of parents or caregivers towards the students' own pain during childhood, and observation of animals and other humans in pain, were key factors influencing the development of their attitudes towards pain. During initial interviews both veterinary and medical students described the attitudes of their parents and or caregivers as having an influence of how their own attitude towards pain in animals and other humans has developed. Students frequently recounted stories of how adult carers had responded to small childhood injuries – and described these in vivid detail. Another frequent

theme that emerged from the initial interviews with students was the impact of having observed pet animals and/or other humans in pain, and how this had led to development of the students own opinions of pain.

7.11.5 Comparison between first and second interviews

When crudely comparing the coding between the initial and follow-up interviews there were some differences. The follow-up interviews contained a greater quantity of coded sentences and all themes were coded in each student's interview. Although the length of the initial interviews was similar, there was less coding in each interview and not all emergent themes were coded in each interview. For example, codes pertaining to the theme 'Empathy' were only coded in 1 medic and 3 vets in the initial interviews. The theme which contained the greatest number of codes in the initial interviews was 'Personal social factors', whereas codes connected to learning were more evident in the follow-up interviews (Figure 7-9).

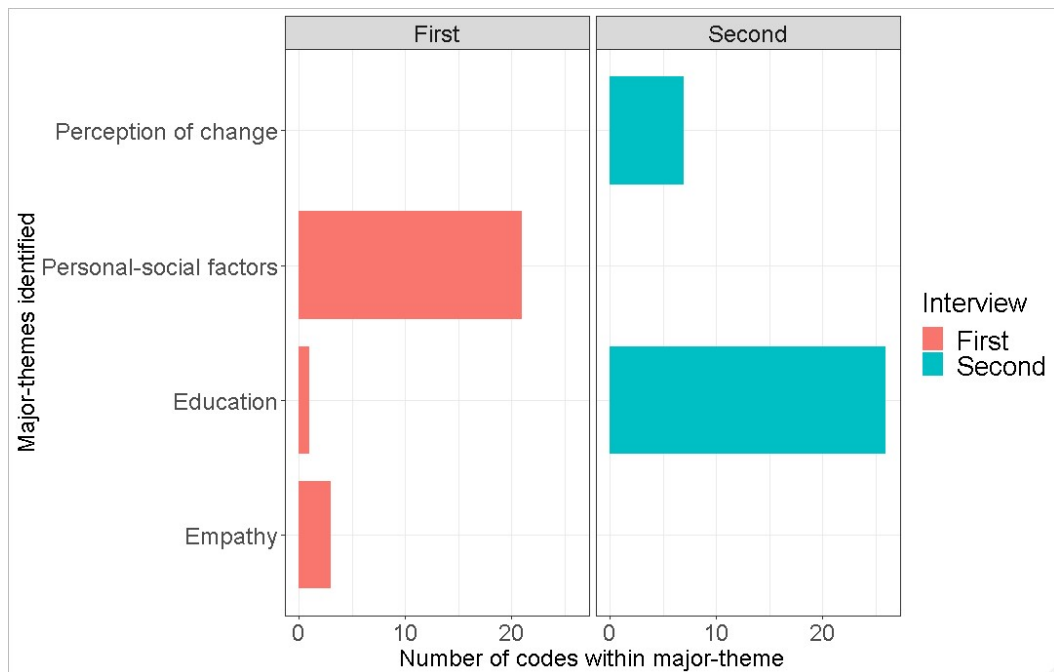


Figure 7-9. Bar plot comparing themes identified and number of times each theme was coded for initial interviews conducted during first year of undergraduate training (First) and follow up interviews conducted during final year of undergraduate training (Second) for veterinary and medical students.

There were some similarities between the themes identified in the first and second interviews, but also marked differences (Table 7-15). Aspects of empathy were coded in both sets of interviews but in slightly different contexts. In both the first and second interviews the students spoke about learning through observation – in the first interviews this reflected the organic process of learning by watching others in an informal manner, whereas the in the second interviews students spoke extensively about learning during clinical placements. However there were differences in the sub-themes which were coded and from which the major themes were derived (Table 7-15).

First interviews		
Major theme	Themes	Codes
Empathy	Recognising empathy in others	Empathy with animals/ humans
		Lack of empathy
	Students own empathy	Reflecting on their own empathy
Education	Academic education	Didactic education/ lectures
		Pre-University education
	Clinical training	Previous training/ work experience
		Observing clinical culture in vet/medical staff
		Hopes/ expectations of clinical training
Personal-social factors	Upbringing	Parent-child relationship
		Attitude of family and/or caregivers towards pain & observation of these people in pain
		Observation of pet animals/ farm animals
	Culture	Social/ community culture
		Depiction of pain in media
	Student characteristics	Own pain experiences
		What students understand about communication
		Beliefs about pain

Second interviews		
Major theme	Themes	Codes
Perception of change	Changing empathy	Observing less compassionate attitudes in qualified staff
		Other students appearing less compassionate about patients
		Examples of change in empathy towards colleagues.
		Self –reflection on how their own empathy may have changed and/ or the influence on pain attitude.
	Improved competency	Better understanding of pain behaviours
Education	Non-clinical learning	Improved ability to communicate with human patients/ carers.
		Expectation of pain experience depending of patient type/ familiarity with patient
	Clinical/ experiential learning	Didactic teaching/ lectures/ formal teaching of pain
		Observation of pain in clinical patients
		Veterinary/ medical clinical training during undergraduate
		Hidden clinical curriculum

Table 7-15. Tables comparing the theme identified in the first interviews to those identified in the second interviews

7.12 Detailed analysis of Perception of change theme

Student's descriptions of change were vague and not immediately easy to define into one distinct sub-theme or theme, but often described their perceptions of their own clinical development. The overarching theme of *Perceptions of change* consisted of sub-themes concerned with observations of changes in empathy/compassion/concern in others and themselves; better understanding of pain and its impact on patients, and/ or improved patient communication/ being able to understand patient behaviour (Table 7-16).

Major themes	Themes	Sub-theme/ codes
Perception of change	Changing empathy	Observing less caring attitudes in qualified staff
		Other students appearing to care less about patients
		Examples of change in empathy towards colleagues.
		Self –reflection on how their own empathy may have changed and/ or the influence on pain attitude.
	Improved competency	Better understanding of pain behaviours
		Improved ability to communicate with human patients/ carers.

Table 7-16. Table showing major theme of Perception of change with constituent themes and sub-themes.

7.12.1 Changing empathy

As described in Chapter 3 the term empathy is multidimensional and interpreted differently by different people.

Empathy and /or the various synonyms were identified as a theme in both sets of interview data (Figure 7-9). Students talked about the impact of empathy on attitude to pain in both animals and humans. Observing others with a lack

of empathy was coded in the initial interview for one veterinary student, but was evident in the transcripts of all the veterinary students and one medical student from the second interview data (Figure 7-9). In particular the students in the second interviews reflected on the factors which may contribute to a deterioration in empathy towards human and/ or animal patients, such as time constraints, stress and familiarity or normalization of pain in the hospital setting.

The students also articulated that they perceived empathy and/ or compassion influenced how they and/or others responded to animals or human patients in pain. During the second interviews some of the students used the words empathy, sympathy and compassion interchangeably and to avoid interrupting their narrative they were not asked to clarify or define the use of these words. The students had an appreciation that elements of empathy for their patients were important in providing good patients care. One medical student talked about empathy being important in providing a holistic approach to pain in patients, saying;

“I think that you need empathy to consider other factors that might make the pain worse for them - even if it doesn't feel worse. It might impact them more than other people. I think it helps in that sense.” M12_17.12 (Quote 7-1)

Students often talked about qualified veterinary or medical staff lacking ‘compassion’, but did so in the context of understanding how external pressures, such as time and finances, could affect someone’s empathy. The students conveyed a sense of understanding of the frustration involved in being unable to provide good pain management and not being able to ‘fix’ pain for all their patients. There was an impression that becoming less empathetic towards patients who you could not help would be a coping mechanism for some people, allowing them to continue working in an environment that otherwise would create ethical or mental conflict. Another veterinary student described how the stress of the job can impact on a vet’s ability to care for their patients, saying;

“I know the stress of the job and the (lack of) time, and having to adhere to consult time and high patient load may make you less able to take a step back and think about the patient on an individual basis, instead of it just being a job.”

V12_17.1 (Quote 7-2)

The same student described how they had witnessed fellow veterinary students being stressed and no longer caring about their patients. They said;

“I've got a couple of friends that are like, they feel so stressed and they don't care as much anymore, which is a shame. I still know I want to be a vet, whereas a lot of my friends are questioning whether they still do now. And it would be hard to have commitment to patient care knowing that you don't really want to be there. But I know some of my friends that have lost the passion, they're just like 'oh I can't be bothered'. I know they've got compassion fatigue, they don't really feel... like they don't care that much anymore.”

V12_17.1 (Quote 7-3)

A medical student described seeing medical staff displaying less than compassionate behaviour or compassion fatigue, particularly in the community setting, such as general practice. They mulled over the idea that GP's empathy over time may change due to factors out with their control, such as long working hours, work related stress and dealing with difficult cases and patients. They said;

“Often you do sit in GP clinics, where they say 'not her again' or 'not him again'. But then it's probably quite easy for me to be empathetic because I'm only seeing them once during my time there, whereas these GP's might be seeing them for years. And it's quite sad because whatever it is, they are coming back for a reason.” M12_17.22 (Quote 7-4)

The same student talked about compassion fatigue in the hospital setting and how they thought they might cope with experiencing compassion fatigue in the future, saying;

“There are times when you do agree with consultants or registrars when it comes to really troublesome patients, but then I feel like I would still have an open mind as to why they are being troublesome, rather than be completely dismissive. Like it's quite understandable, you're at the end of your 15 hour shift or 14 hour shift and you've got this patient who comes in, but I feel like I would still probably have a checklist in the corner of my office, to sort of follow them up and see. Because you are only human as well.” M12_17.22 (Quote 7-5)

This student demonstrated an awareness of the pressures which may affect a doctor's empathy towards their patients. As well as an understanding of how empathy may decline overtime in qualified doctors. This ability to place themselves 'in the shoes of another' is itself a type of empathy known as cognitive empathy or role taking (Table 2-2).

One of the veterinary students talked about seeing practice with an older vet who seemed to be less compassionate about their patients. They speculated that seeing pain in animals frequently may have 'hardened' the vet's attitude towards pain. They described colleagues or qualified clinicians as caring less

about patients, sometimes using the word 'compassion fatigue' due to seeing animals in pain so frequently in becomes 'normal'. The student said;

*"I suppose you could see too much and become immune to it - like it's fine I just don't care anymore. I think in some practices I've seen, like the vet has been there a really long time and they don't (care anymore), it's not like a passion anymore and they just want to go home at the end of the day. They don't really sympathise as much with the animals, but maybe they don't show it very well. But I suppose that can happen when you get older."*V12_17.4 (Quote 7-6)

One of the medical students reflected on what they had learnt during training about the difference between what doctors prioritise and what the patient prioritises when considering pain management. His perception was that doctors were concerned with ruling out life threatening conditions and pain was a minor concern which was not life threatening. The student appreciated the conflicting perspectives of doctor and patient, with doctors wanting to maintain life and patients wanting quality of life.

The student talked about doctors having less empathy for patients as they were focused on curing disease rather than the experience of the patient, saying;

"What the patient worries about and what the doctor worries about are so different and that's become more obvious, that maybe you do lose a bit of empathy when you've been focusing on the more important things. Particularly in the GP setting like you do lots of tests and you rule out the worrying things, like brain tumours and that kind of thing. But then at the end of the day the patients then left with headaches that are unexplained. There are a lot of people that are very good with things like that and help with things like that, but as far as the GP's concerned, for that appointment anyway

they've ruled out all the bad stuff so they can take their time with this. That doesn't help the patient if they want to get to the bottom of it." M12_17.12 (Quote 7-7)

Some of the students reflected on how their own empathy had changed over the course of training. When asked if their own attitude towards animals had changed one of the veterinary students talked about their experience of seeing painful animals had given them a new perspective on whether pain was worrying or not. They described being less concerned as they had learnt that pain does not necessarily mean the animal has a life threatening condition.

This student perceived that they were more able to be rational when faced with a painful animal and described being less concerned about pain as a positive change, saying

"Yeah probably, like less concerned. Not in a bad way, but you know from your own experiences how much pain is expected from a certain thing and not to be alarmed."

V12_17.49 (Quote 7-8)

One of the veterinary students talked about how veterinary training had made them less concerned about animals in pain as they had been exposed to many cases of painful animals. Previously the student would have been distressed by seeing an animal in pain, but no longer felt this way, and speculated that they would feel even less concern with time, saying;

"I'd like to hope it's (the training) has not made me blasé. Easier said than done. I think in 10 years I'll be more blasé, but I'm still young at the moment" V12_17.1 (Quote 7-9)

Another of the veterinary students talked about how they felt their attitude had changed since the initial interview. In the initial interviews this student had described feeling more sympathetic towards animals rather than humans, but

now described feeling equal empathy for both animals and humans. They said;

“I don't think I feel more for animals, I think I feel the same for humans now.” V12_17.4 (Quote 7-10)

In contrast another of the veterinary students also talked about having had greater exposure to painful animals during their training and how this had increased their empathy and concern for painful animals. They said;

“I definitely think my empathy has got more, like I feel it more now than I used to. I feel like... I want to take the pain away. Maybe because I've seen it more. Maybe I understand it more, or recognise it more. I feel quite distressed and 'oh I have to help it' now.” V12_17.49 (Quote 7-11)

A medical student described how they had limited exposure to people in pain before starting training, but seeing patients in pain in hospital had made them realise the impact of pain in people. The student talked about the impact that seeing patients in hospital from fourth year of training onwards had on their own understanding of pain and their empathy towards patients. They said;

“I think I just wasn't aware of it. Like I know that people have pain, but like I said the only pain I had come across was physical injuries and quite minor ones. Actually coming in hospitals you see that pain is a real thing and it really bothers people. (It) has made me more sympathetic towards people.” M17.22 (Quote 7-12)

One of the veterinary students reflected on how her general empathy, including empathy towards other students, had changed during the course of training. She talked about a situation where she was felt angry when another student

displayed emotion and was visibly distressed by dealing with a painful dog. The student described having little empathy for their fellow student and in fact being annoyed at the display of emotion. The student described themselves as also feeling upset, but had learned that displaying emotion would not improve the situation and described adopting a 'detached clinician' approach to the case. They said;

"The owner waited way too long to bring the dog in. It was so painful, it was on a morphine drip. And the student who got the case, just basically broke down. She was so upset about how much pain he (the dog) was in and she basically made herself useless. I was like, it's not about you, it's about the dog. Yes it sucks that he's in pain, but we're pumping him full of drugs. And you need to deal with it, it's not about you. I shouldn't be having to comfort you. I don't know maybe I'm like a robot. Yeah it sucks, I was really upset. Is that going to change the dog? No." V12_17.4 (Quote 7-13)

7.12.2 Improved competency

Although students spoke about communication being important in both sets of interviews, in the final year interviews the students described feeling more able to communicate with patients when assessing pain and conveyed a sense of improved competency in this respect. In comparison, in the first interviews the students described poor communication or inability to communicate as a hindrance when trying to recognise pain in animals and other humans. A prominent sub-theme from the first interviews was the influence of the parent or caregiver in the student's development of their own attitudes towards pain. Although this sub-theme was still present in the data from the second interviews it was much less prominent. Instead students spoke about how they felt they had changed during training and the influence that clinical training had had on their current attitudes.

The medical students articulated that their attitudes towards non-verbal human patients had changed due to maturing during the past five years of training and increased exposure to different non-verbal human patient types. This led to a greater understanding of patient needs and the impact that pain can have on individuals. For example one medical student described how they were more understanding of patients with a disability, saying;

“It (change in attitude) can be a couple of things. It can be fact that I am doing medicine and I'm learning a lot about disabilities and things like that. That's one (reason) or it can be just growing in age and just being exposed to individuals that have disabilities, and just understanding more.”

M12_17.25 (Quote 7-14)

The students often reflected on how their own skills and competency had changed over time. Two of the medical students talked about having a better understanding of communication, particularly in non-verbal patients or those which may have difficulty communicating. One student described seeing a patient with cerebral palsy and realising that he was communicating his discomfort to his mother through non-verbal communication, saying;

“I remember there was one boy who had palsy and he didn't talk at all. He was having trouble with his GI (gastro-intestinal) system and stuff. I'm fairly sure he would have been in pain. His mum was saying he would only eat certain things. And she worked out that there was a way that he was trying to tell you about his pain.” M12_17.25 (Quote 7-15)

Another medical student described how they now appreciate that carers can communicate for patients who are non-verbal, and are a valuable source of information. They said;

“In the last few years I’ve asked patients families as well. Like if someone has dementia and isn’t able to communicate that they are in pain, wives, children or husbands will probably be able to say ‘they’re in pain’. It’s the same with parents of children. So I’ve learnt you don’t just have to listen to the patient to find out whether they are in pain.”

M12_17.22 (Quote 7-16)

Although students acknowledged that they had improved in terms of being able to recognise pain in patient and/ or being able to communicate better to patients and their carers , there was also an awareness that pain could be chronic and difficult to treat.

7.13 Detailed analysis of Education theme

The theme of education was created from themes of non-clinical and clinical/experiential learning. Within the non-clinical theme, sub-themes were coded for learning about animal species and/or non-verbal human patient types; familiarity with animals and/ or non-verbal humans acquired through training; and didactic or formal veterinary/medical education. The experiential clinical learning theme which comprised of sub-themes of observation of painful patients, exposure to cases and teaching during clinical placements and the learning from the ‘hidden curriculum’. (Table 7-17).

Major themes	Themes	Sub-theme
Education	Non-clinical learning	Learning about pain experience depending of patient type/ familiarity with patient
		Didactic teaching/ lectures/ formal teaching
	Clinical/ experiential learning	Observation of pain in clinical patients
		Veterinary/ medical clinical training during undergraduate
		Hidden clinical curriculum

Table 7-17. Major theme of 'Education' and sub-themes

All the students described aspects of the undergraduate training which had influenced their own attitudes to pain and education the students received throughout the undergraduate veterinary and medical course was a prominent theme in all the follow-up interviews. There was a marked difference in the way students described what they had learnt about pain in their formal didactic lectures and tutorials, versus clinical experiential learning from shadowing qualified veterinary and medical staff. The students were less able to recall specific teaching on pain or pain assessment from formal lectures or tutorials, but were able to recall seeing patients in pain during the clinical part of their training. The clinical training, which often involved shadowing qualified veterinary and medical staff as well as practical training, appeared to have involved a deeper learning which allowed students to recall specific cases and teaching on pain.

Although this may be beneficial, many of the students also recalled seeing less desirable attitudes towards pain expressed by staff. This was particularly true of the medical students who had developed a belief that human patient exaggerate their own pain – which may have been conveyed through the 'hidden curriculum' they were exposed to during clinical training.

7.13.1 Non-clinical learning

In the first interviews students spoke about their education before starting University and how it was very science orientated, saying this did not help them understand the personal impact of pain. In the second interview all the student described aspects of undergraduate training they had felt influenced their own attitudes.

Students were able to recall clinical training as being particularly useful, whereas they were often unable to recount any formal teaching on pain. In comparison, non-clinical learning, such as lecture and tutorials was spoken about as 'not memorable' and the students were unable to give examples of formal teaching which had influenced their attitude towards pain or they had felt provided pain education.

Veterinary students reflected on their teaching and what they had learnt regarding how different species of animals respond to painful stimuli. One of the veterinary students described how they had seen different animal species treated quite differently in respect to pain management after surgery. They said;

"A cow would show pain in a different way, they're normally quite quiet and so, and I think farmers don't often pay for loads of medication as well. So you don't often use as much as you would like, pain relief. Like if you gave a caesarean to a cow and a caesarean to a dog, like, I think it's different, like the pain. The amount of pain relief they'd get." V12_17.1
(Quote 7-17)

Another of the vet students expressed being unsure about how much pain different animal species were capable of experiencing. They were unable to

recall any specific teaching on pain, but talked about animals being able to feel different magnitude of pain, saying;

“I don't know, because I still don't know. I think all animals feel pain. I just don't know how, I think some animals have a lot less pain. Like I don't think a bubble bee would feel as much pain as I do. Like I don't think a fish would. I think I feel they all feel pain, but maybe they don't feel it as greatly as us doesn't mean you shouldn't give them some sort of pain relief.” V12_17.4 (Quote 7-18)

The attitude of one of the medical students towards pain in non-verbal humans had changed in that they now reported thinking all humans were similar in their EP. They explained;

“Actually I think all people are capable of feeling the same amount of pain now, especially new-born baby, dementia patients, pre-school child. In some ways I'd even maybe change to, maybe new-born baby, preschool child, person with profound learning difficulty and dementia patient can feel more pain than adults. Because adults have ways of coping with pain which means the pain is not quite as, like coping mechanisms. These people don't have coping mechanisms, so if they feel pain than that's all the feel and they can't focus on anything else.” M12_17.22 (Quote 7-19)

Another medical student told me how learning about non-verbal human such as people with disabilities had changed their own attitude towards pain in these patients, saying;

“What’s probably changed my thoughts is just the fact of how ignorant I was! I’ve learnt a lot about learning disabilities. I feel there’s a lot of lay perception about what learning disability is. Quite a lot is to do with how media portrays it. I had so little insight probably back then.” M12_17.12 (Quote 7-20)

All the students described the training they had received as being an influence on the attitude towards pain in general. Many students expressed an opinion that the extent of the teaching/training received by individual students varied depending on which staff members were involved. The veterinary students recalled formal teaching in the final semester of fourth year that they felt had been beneficial, with one student saying;

“I think in final year prep we had some behavioural lectures and they were talking about you know if a dog has had a spay and it’s whimpering, maybe I use to think - oh it’s just recovering from anaesthesia, but actually it’s probably in pain. So now I think after, when I see things like that I think it’s in pain, rather than just recovering from anaesthesia.” V12_17.1 (Quote 7-21)

Another veterinary student talked about the inconsistency with teaching of pain throughout the undergraduate course, saying they felt the majority of pain was taught during the anaesthesia course, and often was not mentioned during other courses. They said;

“I think it shouldn’t just be in anaesthesia and pharmacology. I feel like the people that are teaching gastro-intestinal, kidney disease - they should be talking about what is painful. They should say ‘here’s some good pain drugs to give in this case’. It’s almost like, Oh you do pain with surgery, because it’s with the anaesthesia course, so pain medication is always with anaesthesia.” V12_17.4 (Quote 7-22)

Students could easily recall examples of pain teaching from clinical situations, yet most students were unable to recall specific information from formal didactic teaching on pain relating to animals and non-verbal human. For example one veterinary student said;

*"I can't remember how we got taught that (pain in animals).
It wasn't very memorable." V12_17.4 (Quote 7-23)*

A medical student expressed a similar opinion that the information they gained about non-verbal human pain from formal didactic learning was not easily recalled, saying;

"It might have had it mentioned in a lecture once. So one of our exams just passed was one of the themes we had to learn about was pain, so I've kind of read about it myself, about different ways to assess it. But I can't really remember we get so many lectures. Nothing sticks out in my mind of someone sitting down and saying 'this is how you assess pain in people that can't tell you'." M12_17.25 (Quote 7-24)

And another students expressed similar views when asked what they had learned in lectures about paediatric pain and non-verbal human pain, they said;

*"Well we've had lectures, but there's nothing I can remember from it. Apart from probably Calpol (paracetamol). In terms of other non-verbal patients.... I do think there could be improvement, simply from the fact that if you ask me am I really confident in treating non-verbal patients - I'm not sure."
M12_17.12 (Quote 7-25)*

7.13.2 Experiential/ Clinical learning

In the data from the first interviews observation of animals and/ or humans in pain was an important sub-theme. Often students described observing pet animals and /or family/ friends in pain, and this being an important influence on their own attitude towards pain (section 5.7). The veterinary students also talked about training in terms of 'seeing practice' before entering University.

In the second interviews students still recalled situations where they had observed pain, but instead of pet animals and /or family/friends they now talked about seeing pain in painful patients. In particular the medical students were able to vividly recall human patients who had been in pain and talked about witnessing pain in hospital as commonplace (Figure 7-9). In the second interviews all the students talked about observing the attitude of qualified veterinary medical professionals and also the culture with the professions (Table 7-15).

All the students talked about their clinical training as being a big influence on their attitude towards pain in patients (see section 8.6). Within the theme of experiential / clinical learning there were definite sub-themes that were coded, including observation of painful patients, clinical training and learning from clinical culture or 'hidden curriculum'. There was some overlap between the sub-themes as clinical training provided the opportunity for students to observe painful patients and also the exposure to clinical culture within hospitals and practices.

Observing patients in pain appeared to provide an important learning opportunity for both veterinary and medical students. The students were often able to recall cases in detail, demonstrating a deep learning (Fry, 2014). One of the veterinary students described seeing an animal on clinics which had a change in their normal behaviour and realising the change was due to pain. They reflected that observing the change in this animal's behaviour was a valuable learning experience, saying;

“Before (she came to the surgery) she (the cat) was angry and hateful, and we had to move her to emergency. And she just got very quiet, and one of the clinicians was like, I think she's painful lets give her some methadone. We gave her (methadone) and there was a change in how she was. She returned to herself and I could see (that she had been in pain). You know the vet back home prefers them quiet cause it's easier to deal with. But it was kind of nice seeing her return to her normal angry self, we're getting natural behaviour.” V12_17.1 (Quote 7-26)

The benefit of clinical teaching and the improved learning gained from clinical situations was discussed by both veterinary and medical students. Most students suggested that the learning opportunities on clinical placements were more memorable than those of formal didactic teaching. One medical students summed it up as;

“I really like bed side teaching. I find bedside teaching is really helpful way of learning, because you see the patient. I suppose it's quite hard if the patient is in pain to have students standing around. But you could even go to see a patient who has had pain and you could ask them about the pain and or if, someone is non-verbal then you can talk to the carers. I think seeing patients is a lot more memorable than a lecture.” M12_17.12 (Quote 7-27)

Another medical student talked about the influence the anaesthetists had on them during clinical rotations, particularly in their understanding of sedated or anaesthetized patients and the degree of pain these patient should experience. They recalled the teaching they had whilst on the clinical anaesthesia rotation;

“I just presumed that if you're under anaesthetics then you're pain free, turns out that's not true. And they (anaesthetists)

were saying that you can tell if a patient that's under anaesthetics is in pain, by their heart rate is faster, that their blood pressures going up, which is quite interesting that a patients that is lying there completely still and unconscious, can still be in pain.” M12_17.22 (Quote 7-28)

One medical student described having good teaching on their medicine of the elderly rotation, but they were unsure of whether all students would have the same experience;

“But I don't know how formal that teaching is. It could of been whoever turns up on the day and might not be that structured. It might just be whatever they tell you.”
M12_17.12 (Quote 7-29)

This student also reflected over the influence of training on their own attitude towards pain in babies, and described feeling that the training had a positive effect, saying;

“I think it is the training, because if I didn't have an understanding at all or any knowledge about babies and their development, I'd probably be like ‘they don't feel as much (pain)’.” M12_17.12 (Quote 7-30)

Although the students described clinical training opportunities in a positive manner, they were also aware of the influence of clinical culture or the hidden curriculum on their attitude and understanding of pain. The medical students described observing clinical culture and/or attitude towards pain of doctors and other medical professionals and how they reacted to patients in pain, often commenting that pain was not taken seriously or the extent of patient pain was disbelieved.

One student talked about learning that all patients tend to exaggerate their own pain experience, saying;

“We've learnt that all patients are always in 10/10 pain, so many patients if you ask them 'how's the pain?' they're always in the worst pain ever. So maybe you learn to take things with more of a pinch of salt, than when I first started if someone had said 'I'm in 10.10 pain' I would have believed them.” M12_17.25 (Quote 7-31)

Another medical student talked about pain as non-life threatening, re-iterating a similar sentiment expressed by another student when discussing changing empathy. The student said;

“A lot of patients probably think if they say the pain is really bad, that you're more likely to listen to them and do something, and also think you're more likely to believe that they have bad pain.” M12_17.22 (Quote 7-32)

Some students were able to reflect on the clinical culture they had observed and articulated their own conflicting views. One medical student described their perception that chronic pain patients are sometimes seen as a nuisance by doctors and medical professionals, saying;

“I guess patients with chronic pain, often they are just seen as a nuisance, there's nothing we can do for you. We've given you all the drugs and it's still not helping you, there's nothing we can do for you - why do you still come back? And GP's are like 'when I see this patient's name my heart sinks'.” M12_17.22 (Quote 7-33)

Another medical student highlighted the difference in attitude towards pain management that they had observed on different wards within the same hospital;

“I feel that if you were a cancer patient, and you said that you're in quite a lot of pain - they are not reluctant to give medication. Whereas if you're on a medicine ward and said I'm in quite a lot of pain and repeatedly said that, I think there is reluctance to give pain medication. Either that is because they need to know why you are in pain or I've seen tendencies for people to think 'she's not really in pain'.”

M12_17.12 (Quote 7-34)

One of the veterinary students described a similar situation in a veterinary clinic where the vet was reluctant to give analgesic medication to animals who had had surgery, saying;

“I think on ems (extra mural studies), all the vets I've been to are like 'oh it's just recovering'. They'd never have given more pain relief. I thought oh yeah I want to give that animal more pain relief, but because it was in the vets I couldn't really question as a student, I don't feel you're in a position to say I think you should give it more pain relief.”

V12_17.1(Quote 7-35)

Another of the veterinary students described the attitude of a vet that they had seen practice (extra mural studies) with during training. The vet had told them it is better not to give analgesics as it keeps the animals quieter, but the student questioned this logic as they described thinking the animal was in pain and needed analgesia. They demonstrated an awareness that veterinary clinicians understanding of pain can differ depending on education. The student said;

“He says it (not giving analgesics) keeps them quiet and keeps them from ripping and tearing at their stitches, which is good for them. Some owners are on it, they immediately

go 'he's much more quiet, is he in pain? I don't want him to be in pain'. And the vet will give his explanation and sometimes he flat out says 'he's not in pain' and I'm like - he is in pain. So I think from where he was taught, it's just a very different level because I'm looking at the animal and thinking 'you need something'." V12_17.4 (Quote 7-36)

7.14 Summary of results

There were little differences in median *EP* scores that students gave to animals and non-verbal humans as they progressed through training. In 3rd year the median *EP* scores given by students to animals and non-verbal human were very similar to those in 1st year, however students were more likely to rate *EP* lower for *Rabbit* and *Learning difficulties* in 3rd year compared to 1st year.

Of the students who completed the questionnaire in final year very few of them rated *EP* in animals as less than 4 (less able to experience pain compared to a typical adult human) and no students gave a *EP* score of 0 (unable to experience pain) to any of the animal species. In the final year data no students rated *EP* as less than 4 in *Learning difficulties* or *Dementia*. One student rated *EP* as 'unable to experience pain' in *Foetus*.

The recapture rate for students deteriorated as the students progressed through training. Very few students completed the *EP* questionnaire in final year which limited the amount of quantitative results (see section 8.7). This meant that determination of changes in influences relied completely on the qualitative data analysis.

From the qualitative analysis, the major-theme of Education was identified in both the first and follow-up interviews, although the volume of coding was greater in the follow-up interview compared to the first.

The major themes identified from the follow-up interviews are concerned with change. Changing empathy and /or observing declining empathy in others

was identified in the transcripts. In addition the students were able to reflect on the factors which contribute to changes in empathy. The students also articulated how their own competency and experience had improved, particularly with reference to communication with patients or understanding what patients were communicating through behaviour.

Although there was some similarities between the first and follow-up interviews, many of the sub-themes identified in the follow-up interviews had not been identified in the first interviews. A prominent theme from the follow-up interviews was the influence of clinical learning on the students, both from providing exposure to painful patients and opportunities for students to observe patients, as well as observing the attitude of qualified staff to painful patients.

7.15 Discussion

The QUAN results revealed little changes to attitudes to pain as assessed by Likert type questions, but did show that the attitudes towards pain became more homogenous as students progressed through training. Changes in the influences on attitude to pain as perceived by the students themselves were identified, with the clinical training they had received and their exposure to clinical culture during training being important influences on the group of students interviewed. The shift from the influences on attitude to pain when they entered veterinary/ medical training (Family/ caregiver; Observation of pets/family/friends in pain) to the influences at the end of training (Training; Clinical culture; Observation of patients in pain) reflects increased exposure to clinical environments and patients during training.

Observational learning was identified as an influence on pain attitudes in both the initial and final interviews. Previous studies have demonstrated that children's attitude towards their own pain is directly influenced by observing their parents attitude towards pain (Goodman and McGrath, 2003, Olsson et al., 2007) and observational learning in this context is an important dimension of pain attitude development (Goubert et al., 2011).

The students were more able to recall teaching from the clinical setting compared to more formal didactic teaching, such as lectures and/or tutorials. This demonstrates the strength of clinical bedside learning compared to more formal didactic learning forms, which in this study the students reported as being less memorable. There is literature to support the value of 'bedside learning' or in the context of veterinary education, 'seeing practice', and this type of learning is essential to develop the higher-levels of clinical reasoning that is required from a competent veterinary or medical practitioner (Carraccio et al., 2008).

In a similar way to the role model function of the adult family members (chapter 5), it appears that the clinical 'adult', that is those people who students perceive as being senior to them in clinical acumen, take on the role model position once occupied by their parents/ caregivers. In this way, students learn socially acceptable ways to respond to pain in different types and animals and different non-verbal humans, in the context of the clinical environment being an isolated enclave of society (Benbassat, 2014).

From the qualitative data analysis codes relating to changes in empathy were evident in the follow-up interviews. Empathy changes in veterinary students as they progress through training have been reported (Schoenfeld-Tacher et al., 2015, Schoenfeld-Tacher et al., 2017). The veterinary students in this study did not report feeling less empathy for their patients themselves, but did reflect on seeing clinical staff or student colleagues with less empathy towards patients. Many of the veterinary students talked about senior veterinary staff losing empathy for their patients which agrees with finding from previous studies where veterinary students regarded qualified vets as 'tough minded' (Paul and Podberscek, 2000).

There is an extensive literature on empathy in medical students and previous studies have shown empathy declines as students progress through undergraduate training into clinical training (Griffith and Wilson, 2001, Mangione et al., 2002, Neumann et al., 2011, Quince et al., 2016b). The medical students in this study appeared to have less empathy for painful

patients and had developed a 'detachment' to patient pain, particularly in their belief that patients tend to exaggerate pain. The phenomenon of the 'detached clinician' has been present within the medical profession for many years and was first advocated by William Osler (1849-1919) (Chrobak, 2004). Osler promoted clinical detachment and prioritised evidence based medicine along with technical progress and this approach to medicine became the accepted norm within the medical profession. Modern clinical society values being objective and clinically detached, over being subjective and displaying emotion (Kerasidou and Horn, 2016, Halpern, 2001, Halpern, 2003) .

It has been suggested that students observing senior veterinary or medical colleagues clinically detached attitudes can promote development of similar attitudes as the student attempts to emulate behaviour they perceive as indicative of 'real' clinicians (Fuks, 2018, Howe, 2018, Jeffrey, 2016b). During the interviews in final year many of the veterinary and medical students recalled situations which illustrated the continued presence of clinical detachment from patients in current clinical culture. A possible reason for clinicians appearing detached from the experience of their patients is to avoid the emotional stress. Veterinary and medical students are trained to identify problems and 'fix' them, which can lead to mental stress in situations where the clinician is unable to 'fix' the painful patients and perhaps psychological damaging when you cannot solve the problem (Lathrop, 2017).

The medical students had learnt, possibly through exposure to the hidden curriculum whilst on clinical placement, to doubt patients own interpretation of the pain they experience. The definition of 'hidden curriculum' varies but usually has negative connotations and implies students learning less patient centred medicine and is recognised as an element of medical training that needs to improve (Gardeshi et al., 2018, Hafferty, 1998, Hopkins et al., 2016, Lawrence et al., 2018) (Chapter 2, section 2.12). Disbelieving and/or discounting patient's has been reported as a concept which is taught to medical students through the hidden curriculum (Simpson et al., 2002, Favaloro and Touzel, 1990). Disbelieving and/or discounting the severity of

pain has important implications for non-verbal human as they are less able to communicate their pain and as such may 'suffer in silence', particularly in the busy clinical setting where quiet patients may be overlooked.

Previous studies which have relied on cross sectional year approach have identified changes in attitude towards pain in students further along in training (Niemi-Murola et al., 2007, Nimmaanrat and Oofuvong, 2015, Morris et al., 2012), but have often recommended the future longitudinal studies on attitude towards pain as cross sectional studies compare attitudes of different students, rather than the same students over time. A limitation for this longitudinal study was the poor response rate to the questionnaire in 3rd and final year. Dropout rates for longitudinal studies are high and have been documented to be between 30% and 70% (Bildt et al., 2001, Gustavson et al., 2012). The response rate to the initial questionnaire (1st year questionnaire) in this study was very good in the veterinary students (>85%) and poorer in the medical (45%), however this deteriorated to 31% for veterinary students and 8% for medical students in 3rd year and further fell to 8% for veterinary students and 3% for medical students in final year.

Previous research has found an association between psychological stress and attrition rate in longitudinal studies, with people experiencing high levels of stress less likely to complete questionnaires (Gustavson et al., 2012). Both medical and veterinary students have been shown to have high levels of stress as they progress through undergraduate training (Adin et al., 2019, Azim and Baig, 2019, Dyrbye et al., 2006, Kim et al., 2017, Kumar et al., 2019), which may have contributed to the lack of engagement with follow-up questionnaires in this study.

Email response rates to questionnaires can be expected to be between 25-30%, and remain low without multiple follow-up emails (Fincham, 2008). Due to the restrictions applied by the project ethical approval limited reminder emails could be sent to students to encourage completion of the questionnaire. In addition the timing of email invites to complete the questionnaire proved difficult as in final year veterinary and medical students are entirely based on

clinical rotations meaning that groups of students can be away from the University setting and even on clinical placements abroad. This geographical distance from the University combined with the demands of clinical rotations may have contributed to the poor response rate in final year.

The poor response meant that the non-response bias for the 3rd and final year questionnaires was substantial. In addition fewer than anticipated of the students who did complete the questionnaire in 3rd and final year elected to provide student numbers which allowed data from 1st, 3rd and final year to be linked. This meant that very few of the students could be tracked throughout training to investigate if their attitudes had changed.

7.16 Conclusion

Veterinary and medical student's attitudes towards pain in specific animal species and particular non-verbal human types did not alter markedly during training. The influences on attitude to pain did change from those identified at the end of their first year on training in the initial interview. Students spoke about being influenced by observing patients in pain, the attitude of veterinary and medical professionals towards pain and their clinical training as influences to the development of their own attitudes. As students were exposed to many of the influences as a part of the clinical training process it is evident that training does impact on student attitude and as such is crucial for promoting useful attitudes towards pain in future generations of veterinary and medical students. Attitudes towards pain in animals and non-verbal humans did not deteriorate during training in this group of students, although there was some evidence of development of less helpful attitudes, such as the belief that all human patients exaggerate pain.

These attitudes are likely to be absorbed from non-formal learning whilst observing clinical practice and as such the potential for these types of learning should not be underestimated. This aspect of 'absorbing' the attitudes and responses towards pain of clinical staff highlight the importance of the hidden

curriculum in undergraduate teaching. This is of particular importance in subjects such as veterinary and medicine where a significant amount of teaching occurs in clinical environments where teaching is less 'scripted' than that of formal didactic.

Chapter 8 Discussion

8.1 Introduction

There is evidence that a clinician's attitudes influence behaviour in terms of welfare and pain management in animals and non-verbal humans (Rodkey and Pillai Riddell, 2013, Darlow et al., 2012, Schechter and Allen, 1986, Hellyer et al., 1999, Becker et al., 2013, Becker et al., 2014, Bell et al., 2014, Capner et al., 1999, Coleman and Slingsby, 2007, Dohoo and Dohoo, 1996, Hewson et al., Hewson et al., 2007b, Hugonnard et al., 2004, Huxley and Whay, 2006, Ison and Rutherford, 2014, Keown et al., 2011, Lascelles et al., 1999, Lim et al., 2014, Lorena et al., 2013, Lorena et al., 2014). Understanding where these attitudes come from, and how they have developed is therefore important. Veterinary and medical undergraduates represent the next generations of veterinary and medical clinicians. Once these students graduate and enter the clinical phase of their careers, the opportunity to promote patient beneficial attitudes 'en masse' is lost as graduates enter different career routes and specialities.

Animals and non-verbal humans are patients who are unable to verbally to complain or communicate their level of pain, therefore it is important that veterinary and medical undergraduate education promotes patient beneficial attitudes to pain in these patients. Common conditions associated with impaired ability to communicate in humans include adults with intellectual disabilities, elderly with dementia, people who have sustained brain injury, patients in critical care and also children (Hadjistavropoulos et al., 2001). For the purpose of this thesis humans with limited or reduced ability to communicate were referred to as non-verbal humans (section 1.1.2).

An inability to communicate does not spare animals and non-verbal humans from experiencing pain and suffering, and so these types of patients rely heavily on clinical staff to appreciate the potential for them to experience pain (Turk and Melzack, 2001). Pain causes stress; delays healing and recovery from surgery; negatively affects well-being and welfare; and is a financial

burden by reducing productivity and increasing medical costs (Turk and Melzack, 2001, Toates and Davey, 2007). Despite these detrimental consequences of pain, previous publications suggest that pain management is inadequate in animals and non-verbal humans (Bradbury et al., 2016, Hewson et al., 2007, Kupsala et al., 2013, Machin, 2001, Vaisanen et al., 2008, Alexander and Manno, 2003, Brasher et al., 2014, Mather and Mackie, 1983, Mazur et al., 2013, Wolfe et al., 2000).

Attitudes have a valence (direction) and strength (Albarracin and Shavitt, 2018), therefore understanding the direction of an attitude and its corresponding effect on behaviour is important (section 2.7). There is evidence to suggest that veterinary and medical clinicians can have attitudes which influence their behaviour in the *direction* of reluctance to provide adequate pain management in animals and non-verbal human patients (Becker et al., 2013, Bell et al., 2014, Brearley, 2014, Dohoo and Dohoo, 1996, Hugonnard et al., 2004, Huxley and Whay, 2006, Ison and Rutherford, 2014, Keown et al., 2011, Alexander and Manno, 2003, Brasher et al., 2014, Mather and Mackie, 1983, Morrison and Siu, 2000). Ideally all clinicians would have attitudes towards pain which influence their behaviour in such a way to provide optimum pain management for their patients. For the purpose of this thesis attitudes that result in inadequate pain management are considered *patient adverse*. Attitudes which promote optimum pain management are described as *patient beneficial* attitudes throughout this thesis.

Previous publications have suggested a number of factors which may influence attitude towards pain in verbal humans, include gender (Robinson and Wise, 2003), ethnicity (Trawalter et al., 2012) previous pain experience (Robinson and Wise, 2004), and empathy (Craig et al., 2010, Gleichgerrcht and Decety, 2014, Goubert et al., 2005, Green et al., 2009, Tait, 2008) (section 2.12). Whether these factors influence veterinary and medical students' attitude to pain in animals and non-verbal humans has not been previously investigated.

Previous published work on attitudes to pain in veterinary and medical students has focused on pain in general; particular types of pain (acute/chronic/surgical); or in one particular species (Ali and Thomson, 2009, Hellyer et al., 1999, Ung et al., 2016, Kielland et al., 2009, Mich et al., 2010). The work in this thesis has identified:

- the attitudes future veterinary and medical clinicians have with regard to pain in different animal species and non-verbal humans when entering undergraduate training;
- what influences these attitudes;
- and whether there was any change during training.

8.2 Recap of development of research questions

The search and review of the literature revealed the following gaps in knowledge (chapter 2):

- No information on veterinary and medical student baseline attitudes to pain in different animal species and different types of non-verbal humans.
- No studies comparing attitudes of veterinary and medical students.

In addition, it was identified that there was limited information on:

- What factors influence veterinary and medical student attitude to pain in animals and non-verbal humans.
- No studies investigating how empathy may influence veterinary and medical student attitude to pain in animals and non-verbal humans.
- Limited information on how veterinary and medical student attitudes to pain in different animal species and different non-verbal humans change during training, and whether the influencing factors change.

To address these gaps, research questions were developed which formed the framework for this thesis. These research questions were;

RQ1. To determine and compare the attitudes of veterinary and medical students entering University towards pain in animals and non-verbal humans, and explore what factors influence development of these attitudes.

RQ2. To determine veterinary and medical students' empathy and investigate how empathy may be associated with attitude towards pain in animals and non-verbal humans.

RQ3. To determine if attitudes of veterinary and medical undergraduates towards pain in animals and non-verbal humans change during training, and explore what influencing factors they may be exposed to during training.

8.3 Recap of methods

In order to investigate Research Questions 1-3, mixed methods, using both quantitative and qualitative approaches (section 3.3), was used to study veterinary and medical undergraduate's (section 3.5) attitudes to pain in animals and non-verbal humans, and the factors which influence these attitudes. A Mixed Methods Research (MMR) approach was chosen for this project as the research questions are broad, and require an understanding of both student attitudes and the factors which influence these attitudes, so it was felt that using a MMR approach, would allow a deeper investigation of the research questions. Undergraduates were studied from entry to Edinburgh University's College of Medicine and Veterinary Medicine, to final year of training (section 1.2).

There have been no previous published tools which evaluated veterinary and medical student attitudes to pain in different animal species and non-verbal humans. After reviewing previous publications on attitudes, a Likert-type scale was developed to quantify student attitude towards pain in a range of animal species which included pet animals, farm animals, laboratory animals and exotic/wildlife. The animal species included were: higher primates

(*Chimpanzee*), companion animals (*Dog; Cat; Horse; Rabbit*), production animals (*Cow; Pig*), laboratory animal (*Rat*); exotic or wildlife species (*Bird; Snake; Fish; Insect*).

Non-verbal human groups were chosen to represent non-verbal patient types for which previous publications have suggested inadequate pain management (Chatelle et al., 2014, Curtiss, 2010, Harrison et al., 2014), and included: paediatric subjects [foetus in last trimester (*Foetus*); new-born baby (*Baby*)]; vulnerable adults [person with learning difficulties (*Learning difficulties*); person with dementia / cognitive impairment (*Dementia*)]; and critically ill/unconscious patients [person in a coma (*Coma*); anaesthetized person (*Anaesthetized*)]. The questionnaire asked students to rate *Expectation of pain (EP)* for each animal species and non-verbal human (section 3.6).

The scale had 3 anchor points – 0 (unable to experience pain); 4 (same pain experience as a typical adult human); 7 (much more pain than a typical adult human). This type of attitudinal scale is a direct measure of attitude and a substantial amount of the psychology literature focuses on development of such scales (Eagley et al., 1993, Henerson et al., 1987, Oppenheim, 2005). Use of a different direct attitudinal scale or even an indirect measure of attitude potentially could have resulted in different results due to difference in detecting attitude strength and/or direction (see section 8.7.2).

Questionnaires were distributed to students in their first year to gather quantitative data on student characteristics, prior experience and the *Expectation of Pain (EP)* attitudinal scale. The *EP* ratings were analysed to assess baseline attitudes when entering University; to compare attitudes between veterinary and medical students; and to assess relationship between *EP* rating and student characteristics (section 3.10). During analysis the *EP* ratings were examined in 3 ways: the individual student ratings; dichotomized into ratings of 'unable to experience pain' ($EP = 0$) and all other ratings; and dichotomized into 'less pain than a typical adult human' ($EP < 4$) and all other ratings. As the set of student characteristics was large and data was unbalanced, a relatively new, but recognised multivariable general linear

model selection technique utilizing a genetic algorithm was used as part of the quantitative analysis (Burnham K. P., 2011). The *EP* questionnaire was repeated when the students were in third and final year to investigate changes in attitude as students progressed through their training.

Interviews at the start of second year and final year were used to gather qualitative data on factors which students themselves perceived influenced attitude to pain in animals and non-verbal humans (section 3.11). Interview data was analysed using open thematic coding to identify themes (section 3.11.8).

Finally, the relationship between student empathy, using the validated Empathy Quotient (EQ) score, and attitude to pain in animals (*Small dog; Lamb; Cat*) and non-verbal humans (*Infant child; Elderly person; Baby*) depicted in six video clips was investigated when the students were in third year (section 3.8, 3.9 and 3.10).

8.4 Results for Research Question 1 (RQ1)

RQ1. To determine and compare the attitudes of veterinary and medical students entering University towards pain in animals and non-verbal humans, and explore what factors influence development of these attitudes.

Chapter 4 used a quantitative approach and focused on baseline attitudes to pain in animals and non-verbal humans when students started University using the *EP* attitudinal scale; and what, if any, student characteristics and demographic factors influenced student attitude to pain. Chapter 5 reported the results of the qualitative approach to investigating what students themselves perceived as influencing their attitudes to pain in animals and non-verbal humans. This utilized an interview technique and open thematic coding to identify themes in relation to factors which influence attitude towards pain in

animals and non-verbal humans. The gaps in the literature that were investigated by chapters 4 and 5 were;

- No information on veterinary and medical student baseline attitudes to pain in different animal species and different types of non-verbal humans;
- No studies comparing attitudes of veterinary and medical students;
- Limited information on what factors influence veterinary and medical student attitude to pain in animals and non-verbal humans.

There are no previous publications comparing veterinary and medical attitude to pain at all. As both groups of students have similar educational backgrounds, and both professions are orientated towards caring for others, it was assumed that general attitudes towards pain would be similar between veterinary and medical students. However, it was also anticipated that veterinary students may have more *patient beneficial* attitudes towards animals, and medical students more *patient beneficial* attitudes towards non-verbal humans.

Students arrived at veterinary or medical school with diverse attitudes towards pain in animals and non-verbal humans. The attitudes varied widely between individual students, with some students rating *EP* high, whilst others rated *EP* low for the same animal species or non-verbal human type (sections 4.6-4.10). There were differences in how veterinary and medical students rated *EP*. Veterinary students were more likely to have *patient beneficial* attitude to pain in all the animal species, apart from *Cow* and *Horse*. However, there was no difference in veterinary and medical student *EP* ratings for the non-verbal humans, apart from *Anaesthetized* where veterinary students were more likely to rate *EP* higher (section 4.11).

A potential explanation for the differences in animal *EP* ratings between veterinary and medical students is the familiarity that veterinary students have with different animal species. There were marked differences in the student

characteristic data between veterinary and medical students before entering University (table 4.3, section 4.5.3), with veterinary students having had significantly more experience with animals. This is supported by the results from the multivariable general linear models which suggest that experience of working with or caring for animals was associated with how veterinary students rated *EP* in all the animal species (section 4.12).

Attitudes of students entering veterinary and medical school towards pain in animals and non-verbal humans did vary depending on the animal species or non-verbal human type. The attitude towards pain in some animal species and non-verbal humans was more homogenous amongst the students, for example *Chimpanzee* had little variation in *EP* rating. For laboratory and wildlife animal species, and non-verbal humans (*Foetus, Coma and Anaesthetized*) the majority of students rated *EP* <4, i.e. less than a typical conscious adult human.

There is evidence that welfare attitudes to animals vary depending on the level of sentience an animal is believed to have (Kupsala et al., 2013, Mather, 2011, Singer, 2009, Proctor, 2012). For this reason it was anticipated that species which are generally considered less sentient or have less cognitive function, such as fish and insects would receive lower *EP* scores (Cornish et al., 2018). In the animal species *EP* was rated lowest in *Snake, Fish and Insect*; and highest in *Chimpanzee* – a species considered to have advanced cognitive function (Beran and Hopkins, 2018, Hirata, 2009, Webb et al., 2017) (section 2.10). This indicated that many students enter veterinary and medical school with the belief that certain animal species, for example those considered as wildlife, are less capable, or even incapable, of experiencing pain when compared to a typical adult human. A potential explanation for the differences in *EP* scores between species is the suggestion that humans are programmed to feel more empathy to organisms which they view as similar to themselves, for example those which are closer on the phylogenetic tree (Rae Westbury and Neumann, 2008) (section 2.13).

When considering how students would score *EP* non-verbal humans, previous publications suggest that clinical staff have *patient adverse* attitudes to pain in non-verbal humans (Brown, 2011, Feldt et al., 1998, Massaro et al., 2013, Morrison and Siu, 2000, Margolius et al., 1995, Mather and Mackie, 1983, Plummer et al., 2016), so it was anticipated that *EP* scores would be below 4 for the non-verbal humans included in the questionnaire. For the non-verbal humans *EP* was lowest in *Anaesthetized*, *Coma* and *Foetus* (section 4.11). There was a wide variation in *EP* scores for *Foetus* with almost two thirds of students rating *EP* as less able to experience pain compared to a typical adult, indicating that the majority of students held *patient adverse* attitudes towards foetal pain. The evidence for foetal pain is controversial (Bellieni and Buonocore, 2012), but a recent publication suggests human foetuses are likely to feel pain from 27 weeks gestation and beyond (Lee et al., 2005). A more recent review article on foetal pain concluded that human foetuses are likely to experience pain during the second half of gestation (from week 20) and that foetal analgesia/ anaesthesia should be mandatory when performing potentially painful procedures (Bellieni et al., 2018).

The majority of veterinary and medical student scored *EP* in *Foetus* lower than that of a typical adult human, and these attitudes changed very little during training (see section 8.6). Based on these findings it would be sensible to suggest undergraduate training in foetal pain is required to ensure that medical students, who are future clinicians, appreciate the potential for foetal pain and are able to treat it accordingly. A first step to devising future teaching in foetal pain would be to determine the extent of current undergraduate training in the concept of foetal pain (see section 8.9).

There is a substantial amount of evidence indicating that attitudes to pain in neonates and paediatric patients is poor, leading to inadequate pain management for these patients (Alexander and Manno, 2003, Brasher et al., 2014, Margolius et al., 1995, Massaro et al., 2013, Mather and Mackie, 1983, Petersen et al., 2009, Schechter and Allen, 1986). There are no previous studies which have assessed the attitude of students entering University to

pain in neonates and paediatrics, but it was assumed that the students would score *EP* in *Foetus* and *Baby* similarly to other non-verbal humans. Compared to the *EP* scores for *Foetus*, fewer students rated *EP* < 4 for *Baby*, but over 25% of medical students scored *EP* < 4 and there was still a wide range of scoring indicating little homogeneity with the student attitude (section 4.11). It is unclear why some students had less *patient beneficial* attitudes toward pain in babies. Future work could explore attitudes to paediatric pain in more depth, particularly in students who hold less *patient beneficial* attitudes, to determine to reasoning behind their attitudes (see section 8.9).

In comparison the *EP* scores for *Learning difficulty* and *Dementia* were more consistent, with a small number of students rating *EP* <4 for these non-verbal humans. This conflicts with evidence of poor attitude to pain and inadequate pain management of clinical patients with cognitive dysfunction (Brown, 2011, Curtiss, 2010, Feldt et al., 1998, Massaro et al., 2013, Morrison and Siu, 2000). The majority of veterinary and medical students in this study had *patient beneficial* attitudes to pain in patients with cognitive dysfunction on entering University, but due to low questionnaire completion rates it is unclear whether these attitudes remained the same at the end of their training (see section 8.3). It has been suggested that inadequate training in relation to pain in cognitively impaired patients contributes to poor attitude, which in turn results in inadequate pain management (Saroyan et al., 2008). This study did not specifically look at the impact of training on attitudes to pain in cognitively impaired patients, therefore future work should assess the impact of current undergraduate pain education on the attitudes of students to pain in these patients.

Previously published work indicated that cultures and region of habitation effects pain beliefs (Orhan et al., 2018, Thong et al., 2017). Students completed the *EP* within the first week of entering veterinary or medical undergraduate training, so it was anticipated that there would be variation in attitudes which would reflect cultural or regional differences which had influenced the students before entering University. In this study culture did

appear to influence attitude to pain in animals and non-verbal humans. Where students grew up did appear as a predictor of attitude to pain in the quantitative analysis *EP* data (section 4.10-4.13). Students who grew up in places other than UK and mainland Europe had less *patient beneficial* attitudes towards pain in production animals, laboratory animals, wildlife species, *Baby* and *Dementia*. This linked to the culture theme from qualitative analysis of interview data (section 5.3.4), where students spoke about the social and/or community culture within which they grew up as having an influence on their attitudes to pain, particularly about cultural influences on their attitude to pain with respect to gender expectations. The influence of culture in the broader sense and its potential to create unconscious bias in our attitude towards pain in different animal species and non-verbal humans has not been explored, raising potential questions for future research (see section 8.9).

There were links and/or overlap with findings from the qualitative and quantitative findings. For example, from the qualitative data students '*own previous experience of pain*' and '*observation of non-verbal people*' emerged as influences on attitude to pain in animals and non-verbal humans (section 5.7.3). Similarly, students '*experience of a minor procedures*' appeared in the 'best-fit' models as an explanation of how students rated *EP* in animals and non-verbal humans, although these were not statistically significant (sections 4.10-4.13). In addition, experience of caring for non-verbal humans was associated with students scoring lower *EP* for the non-verbal humans, although this varied and differed between veterinary and medical students (section 4.10-4.13).

These previous experiences such as experience of pain or experience of working with or caring for others, either animal or non-verbal human, can be considered to be experiential learning, that is *learning from experience* (Yardley et al., 2012a, Yardley et al., 2012b). Constructing knowledge and learning from real-life experiences is used in veterinary and medical education in the context of 'practice based' learning (Yardley et al., 2012b). The influence

of 'practice based' learning opportunities was evident in the qualitative data collected from students during their final year of training (section 8.6).

Caring and working with animals and non-verbal humans also allows students to learn about pain through observing the behaviour of those in pain (Horsburgh and Ippolito, 2018, Goubert et al., 2011). This links to previous publications which suggest that pet ownership during childhood, and hence experience and observation of animals, is linked to more positive attitudes towards animals (Hawkins et al., 2017). As the results of the student characteristic questionnaire indicated that veterinary students had more experience of pet ownership compared to medical students (section 4.5.3), it was expected that veterinary students would have more positive attitudes towards pain in animals. As discussed earlier, the veterinary students were more likely to rate *EP* higher in the majority of animal species compared to medical students and pet ownership did appear in the best-fit models for student characteristics variables which influence whether students rated *EP* less than 4, although was not statistically significant in most cases (sections 4.10 & 4.12). This is in agreement with the findings from the qualitative analysis of the interviews which identified '*observation of pet animals/livestock*' as a factor which students discussed as influencing their attitude to pain (section 5.7.3). Future work should explore the use of both experiential and observational learning to enhance *patient beneficial* attitudes to pain in animals and non-verbal humans (see section 8.9).

Previous studies have reported that male students have less empathy towards animals than female students (Paul, 2000). Furthermore, studies on people's attitudes to farm animal welfare indicate that women express more concern for the welfare animals than men (Mather, 2011, Herzog, 2007). Male medical students had lower empathy scores than female medical students, although there was no difference in empathy scores between the genders for veterinary students (section 8.6). Based on these findings and previous publications male students were anticipated to have less *patient beneficial* attitudes to pain in animals and non-verbal humans. Male gender was associated with less

patient beneficial attitudes towards pain in *Horse, Rabbit, Pig, Cow* and *Snake*, but was not always statistically significant and/or consistent between veterinary and medical students. Male gender appeared as a predictor for *EP* ratings of medical students, with males more likely to have positive attitude to pain in *Learning difficulties*.

The qualitative evidence indicated that students described gender of the person in pain influencing how much empathy they experienced, which overlapped with the cultural influences which were evident in the coding of many of the medical students' transcripts. Social roles, including gender roles, relate to how people are expected to behave in a particular role or context and social norms involve society's rules for what behaviours are considered appropriate (Wood, 2000). The social roles and norms are often a product of the culture within in which people live and can have a strong influence on attitudes.

In the context of pain, veterinary and medical students spoke about gender expectation of pain, often saying that women were less able to tolerate pain. These results are similar to those of previous studies which have found gender expectations related to the pain experience to be prevalent (Fillingim et al., 2009, Glick and Fiske, 1996, Greenspan et al., 2007, Hirsh et al., 2014, Hollingshead et al., 2015). A potential explanation for gender role expectations is the influence of cultural social roles that the students experienced whilst growing up. This was not explored fully and along with the quantitative results, presents a potential avenue for further research (see section 8.9).

The results of qualitative data supported the concept that veterinary and medical students attitudes to pain are influenced by observation of family members, who act as role models during the students' upbringing. It has been suggested that observation of role models plays an important part in attitude development (Albarracin and Shavitt, 2018, Dalege et al., 2016, Lousberg et al., 1996, Petty, 1997, Shaver, 1987). For example, children spend a great deal of time observing the attitudes of their parents and usually begin to demonstrate similar outlooks (Albarracin and Shavitt, 2018). The influence of

role models was also apparent when the students were in final year (see section 8.6), and presents a potentially interesting route for further research (see section 8.9).

8.5 Results for research question 2 (RQ2)

RQ2. To determine veterinary and medical students' empathy and investigate how empathy may be associated with attitude towards pain in animals and non-verbal humans.

Empathy was identified as a factor which interviewed students perceived as influencing their attitude to pain in animals and non-verbal humans (section 5.7.1). Students described empathy towards painful animals and non-verbal humans differing between people, and also that their own empathy impacted on their attitude towards pain. These results led on to a quantitative assessment of each student's empathy, and the relationship between empathy and attitude towards pain was explored (chapter 6).

The gap addressed was;

- No studies investigating how empathy may influence veterinary and medical student attitude to pain in animals and non-verbal humans.

There are no previous publications comparing empathy levels in veterinary and/or medical students; nor has the relationship between empathy and attitude to pain in animals or non-verbal humans been previously explored.

However, as previous work indicated that males have less empathy than females (Baron-Cohen and Wheelwright, 2004, Cohen and Bennett, 2006, Lamm et al., 2011), it was anticipated that male students would have lower empathy levels as measured by the Empathy Quotient. Male medical students did score lower for empathy than female medical students, but no gender difference was apparent in veterinary students. Overall, there was no difference between empathy levels in veterinary and medical students, and levels were consistent with those previously reported for typical adults (Baron-Cohen and Wheelwright, 2004).

There are no previous publications investigating the relationship between empathy levels of veterinary and medical students and their attitude to pain in different animals and non-verbal humans. There is evidence from functional magnetic resonance imaging studies that the same neural pathways activated when experiencing pain are also activated when observing someone else's pain (Danziger et al., 2009, Decety et al., 2008, Fan and Han, 2008, Jackson et al., 2006), which would suggest a link between empathy and observing pain.

In one previous publication psychology undergraduates with higher levels of empathy were more likely to perceive higher pain levels in observed humans (Green et al., 2009). In addition a positive relationship has been proposed between empathy in veterinary clinicians and pain scores given to animals (Norrington et al., 2014). Based on these findings it was expected that there would be a relationship between veterinary and medical student empathy and how they scored pain in the animals and non-verbal humans depicted in the six videos. However, the quantitative analysis indicated that there was no consistent relationship between student empathy and attitude to pain of animals and non-verbal humans depicted in the six videos (section 6.9-6.10). Although there was a weak relationship between student empathy and how they scored pain in *Infant child* and *Small dog*, overall the results did not indicate a relationship between veterinary and medical student empathy levels, as quantified by the Empathy Quotient test, and attitude to pain in animals and non-verbal humans. A potential reason for the lack of a strong relationship

between student empathy and how they scored pain, is the choice of Empathy Quotient as a measurement tool instead of the use of a context-pain specific empathy measurement tool (see section 8.7).

8.6 Results for research question 3 (RQ3)

Both qualitative and quantitative data was used to examine whether there were changes in attitude to pain in animals and non-verbal humans, and also whether influencing factors changed, thereby answering RQ3 (chapter 7).

RQ3. To determine if attitudes of veterinary and medical undergraduates towards pain in animals and non-verbal humans change during training, and explore what influencing factors they may be exposed to during training.

Quantitative data gathered from repeat *EP* questionnaires was used to determine if veterinary and medical student's attitude towards pain in animals and non-verbal human's changed during undergraduate training (section 7.8). Qualitative data from repeat interviews at the end of undergraduate training were used to determine if the factors which students themselves perceived as influencing their attitude to pain had changed (section 7.10). The gap addressed was;

- Limited information on how veterinary and medical student attitudes to pain in different animal species and different non-verbal humans change during training, and whether the influencing factors change.

In contrast to the work presented here, previous studies have used a cross sectional approach to compare pain attitudes in different cohorts of medical students (section 2.9). These studies have reported that attitudes towards pain in patients become less *patient beneficial* as students' progress through training (Ung et al., 2016, Saroyan et al., 2008, Wandner et al., 2010, Griffith and Wilson, 2001). Similarly, Hellyer found that progression through veterinary

training was associated with a reluctance to treat pain in animals (Hellyer et al., 1999). However, cross-sectional studies have limitations as the methodology does not allow comparison of attitude in individual students, or even within the same group of student. This means that any change reported could be merely due to different cohorts having differing attitudes to start with, rather than change being linked to any external factors such as training.

Taking into account the caveats associated with the limitations of these previous studies, it was anticipated that the attitudes in the veterinary and medical students in the current study to pain in animals and non-verbal humans would deteriorate as students progressed through training. Unfortunately, whilst the current work did follow individual students, fewer veterinary and medical students completed the follow-up *EP* questionnaires in 3rd and final year than had been anticipated (see section 8.7.1). For students where data from 1st and 3rd year could be linked, there was no difference in how they rated pain for the majority of animal species and non-verbal humans. However, for *Rabbit* and *Learning difficulties* students were more likely to rate *EP* lower once in 3rd year. It is unclear why attitudes to pain in *Rabbits* and *Learning difficulties* should become less *patient beneficial*, but future work should compare how the subject of pain in rabbits and people with cognitive dysfunction is approached compared to other animals species (see section 8.8). This may reveal useful indicators of teaching methods which are less effective at improving attitudes to pain.

The number of students who completed the final *EP* questionnaire and where data could be linked to previous questionnaires was too low to make any comparisons (see section 8.7.1), so it is difficult to determine if there was any significant change in attitude for the veterinary and medical students from the start to the end of training. In addition, for both the 3rd and final year data, the numbers of students who completed the *EP* questionnaire were too low to allow any quantitative methods of determining predictor factors for *EP* scores (see section 8.7.1). Any future longitudinal studies should explore methods to maximize engagement by students at a later stage of training (see section 8.8).

When the qualitative data from interviews (Chapters 5 & 7), and also the quantitative data (Chapters 4 & 6), relating to influencing factors on veterinary and medical student's attitude to pain were considered, there were two broad categories of influencing factors which emerged. Firstly, factors which can be considered demographic and/or out with the influence of educational interventions were included in the *Characteristics* category (Table 8.1). These factors included empathy, observer characteristics (e.g. student gender) and animal/non-verbal patient characteristics (e.g. animal species or non-verbal patient type). Secondly, a broad category of *Learning*, which included different types of learning which were identified as influencing student attitude to pain (Table 8.1). These types of learning included didactic learning (e.g. formal lectures), observational learning (e.g. learning from role models), experiential learning (e.g. learning from real life experiences) and socio-cultural learning (e.g. learning through clinical culture).

Influences on attitude to pain		QUAN Evidence		QUAL Evidence	
		Chapter	Results	Chapter	Results
Characteristics	Empathy			5, 7	Students Observing other peoples empathy and recognising different levels and /or lack of empathy with animals/ humans
				5, 7	Students were able to recognise when other peoples empathy a lack of empathy
		6	No relationship between empathy as measured by Empathy Quotient and attitude to pain in animals and non-verbal humans.	5, 7	Students reflecting on their own empathy and its influence on their attitude.
	Observer	4	Gender & Age associated with how students scored <i>EP</i> to some animals and non-verbal humans	5	What students understand about communication
		4	Self-reported pain threshold	7	Improved competency: student reflected they had better understanding of pain behaviours
	Animal/ non-verbal human	4 & 7	<i>EP</i> scores awarded by students vary with different species or non-verbal human type		
Learning	Didactic learning during formal educational experiences	7	No change in <i>EP</i> scores between 1 st and final year	5	Students Pre-University education and/or Didactic education/ lectures were not as memorable as observational learning experiences
				7	Students less able to recall memorable didactic experiences about pain, compared to experiential learning
	Observational learning			5	Family and/or caregivers role models attitude towards pain, identified as influencing student attitude to pain
				7	Clinical role models attitude towards pain identified as influencing students attitude to pain.
				5	Observation of pet animals/ farm animals identified as influencing student attitude towards pain
				5, 7	Observing animals and/or non-verbal humans in pain during clinical training/ work experience

Influences on attitude to pain		QUAN Evidence		QUAL Evidence	
		Chapter	Results	Chapter	Results
Learning (continued)	Experiential learning	4	Experience of caring for non-verbal humans associated with how students scored <i>EP</i> to some animals and non-verbal humans	5	Memories of how parents/caregivers responded to the student's childhood painful experiences identified as influencing student attitude to pain
		4	Working with animals associated with how students scored <i>EP</i> to some animals and non-verbal humans	5	Student's own pain experiences before entering University inform and influence their attitude to pain in animals and non-verbal humans
		4	Experience of pet animals associated with how students scored <i>EP</i> to some animals and non-verbal humans	7	Student's experience of working with painful animal/ non-verbal patients
		4	Experience of a minor painful procedure associated with how students scored <i>EP</i> to some animals and non-verbal humans		
	Socio-cultural learning	4	Where students grew up/ country of origin associated with how students scored <i>EP</i> to some animals and non-verbal humans	5	Social/ community culture influences attitude to pain
		4	Parent/ caregiver in clinical profession associated with how students scored <i>EP</i> in some animals and non-verbal humans	7	Clinical culture/ hidden curriculum during training exposes students to <i>patient adverse</i> attitudes towards pain
				5	Depiction of pain in media can influence attitude

Table 8-1. Comparison of Quantitative (QUAN) and Qualitative (QUAL) evidence for factors which influence veterinary and medical student attitude towards pain in animals and non-verbal humans.

Empathy appeared to influence student attitude to pain in animals and non-verbal humans. When considering the influence of empathy, the quantitative and qualitative results conflicted (Table 8-1). The quantitative analysis indicated that there was no consistent relationship between student empathy and attitude to pain of animals and non-verbal humans depicted in the six videos (chapter 6). However, during interviews students often spoke about empathy as an influence on attitude to pain (chapters 5 & 7). During follow-up interviews students recognised that empathy can change, giving examples of when they had perceived changes in empathy (Table 8.1). The changes students described were often concerned with reduction in empathy which they themselves or others displayed for clinical cases. This is in agreement with previous studies which have demonstrated a reduction in empathy as veterinary and medical students progress through training (Ahrweiler et al., 2014, Griffith and Wilson, 2001, Kliszcz et al., 1998, Mangione et al., 2002, Neumann et al., 2011).

It is unclear why empathy towards patients deteriorates, or as in this study, is perceived to deteriorate during training. There is evidence that clinical trainees emulate behaviour of senior clinicians (Benbassat, 2014), so there is the potential for students to observe clinicians who are less empathetic towards their patients but excel in other clinical areas, resulting in students thinking lack of empathy for patients is a trait associated with a good clinician. A potential consequence of clinical role models who are less empathetic towards patient pain models is students try to emulate this behaviour in their future practice – mistakenly identifying lack of empathy and detachment as way to be a good clinician.

In the initial interviews students were able to recall examples of how their parents or relatives reacted to themselves or others in pain, who were in effect role models for how to react and behave in the context of pain (section 8.4) (Table 8.1). In comparison during the final interviews students didn't talk about observing their parents reaction to pain, instead they spoke about observing how clinical staff had reacted to pain in patients (section 7.11) (Table 8.1).

Observational learning is a way in which people acquire attitudes, values, and learn how to behave by observation of the examples provided by others (Bandura, 2008).

The influence of observational learning whilst on clinical placements was apparent in the qualitative data from follow-up interviews with veterinary and medical students towards the end of their undergraduate training. Clinical learning opportunities enabled students to observe the attitude of clinical staff towards pain and develop their own understanding of pain and its impact, which in turn informed their own attitudes towards pain. (section 7.11). In the context of pain the observed clinical staff appear to have functioned as role models for students, and students learnt from them the way to behave and respond to pain in animals and non-verbal humans.

There is also an element of social learning when considering the influence of role models, as individuals pay attention to role models because they believe they can learn skills and accepted ways of behaving in a particular context (Horsburgh and Ippolito, 2018). Horsburgh *et al.* has suggested that people tend to identify individuals as role models who hold a social position to which they themselves aspire, in this context a successful senior veterinary or medical clinician in a specialty of interest (Horsburgh and Ippolito, 2018). Future research should investigate ways to use clinical role models to promote *patient beneficial* attitudes to pain in animals and non-verbal humans (section 8.8).

However, there is a tendency for clinicians to teach in the way they themselves were taught, which may perpetuate any negative clinical culture surrounding pain in animals and non-verbal humans (McKegney, 1989). Like parents who raise their children as they themselves were raised, each generation of clinician pass down what they were taught to the next generation, and the patterns are perpetuated (McKegney, 1989). For example, medical clinical role models have been found to promote negative attitudes towards elderly patients, fuelling the clinical culture that these patients are 'frustrating and not interesting' (Meiboom et al., 2015).

During follow-up interviews students discussed being exposed during clinical placements to aspects of the clinical culture and hidden curriculum which promote a more negative attitude towards patient pain (Table 8.1). For students who already hold less helpful attitudes to pain, these experiences may reinforce those attitudes. Results from this study suggest that the hidden curriculum often conveyed messages which were not *patient beneficial* in term of attitude to pain in animals and non-verbal humans (section 8.6). This combined with lack of education when it comes to non-verbal human assessment of pain, e.g. (Saroyan et al., 2008) (section 2.15), may have a particularly negative effect on vulnerable non-verbal human patients as they rely heavily on clinicians having an appreciation of the potential for pain.

Previous publications have identified common misconceptions amongst medical clinical staff which contribute to the clinical culture and hidden curriculum – for example a major misconception is that patients exaggerate their pain (Simpson et al., 2002, Favaloro and Touzel, 1990). Michelec *et al.* has suggested that the medical hidden curriculum encourages mistrust of lay people, and distancing from patients/ colleagues as desirable qualities in medical professionals (Michalec, 2012). A very recent publication on the hidden curriculum in medical training found that medical students faced increasing numbers of examples against patient-centeredness (Alimoglu et al., 2019). These findings concur with the accounts of the final year medical students who all expressed the view that patient exaggerate the levels of pain they are experiencing (section 7.11) (Table 8.1). How this mistrust of patient pain would manifest itself when dealing with non-verbal patient is unclear. Misconceptions about pain are also present in veterinary hidden curriculum. Anecdotally many veterinary students on clinical placements have been told ‘injecting local anaesthetic hurts more than a sharp scalpel’ or ‘greyhounds are just wimps’, although no published evidence exists to verify the extend of the hidden curriculum in veterinary education.

A potentially important future research stream would be to investigate the impact of the hidden curriculum on attitude to pain in non-verbal humans (see

section 8.8). Future research should also investigate the effects of the hidden curriculum on attitude to pain, particularly whether it affects attitude to pain in different species in differing ways (see section 8.9).

Strongly held attitudes are known to persist over time, be resistant to change and likely to predict future behaviour (Krosnick and Petty, 1995, Darlow et al., 2012). This combined with the theory that susceptibility to attitude change drops precipitously by mid-twenties (Krosnick and Alwin, 1989), makes it essential that students with less helpful attitudes to change are exposed to positive pain role models within the clinical setting at an early opportunity (section 8.8.2). Understanding the content and context of the current hidden curriculum in relation to pain in animals and non-verbal humans is an important next step to working towards developing a way to harness the hidden curriculum (see section 8.8).

Another type of learning identified as a potential influence on student's attitude to pain in animals and non-verbal humans was experiential learning. The student characteristics theme identified from the qualitative analysis of the interview data (section 5.7) included codes about students own previous experience of pain as an influence on attitude to pain and students 'experience of a minor procedures' appeared in the best-fit models as an explanation of how students rated *EP* in animals and non-verbal humans, although these were not statistically significant (Table 8.1). As both the quantitative and qualitative results indicate that student's prior experience of pain influences attitude towards pain, this strengthens the evidence that real-life learning experiences (experiential learning) are valuable when constructing attitudes to pain. Future work should investigate how experiential learning can be harnessed to promote *patient beneficial* attitudes to pain (see section 8.8.2).

Characteristics linked to the observer, such as student gender and age (Table 8.1, section 8.4) appeared to influence how students scored *EP*. In addition, the student's own understanding of communications and their perception of

improved competency as they progressed through training were identified from the analysis of the qualitative data as influencing factors on their attitude to pain in animals and non-verbal humans (Table 8.1). Many of these observer characteristics are static and unable to be influenced by educational interventions, for example age. However, knowledge of student characteristics which are linked to having *patient adverse* attitudes to pain in animals and non-verbal humans may enable innovative teaching methods in the future. With the increased use of electronic teaching methods could students likely to have *patient adverse* attitudes to pain receive educational interventions aimed to promote more *patient beneficial* attitudes to pain in animals and non-verbal humans? This route of future educational development would require collaboration with those in charge of curricula and software developers.

8.7 Limitations

Before considering future studies/work and directions there were a number of limitations of the study in terms of methods adopted and results obtained. These are likely to have impacted on the results, but have also raised additional questions and provided information on how possible future studies could explore these.

8.7.1 Response rates and attrition

There is a possibility that students who were already interested in pain were more motivated to complete the questionnaire, thereby biasing the results. The completion rate for the first year *EP* questionnaire were particularly good in the veterinary students (>85%), but less so in medical students (7.2%-45.3%) [section 4.5]. Student engagement reduced as the students progressed through training, resulting in the poorest response rate for the final questionnaire (3-8%). The lack of student engagement resulting in poor completion of *EP* questionnaires in 3rd and final year is a limitation, which requires further investigation (section 8.8.1).

The effect of participant loss is debated, with authors suggesting that participant loss greater than 20% poses a serious threat to study validity and

can cause bias within the data as non-responder can have different attributes to responders (Brilleman et al., 2010, Cameron et al., 2017, Ng et al., 2016). Although others claim attrition rarely effects estimates of association (Saiepour et al., 2019). Attrition rates for veterinary and medical students was high and largely due to students not responding to requests to complete follow-up questionnaires. Attrition rates for longitudinal studies are reported to be between 30-70% (Gustavson et al., 2012). Over 90% of veterinary and medical students who completed the initial *EP* questionnaire on entering University failed to complete the *EP* questionnaire in their final year of training.

As the attrition rate was higher than previously reported (Gustavson et al., 2012), efforts were made to improve completion rates for the students in final year. However, ethical approval restricted the number of times veterinary and medical students could be contacted with requests for follow-up data collection. Non-responding students received up to three reminder emails to their university registered email address and a reminder message was placed on the electronic year forum for veterinary and medical students. Some authors have suggested using SMS messages to improve participation rates could be affected, although recent work indicates this is also ineffective (Keding et al., 2016). Future work should investigate ways to maximize veterinary and medical student's engagement (see section 8.8.1).

Similarly there was a loss of participants who took part in the qualitative interviews. The number of initial interviewees was restricted to eight participants to ensure the feasibility of conducting, transcribing and analysing all the interview data. Unfortunately two students declined to be re-interviewed in final year which reduced the number of interviewees to six. A decision was made not to replace the two students who declined to be interviewed as the aim was to determine whether the students perceived a *change* in what influenced their own attitude to pain in animals and non-verbal humans during training. Hence the addition of two new interviewees would not have contributed to this aim.

8.7.2 Data collection

i. Likert-type measures

The Likert-type scale, was developed in the 1930's by Rensis Likert (Likert, 1932) and has since become ubiquitous in psychology research. The *EP* attitudinal measure and the Empathy Quotient measure are direct measures of attitude using Likert-type questions. The Empathy Quotient is well known and has been published extensively (Lawrence et al., 2004, Preti et al., 2011, Sreehari et al., 2016, Wakabayashi et al., 2006, Wheelwright et al., 2006, Auyeung et al., 2009, Baron-Cohen and Wheelwright, 2004, Berthoz et al., 2008, Chapman et al., 2006, Kim and Lee, 2010) There was no previously published attitude measure designed to assess attitude to pain in animals and non-verbal humans, so the attitude measure (*Expectation of Pain (EP)* questionnaire) was constructed using Likert-type questions, specifically to determine the attitude of veterinary and medical students towards pain in animals and non-verbal humans.

Attitude is a complex and multi-dimensional construct which is difficult to measure accurately (section 2.7). In addition, attitude doesn't necessarily predict behaviour. Whether attitudes does predict behaviour depends on a number of factors including attitude function, attitude strength, the person and the situation (Albarracin and Shavitt, 2018), but in university students the relationship between attitude and behaviour is weaker than in non-students (Kraus, 1995), although it is unclear why this is.

The link between attitude and behaviour has been discussed and studied in the field of psychology, the breadth and depth of which was beyond the scope of this thesis (Eagley et al., 1993, Henerson et al., 1987, Oppenheim, 2005). As such, for the purpose of this thesis it was assumed that student attitude towards pain would be an indicator of future clinical behaviour in the context of pain management in animals and non-verbal humans (Ali and Thomson, 2009, Hellyer et al., 1999, Mathew et al., 2011, Polkki et al., 2010, Ung et al., 2016).

During initial development of the *EP* scale it was decided to use an ascending scale with a lower anchor point (0=unable to experience pain) and an upper

anchor point (4=equivalent pain experience to typical adult human). However, after initial pilot questionnaire testing, feedback from test volunteers indicated that for some animal species and non-verbal humans respondents may opt to score more than 4, therefore additional points on the scale were added (5,6 & 7), with a new upper anchor point (7 = much greater pain experience than typical adult human). The addition of the points and widening of the scale would have increased the variance within the students' scores. Previous research has found that a five-point scale appears to be less confusing and to appear to increase response rate (Dawes, 2008). There is the possibility that student responses would have been different and/or attrition rates lower (see section 8.8.1) had the scale remained a 5-point scale (0-4).

Despite its widespread use, Likert-type scales do have inherent limitations. For example, it has been shown that scoring on a Likert-type scale is influenced by the direction of negative to positive options, that is whether the options are negative to positive moving towards the right, or towards the left (Nicholls et al., 2006). The direction of the numerical increase for the *EP* was from left-right, which may have influenced how students rated *EP* using the scale in an unknown way. Previous research has shown that when using Likert-type scales which have an anchor point in the middle the resultant ratings tend to be higher overall and the middle options are preferred to those on the outside (Hartley and Betts, 2008). The *EP* scale devised for this study attempted to avoid some of the labelling pit falls by providing a numerical scale and text descriptions of the lower, mid-point and upper options.

A criticism of direct measures of attitude which use Likert-type questions, is that respondents tend to misrepresent their responses, in order to present themselves in a favourable way to peers (Paulhus and John, 1998). There is the potential for student's individual responses to not reflect their own opinion, but instead an opinion they perceive to present themselves in a positive manner to their peers – although there is no evidence to support this occurs specifically in veterinary or medical students. It was assumed that allowing the students to complete the questionnaire in private would avoid this phenomena,

so the 3rd year and final year questionnaires were distributed electronically which enabled students to complete the questionnaire in private.

ii. Empathy measurement tool

The Empathy Quotient is a general measure of empathy that was originally developed for use in diagnosing autism and high functioning Asperger's (Baron-Cohen and Wheelwright, 2004) (section 3.7.1), and uses Likert-type questions to quantify empathy. Some researchers doubt whether a general measure of empathy is sensitive enough to pain specific empathetic responses to quantify the specific component of empathy which relate to the reaction to observing pain in others (Craig et al., 2010, Danziger et al., 2006, Goubert et al., 2005). An Empathy for Pain Scale (EPS) was developed to more accurately quantify the component of the empathy construct which is pain-context specific (Giummarra et al., 2014).

Unfortunately at the time of selecting an appropriate empathy measurement tool (2013) the Empathy for Pain scale had not been published (Giummarra et al., 2014). So after seeking external advice from a researcher with experience in the field (Paul, 2000) the decision was made to use the Empathy Quotient. In hindsight, the choice of the Empathy Quotient instead of the EPS may have masked any potential relationship between the components of empathy involved in pain and how student scored pain for the patients in the videos.

Although this study has not identified a strong relationship between general empathy and attitude to pain in animals and non-verbal humans, it could be argued that a gap in knowledge still exists with respect to whether there is a relationship between the pain-context specific component of empathy and attitude to pain in animals and non-verbal humans (see section 8.8.1). Although the quantitative data did not provide evidence of a relationship between student empathy and attitude to pain, the qualitative data identified empathy as an influencing factor on student attitude to pain (section 8.6). The discrepancy between quantitative and qualitative findings relating to empathy may highlight the differences between these research methodologies (section 3.3). As empathy is a concept which is difficult to isolate (section 2.13),

especially in terms of the particular component of the construct involved in pain, qualitative methods may be able to tease out any influence on attitude to pain in animals and non-verbal humans that the blunt quantitative methods would obscure (see section 8.8.2).

iii. Pain scoring tool

There are many pain assessment tools for use in animals and non-verbal humans (Table 3-7). All these assessment tools are designed to be used on real animal or human patients, and often include domains that require interaction with the animal or human patient. For example, the consolability domain of the FLACC scoring system requires an assessment of whether the patient responded to consoling (Merkel et al., 1997). As an element of the study required students to assess pain in animals and non-verbal humans depicted in video footage, the choice of an assessment tool designed for use on patients in real time may have been a limiting factor.

The FLACC assessment tool was chosen as it has been validated in both paediatric human patients and critical ill human patients (Merkel et al., 1997, Voepel-Lewis et al., 2010), and also contained similar domains to those found in animal pain assessment tools (Brondani et al., 2013, Firth and Haldane, 1999, Grandemange et al., 2013, Hellyer et al., 2006c). However, the FLACC assessment tool was not specifically designed for use in animals which may have affected how the students scored pain for the animals depicted in the videos.

Lastly, accurate assessment of moderate pain is more difficult than assessment of severe or mild pain, so there is more interrater variability of pain scores when assessing moderate pain (Ashley et al., 2005). The patients depicted in the videos were not graded in terms of their pain severity, but were reviewed by two experienced specialist veterinary anaesthetists and a medical general practitioner. Based on these opinions the severity of pain depicted in the videos were (least pain to most pain); Cat → *Baby* → *Small dog* → *Infant child* → *Lamb* → *Elderly person*. Data was not analysed to assess accuracy of pain assessment as compared to the expert opinions, therefore it is not

known if student's with greater empathy were more accurately able to assess pain in the animal and non-verbal human patients depicted in the videos.

iv. Analysis of the *EP* attitudinal measure

The *EP* attitudinal measure is a numerical scale (0-7). The specific numerical score students gave in relation to different animal species and non-verbal humans was used to compare scores between groups, but to facilitate further analysis the data collected was dichotomized in two ways; scores below 4, and scores of 4 and above; scores of 0, and scores of 1 and above. The dichotomization allowed identification of students who scored *EP* as *at least* equivalent pain experience to typical adult human, compared to those who scored *less than* equivalent pain to typical adult human; or those who scored *EP* as unable to experience pain compared to all others.

Treating the data in this way facilitated multiple analytical approaches to looking at associations between *EP* scores and students characteristics, but also altered the meaning of the scale by reducing the distinction between numerical scores. Dichotomization of quantitative data is associated with negative consequences including loss of information about individual differences, loss of effect size and power, risk of spurious statistical significance and potential to overlook relationships (MacCallum et al., 2002). There is a risk that dichotomization of the *EP* data may have resulted in loss of variance within scores, thereby obscuring small differences in how students scored *EP*. However, the entirety of the *EP* attitudinal scale of 0 to 7 was used for comparison of scores between veterinary and medical students, and males and females, enabling the individual scores across the entire scale to be considered.

The multivariable general linear model technique used to analyse the *EP* data is a relatively new approach using a genetic algorithm (section 3.10). This technique allows the production and comparison of multiple models, with the algorithm identifying the predictor factors that represent the *best fit* model. This method was adopted as the number of potential predictor factors was large. A potential criticism of using this technique is the risk of 'over-fitting' of

the model due to the multiple predictors and corresponding numbers of respondents. It has been suggested that a minimum of 10-20 respondent outcome variables (*EP* scores) are required per additional predictor variable (Stoltzfus, 2011). Up to 25 predictor variable were included in the models (Figure 3-15), requiring a minimum number of 250-500 respondent outcome variables. There is the potential that greater numbers of respondents to the initially background and *EP* questionnaire would have altered the outcome of the predictor factors included in the best-fit models. Repeating the background and *EP* questionnaire for subsequent entry years to the veterinary and medical undergraduate program would help validate the findings of this study and aid in future research (see section 8.8).

There is the added complexity of cultural influence when analysing the results from Likert-type scales, with people from certain cultures, e.g. North America, favouring the extremes of the scale and others, e.g. Asian backgrounds, favouring the mid-points (Hartley and MacLean, 2006). Fifteen per cent of students originated from North America (section 4.5). To determine if cultural background influenced how students scored *EP* on the Likert-type scale, 'country of origin' was included in the statistical model and did appear to influence how students rated *EP*.

v. Researcher factors

Effective interview technique is a skill which can take years to hone and perfect. Researchers who are experienced in interview technique should be able to encourage flow of conversation without limiting or leading the interviewee (Merriam, 2009). The initial interviews were conducted after limited previous interview experiences. After review of the audio recording it was evident that my inexperience at interview technique had resulted in a degree of rushing the interviewee and not allowing gaps in dialogue within which the interviewee could formulate their thoughts. This may have restricted dialogue by preventing interviewees from articulating their thoughts completely. The interruption of dialogue gaps may also have led the dialogue

in a different direction compared to if interviewees had had time to process their thoughts.

8.8 Future work

8.8.1 Remaining gaps in knowledge

i. Comparison of attitude in 1st year and final year

The number of students who completed the repeat *EP* questionnaire in final year was too low to allow any meaningful comparison with first year *EP* scores. This means that there is still a gap in knowledge as information on how attitudes towards pain in animals and non-verbal humans during undergraduate training is still limited. The methodology of any future study investigating the progression of attitudes throughout training needs careful consideration to maximize data collection from student in the later years of training. The attrition rates for this study were higher than previous published attrition rates for longitudinal studies (section 8.7.1), but it is unclear why students in final year did not engage with *EP* questionnaire.

A first step to improving attrition rates for any questionnaire based studies would be to determine the best data collection methods to engage veterinary and medical students in later years of training. This could be achieved initially by comparing response rates for various data collection methods, for example face-to-face contact and hard copy questionnaires compared to virtual contact and electronic questionnaires.

Potential reasons why students did not engage as they progressed through training, could include stress associated with training, lack of time and over surveying due to multiple requests to complete questionnaires throughout training. The use of qualitative methods to delve more deeply into the motivation of non-responders could aid in understanding why students do not engage and potentially help develop methods to improve response rates in the future.

ii. Patient beneficial attitudes

As there is little observed change in veterinary and medical student attitudes to pain in animals and non-verbal humans between 1st and 3rd year of training (section 7.8), it would be advantageous to study why some students have less *patient beneficial* attitudes to pain in laboratory animals, wildlife species, human paediatrics and critical ill humans when entering University. An exploratory qualitative study may reveal the relative importance of the influencing factors, for example whether animal characteristics, observer characteristics or one of the component of learning (Table 8.1) are most influential on attitudes towards pain in the animals and non-verbal humans that were consistently scored low on *EP*. To achieve this an initial quantitative *EP* attitudinal questionnaire distributed to students on entering University would allow identification of those with less *patient beneficial* attitudes to pain in animals and non-verbal humans. Interviews with these students could then delve more deeply into why students have less *patient beneficial* attitudes.

There was little change in how students rated *EP* in animals and non-verbal humans between 1st and 3rd year, apart from *Rabbit* and *Learning difficulties* where students had slightly less *patient beneficial* attitudes by the time they reached 3rd year of training. Investigating why attitudes changed slightly to become less *patient beneficial* in *Rabbit* and *Learning difficulties* may aid in the understanding of what influences attitudes to pain in animals and non-verbal humans.

A future study could include a curriculum review to specifically identify how the subject of pain is taught in the context of different animal species and non-verbal humans may help identify teaching methods which promote *patient beneficial* attitudes, or conversely those that have a negative effect on attitude to pain in animals and non-verbal humans.

iii. Pain-context specific empathy

Empathy was identified in the qualitative data as influencing attitude to pain in animals and non-verbal humans (section 8.4, Table 8.1), yet there was only a weak relationship between Empathy Quotient scores and how students scored

pain in animals and non-verbal humans depicted in videos and relationship with attitude to pain (sections 6.11, 6.12). There is the potential that the use of the Empathy Quotient measurement tool, which is a general measure of empathy rather than a pain-context specific measure, failed to identify any relationship between student empathy and attitude to pain in animals and non-verbal humans (section 8.8.2).

A future study should use a pain-context specific empathy measurement tool, such as the Empathy for Pain Scale (Giummarra et al., 2014), to investigate whether any relationship exists between the specific pain related component of the empathy construct and attitude to pain in animals and non-verbal humans.

8.8.2 Emergent gaps in knowledge

i. Experiential learning

Attitudes based on direct experience are stronger predictors of subsequent behaviour than attitudes based on indirect experience (Krosnick and Petty, 1995). Hence there is the potential for experiential learning experiences to have a significant impact on attitudes to pain in animals and non-verbal humans and subsequent pain management decision making. In the context of veterinary and medical training experiential learning takes the form of extramural studies or clinical clerkships, where students have the experience of working with real patients in clinical environments.

In this study veterinary and medical student's experiential learning whilst on clinical placements influenced their attitudes to pain in animals and non-verbal humans (Table 8.1). Medical education has had an interest in the impact of experiential learning whilst on clinical clerkships and recognises the benefits of this type of learning (Carraccio et al., 2008, Dhakal et al., 2018, Fry, 2014, McDermott, 2017, Yardley et al., 2012a, Yardley et al., 2012b). In veterinary education extra-mural studies are a valuable tool for preparing veterinary students for clinical practice (Baguley, 2006).

Further research is needed to fully understand how experiential learning influences attitude to pain in animals and non-verbal humans, with the aim to identify ways in which experiential learning can be used to promote *patient beneficial* attitudes. There have been no previous publication investigating how extramural studies effect veterinary student's attitude to pain in animals, or how clinical clerkships effect medical student's attitude to pain in non-verbal humans. A future study could take the form of a qualitative study comparing attitudes to pain in veterinary and medical students before and after experience of clinical experiential learning.

ii. Hidden curriculum

Experiential and observational learning experiences influenced veterinary and medical student's attitude to pain in animals and non-verbal humans whilst on clinical placement (sections 8.6 & 8.7.2, Table 8.1). As much of the teaching that occurs during clinical placements is informal there is little information on what is taught about pain in animals and non-verbal humans in this context and the impact this type of experiential and observational learning has on student attitudes

There are numerous previous publications on the medical hidden curriculum (Alimoglu et al., 2019, Bandini et al., 2017, Damiano et al., 2019, Doja et al., 2016, Draper and Louw, 2007, Gardeshi et al., 2018), but none that have focused on how pain in non-verbal humans is presented to medical student whilst on clinical placements. Whilst there have been two previous publications reporting the hidden curriculum in medical education on chronic pain – one a review of the literature and another qualitative interview based study (Rice et al., 2018, Webster et al., 2017), there have been no studies on the medical hidden curriculum relating to pain in non-verbal humans.

There is less data on the impact of the hidden curriculum in veterinary education compared to medical education (Whitcomb, 2014), and in particular no studies have investigated the hidden curriculum in clinical practice settings which are out with the control of veterinary schools and colleges. Similarly, there have been no studies on the veterinary hidden curriculum and how it

relates to pain in animals. As much of veterinary student's experience of clinical practice occurs in non-university practice settings, it is important that veterinary educators have a better understanding of how clinical culture and hidden curriculum function in these settings, which are outside of the control of those setting the curriculum, and may affect student attitude to pain in animals and non-verbal humans.

A larger qualitative study to assess the current hidden curriculum in terms of animal and non-verbal human pain, within settings involved in veterinary and medical undergraduate clinical teaching would be an essential first step to understanding the impact of the hidden curriculum on attitude to pain in animals and non-verbal humans.

iii. Observational learning and role models

Role models have an important function in influencing attitudes to pain in animals and non-verbal humans (sections 8.4 & 8.6). Veterinary and medical student's experience of role models within the clinical setting is a potential area in which improvements can be made.

Alimoglu *et al.* suggested that deterioration in medical student's attitude towards patient's is because 'observations of wrong role models and misbehaviours lead a perception shift toward less patient centeredness in medical students' minds' (Alimoglu et al., 2019). A possible route to promoting *patient beneficial* attitudes towards pain in animals and non-verbal humans in veterinary and medical students would be to embrace the potential power of role models (section 8.7.2). One method to achieve this may be to make positive pain role models more visible within the clinical team. Identifying staff which exhibit attitudes to pain which are beneficial to patients and improving their visibility within the clinical setting could improve the messages about pain in animals and non-verbal humans which are delivered, and cause a shift in clinical culture towards the *patient beneficial* attitudes.

Future work should aim to identify ways to harness role models as a teaching tool and evaluate the effectiveness of this on changing attitudes towards pain

in animals and non-verbal humans, particularly in those students who entered University with less *patient beneficial* attitudes. A first step to achieving this would be to evaluate the current impact of clinical 'role models' on attitudes to pain in animals and non-verbal humans.

Alimoglu *et al.* used a longitudinal quantitative questionnaire design to evaluate the impact of role models on patient- centered attitudes in medical students (Alimoglu et al., 2019). A starting point therefore would be to use a similar methodology to investigate the impact of role models on veterinary and medical student's attitude to pain in animals and non-verbal humans.

8.9 Conclusion

This study has investigated veterinary and medical students attitudes, and influencers of attitude towards pain in animals and non-verbal humans, at the start of training and as they progressed through training. Students arrived at University with diverse attitudes to pain in animals and non-verbal humans, which varied depending on animal or non-verbal human type.

Student prior experiences and characteristics; observation of animals and people in pain; education; role model attitude and culture were all important influences on the development of student attitude to pain. In addition the hidden curriculum in veterinary and medical education emerged as an influencing factor on student's attitude to pain in animals and non-verbal humans.

Although students discussed empathy as an influence in their attitude development, student empathy, as assessed in the current thesis, was not associated with attitude to pain in animals and non-verbal humans. Student attitudes did not change significantly during training, but differences emerged in how students perceived clinical versus non-clinical learning had influenced their attitudes.

Future work should aim to improve pain management in animals and non-verbal humans, for which there is evidence that current pain management is inadequate. As observational learning, role models and the hidden curriculum are influencing factors on student's attitude to pain in animals and non-verbal humans, it is possible that improvements to the clinical learning environments will be effective at promoting *patient beneficial* attitudes. One potential method would be to introduce clinical role models within the clinical teaching environment who have *patient beneficial* attitudes towards pain management in patients. This may help change aspects of clinical culture which promote less *patient beneficial* attitudes to pain. A greater understanding of the hidden curriculum and role models in relation to veterinary and medical pain teaching, specifically in relation to the impact on attitude towards pain in animals and non-verbal humans is needed and future research should aim to increase understanding in this area.

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Appendix 1

Pain in non-verbal patients 	
1. Unique i.d. 	
2. Are you ☐ Male ☐ Female	
3. How old are you? 	
4. In which Country and County/State is your home address? Country County/ State	
5. What nationality are you? 	
6. Do your parents/ guardians work in the medical (e.g. doctor, nurse, dentist) or veterinary professions? ☐ Medical ☐ Veterinary ☐ N/A	
7. Have you ever kept any of the following animals?	
☐ Dog	☐ Horse
☐ Cat	☐ Sheep
☐ Bird	☐ Cow
☐ Rabbit	☐ Pig
☐ Rodent	☐ Fish
☐ Reptile	☐ Insects
Other (please specify) 	

Pain in non-verbal patients

8. Have you ever worked or helped out at any of the following?

☐ Cattle/ sheep Farm	☐ Pig farm
☐ Veterinary practice	☐ Laboratory (with animals)
☐ Pet shop	☐ Animal rescue centre
☐ Kennels	☐ Wildlife sanctuary
☐ Stables (Horses)	☐ Zoo/ Wildlife park
☐ Cattery	☐ Aquarium
☐ Fish Farm	☐ Chicken/ turkey farm

Other work with animals (please specify)

9. Have you spent time caring for any of the following groups of people?

☐ Babies	☐ People with dementia or other mental impairments
☐ Young children	☐ People with profound communication difficulties
☐ People with profound learning disabilities	☐ N/A

10. Do you have children?

- ☐ Yes
- ☐ No

11. Do you exclude any of the following foods from your diet? if yes please indicate the reason.

	Animal welfare concerns	Ethical reasons	Don't like the taste	Religious reasons	Medical reasons
Chicken	☐	☐	☐	☐	☐
Pork	☐	☐	☐	☐	☐
Beef	☐	☐	☐	☐	☐
Lamb	☐	☐	☐	☐	☐
Milk	☐	☐	☐	☐	☐
Other Dairy	☐	☐	☐	☐	☐
Fish	☐	☐	☐	☐	☐
Eggs	☐	☐	☐	☐	☐

Other (please specify)

12. Have you ever had a minor procedure? For example, skin/ear piercing, tattoo, small wound requiring stitches.

- ☐ Yes
- ☐ No

Pain in non-verbal patients

13. If you answered 'yes' to question 11, on a scale of 1 to 5 how painful did you find the minor procedure?

- ☐ 1 - not painful at all
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5 - Excruciatingly painful

14. Have you ever experienced a major painful event? For example, broken a major bone, major surgery, child-birth, severe burns.

- ☐ Yes
- ☐ No

15. If you answered 'yes' to question 13, on a scale of 1 to 5 how painful did you find the major painful event?

- ☐ 1 - not painful at all
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5 - excruciatingly painful

16. On a scale of 1 to 5, how high a pain-threshold do you think you have?

- ☐ 1- I cannot tolerate any pain
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5 - I can tolerate pain that others would find unbearable

Pain in non-verbal patients

17. Compared to an adult human, rate the following species on their ability to experience pain. 0 = Unable to experience pain, 4 = experiences the same pain as an adult human, 7= experiences much greater pain than an adult human.

	(No pain) 0	1	2	3	(= Adult human) 4	5	6	(Much greater pain) 7
Dog	☐	☐	☐	☐	☐	☐	☐	☐
Cat	☐	☐	☐	☐	☐	☐	☐	☐
Rabbit	☐	☐	☐	☐	☐	☐	☐	☐
Chimpanzee	☐	☐	☐	☐	☐	☐	☐	☐
Rat	☐	☐	☐	☐	☐	☐	☐	☐
Frog	☐	☐	☐	☐	☐	☐	☐	☐
Fish	☐	☐	☐	☐	☐	☐	☐	☐
Bird	☐	☐	☐	☐	☐	☐	☐	☐
Horse	☐	☐	☐	☐	☐	☐	☐	☐
Pig	☐	☐	☐	☐	☐	☐	☐	☐
Cow	☐	☐	☐	☐	☐	☐	☐	☐
Sheep	☐	☐	☐	☐	☐	☐	☐	☐
Insect	☐	☐	☐	☐	☐	☐	☐	☐
Snake	☐	☐	☐	☐	☐	☐	☐	☐

Pain in non-verbal patients

18. Compared to an adult human, rate the following groups of people on their ability to experience pain. 0 = unable to experience pain, 4 = experiences the same pain as an adult human, 7= experiences much greater pain than an adult human.

	(No pain) 0	1	2	3	(= Adult human) 4	5	6	(Much greater pain) 7
Unborn child in last 3 months of pregnancy	☐	☐	☐	☐	☐	☐	☐	☐
Newborn baby	☐	☐	☐	☐	☐	☐	☐	☐
Pre-school child	☐	☐	☐	☐	☐	☐	☐	☐
School aged child	☐	☐	☐	☐	☐	☐	☐	☐
Elderly person	☐	☐	☐	☐	☐	☐	☐	☐
Person with dementia or other mental impairment	☐	☐	☐	☐	☐	☐	☐	☐
Person in a coma	☐	☐	☐	☐	☐	☐	☐	☐
Person with profound learning disabilities	☐	☐	☐	☐	☐	☐	☐	☐
Anaesthetized person	☐	☐	☐	☐	☐	☐	☐	☐

19. Have you changed any of your answers to Question 16 after reading Question 17?

☐ Yes

☐ No

20. Would you be willing to participate in on-going research on attitudes to pain in non-verbal patients?

Participation would involve one yearly questionnaire and possibly yearly group discussions and/or individual discussions.

☐ Yes

☐ No

21. If willing to participate in on-going research, please leave your contact information below.

Name

sms number

University email address

Appendix 2

Pain in non-verbal humans and animals

Page 1

This questionnaire follows on from previous questionnaires you may have completed in your 1st and 3rd year of training. We are interested in attitudes towards pain in non-verbal humans and animals. Completing the questionnaire is voluntary. All data will be treated as confidential and will be anonymized before analysis. The questionnaire can also be completed online by going to the following link

<https://edinburgh.onlinesurveys.ac.uk/pain1>

What gender do you identify with? * *Required*

- ☐ Male ☐ Female ☐ Rather not answer
☐ other

What is your date of birth?

What degree course are you studying?

- ☐ Medical undergraduate (MBChB) ☐ Veterinary undergraduate (BVM&S)

Which year of study are you in?

- ☐ Third year ☐ Fourth year ☐ Fifth year
☐ Sixth year ☐ Other

If you selected Other, please specify:

What is your University of Edinburgh student number? This will be used to link responses to this questionnaire with previous questionnaire data. Providing this information is optional.

Compared to the average adult human rate the following on their ability to experience pain. Where, 0 = unable to experience pain; 4 = experiences similar pain to that of an adult human; 7 = experiences much greater pain than an adult human is capable of experiencing.

Please don't select more than 1 answer(s) per row.

	0 (No pain)	1	2	3	4 (Equivalent to average adult human)	5	6	7 (Much greater pain)
Dog	☐	☐	☐	☐	☐	☐	☐	☐
Premature baby (<35weeks, where full term = 40 weeks)	☐	☐	☐	☐	☐	☐	☐	☐
Unborn human in last trimester (29 - 40 weeks)	☐	☐	☐	☐	☐	☐	☐	☐
Newborn human baby (Full term)	☐	☐	☐	☐	☐	☐	☐	☐
Cat	☐	☐	☐	☐	☐	☐	☐	☐
Rabbit	☐	☐	☐	☐	☐	☐	☐	☐
Chimpanzee	☐	☐	☐	☐	☐	☐	☐	☐
Rat	☐	☐	☐	☐	☐	☐	☐	☐
Frog	☐	☐	☐	☐	☐	☐	☐	☐

Fish	☐	☐	☐	☐	☐	☐	☐	☐
Bird	☐	☐	☐	☐	☐	☐	☐	☐
Elderly person (>75 years)	☐	☐	☐	☐	☐	☐	☐	☐

Compared to the average adult human rate the following on their ability to experience pain. Where, 0 = unable to experience pain; 4 = experiences similar pain to that of an adult human; 7 = experiences much greater pain than an adult human is capable of experiencing.

Please don't select more than 1 answer(s) per row.

	0 (No pain)	1	2	3	4 (Equivalent to average adult human)	5	6	7 (Much greater pain)
Person with dementia	☐	☐	☐	☐	☐	☐	☐	☐
Person in coma	☐	☐	☐	☐	☐	☐	☐	☐
Person with profound learning difficulties	☐	☐	☐	☐	☐	☐	☐	☐
Horse	☐	☐	☐	☐	☐	☐	☐	☐
Pig	☐	☐	☐	☐	☐	☐	☐	☐
Cow	☐	☐	☐	☐	☐	☐	☐	☐
Sheep	☐	☐	☐	☐	☐	☐	☐	☐
Snake	☐	☐	☐	☐	☐	☐	☐	☐
Person under general anaesthesia	☐	☐	☐	☐	☐	☐	☐	☐

Appendix 3

Patient_PainScore_PaperVersion_3rd year

Page 1

This questionnaire follows on from previous questionnaires you may have completed in your 1st of training. We are interested in attitudes towards pain in non-verbal humans and animals. Completing the questionnaire is voluntary. All data will be treated as confidential and will be anonymized before analysis. The questionnaire can also be completed online by going to the following link

<https://edinburgh.onlinesurveys.ac.uk/pain1>

What gender do you identify with? * *Required*

- ☐ Male ☐ Female ☐ Rather not answer
☐ other

What is your date of birth?

What degree course are you studying?

- ☐ Medical undergraduate (MBChB) ☐ Veterinary undergraduate (BVM&S)

Which year of study are you in?

- ☐ Third year ☐ Fourth year ☐ Fifth year
☐ Sixth year ☐ Other

If you selected Other, please specify:

What is your University of Edinburgh student number? This will be used to link responses to this questionnaire with previous questionnaire data. Providing this information is optional.

Compared to the average adult human rate the following on their ability to experience pain. Where, 0 = unable to experience pain; 4 = experiences similar pain to that of an adult human; 7 = experiences much greater pain than an adult human is capable of experiencing.

Please don't select more than 1 answer(s) per row.

	0 (No pain)	1	2	3	4 (Equivalent to average adult human)	5	6	7 (Much greater pain)
Dog	☐	☐	☐	☐	☐	☐	☐	☐
Premature baby (<35weeks, where full term = 40 weeks)	☐	☐	☐	☐	☐	☐	☐	☐
Unborn human in last trimester (29 - 40 weeks)	☐	☐	☐	☐	☐	☐	☐	☐
Newborn human baby (Full term)	☐	☐	☐	☐	☐	☐	☐	☐
Cat	☐	☐	☐	☐	☐	☐	☐	☐
Rabbit	☐	☐	☐	☐	☐	☐	☐	☐
Chimpanzee	☐	☐	☐	☐	☐	☐	☐	☐
Rat	☐	☐	☐	☐	☐	☐	☐	☐
Frog	☐	☐	☐	☐	☐	☐	☐	☐

Fish	☐	☐	☐	☐	☐	☐	☐	☐
Bird	☐	☐	☐	☐	☐	☐	☐	☐
Elderly person (>75 years)	☐	☐	☐	☐	☐	☐	☐	☐

Compared to the average adult human rate the following on their ability to experience pain. Where, 0 = unable to experience pain; 4 = experiences similar pain to that of an adult human; 7 = experiences much greater pain than an adult human is capable of experiencing.

Please don't select more than 1 answer(s) per row.

	0 (No pain)	1	2	3	4 (Equivalent to average adult human)	5	6	7 (Much greater pain)
Person with dementia	☐	☐	☐	☐	☐	☐	☐	☐
Person in coma	☐	☐	☐	☐	☐	☐	☐	☐
Person with profound learning difficulties	☐	☐	☐	☐	☐	☐	☐	☐
Horse	☐	☐	☐	☐	☐	☐	☐	☐
Pig	☐	☐	☐	☐	☐	☐	☐	☐
Cow	☐	☐	☐	☐	☐	☐	☐	☐
Sheep	☐	☐	☐	☐	☐	☐	☐	☐
Snake	☐	☐	☐	☐	☐	☐	☐	☐
Person under general anaesthesia	☐	☐	☐	☐	☐	☐	☐	☐

Appendix 4

G2018. Empathy. Patient type. Autumn 2015

The following survey is aimed at undergraduate medical and veterinary students at Edinburgh University. The data will be used to investigate how training affects your perception of pain in humans and animals. The survey should take approximately 15 minutes to complete and all data gathered will be kept confidential.

* 1. What gender are you?

☐ Male

☐ Female

* 2. What age are you?

* 3. What degree course are you studying?

☐ Medical undergraduate degree (MBChB)

☐ Veterinary undergraduate degree (BVM&S)

Other (please specify)

* 4. Which year of study are you in?

☐ First year

☐ Fourth year

☐ Second year

☐ Fifth year

☐ Third year

☐ Intercalated year

Other (please specify)

G2018. Empathy. Patient type. Autumn 2015

Below is a list of statements. Read each statement carefully and rate how strongly you agree or disagree with it by clicking on your answer. There are no right or wrong answers. Please give an answer to ALL the statements.

1. I can easily tell if someone else wants to enter a conversation.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

2. I prefer animals to humans.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

3. I try to keep up with current trends and fashions.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

4. I find it difficult to explain to other people things that I understand easily, when they don't understand it first time.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

5. I dream most nights.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

6. I really enjoy caring for other people.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

7. I try to solve my own problems rather than discussing them with others.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

8. I find it hard to know what to do in a social situation.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

9. I am at my best first thing in the morning.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

10. People often tell me that I went too far in driving my point home in a discussion.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

11. It doesn't bother me too much if I am late meeting a friend.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

12. Friendships and relationships are just too difficult, so I tend not to bother with them.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

13. I would never break the law, no matter how minor.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

14. I often find it difficult to judge if something is rude or polite.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

15. In a conversation, I tend to focus on my own thoughts rather than what the listener might be thinking.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

16. I prefer practical jokes to verbal humor.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

17. I live for today rather than the future.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

18. When I was a child, I enjoyed cutting up worms to see what would happen.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

19. I can pick up quickly if someone says one thing but means another.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

20. I tend to have very strong opinions about morality.

- ☐ Strongly agree
- ☐ Slightly agree
- ☐ Slightly disagree
- ☐ Strongly disagree

Appendix 5

18/05/2019



Student Perceptions of Pain in non-verbal patients

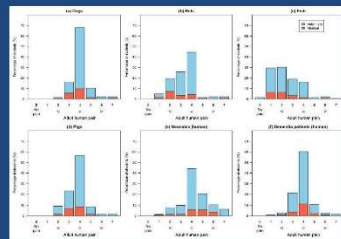
Juliet Duncan, Dr Darren Shaw & Prof Eddie Clutton
Royal (Dick) School of Veterinary Studies
Edinburgh University

Michael Ross
Centre for Medical Education, Little France
Edinburgh University

What is the project about?

- Six year study on students perception of pain
- What influences perceptions?
- How perceptions change during training?
- Background survey in first year
- Qualitative interviews in second year
- Follow up survey

Background survey in 1st year



Follow up survey

The survey can be found at:

<https://www.surveymonkey.com/s/pain-human-animal>

To complete the survey you will need to watch the video clips on the accompanying storyline power point.

The link for the storyline power point is below. You will be asked to log in to your EASE account before you can access the storyline power point

www.apps.vet.ed.ac.uk/web/ease/pain-human-animal-patients/story.html

Contact details

Juliet.Duncan@ed.ac.uk

Room 157
Large Animal Hospital
Easter Bush Campus
Tel: 0131 650 8806

Thank you for your participation

Appendix 6



Veterinary and medical undergraduate student attitudes towards pain in non-verbal subjects

Information for Participants

You are being invited to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please read the following information carefully, and feel free to contact me (details below) with any questions or if you wish to discuss further.

What is the purpose of the study?

The aim of this study is to gain an understanding of what undergraduate veterinary and medical students think about pain in animals and non-verbal humans. We hope this will help us improve future teaching in this important area.

What will it involve?

You are being asked to participate in one-to-one interviews in the first semester of your second year of study and again in your final year of study. Each interview will last around 40 minutes at a time and location convenient to you. I am happy to come to any University of Edinburgh campus location and will provide refreshments (coffee and biscuits, sandwich lunch etc – depending on your preference and the time of day). The interview will be structured around a number of broad questions relating to pain in animals and non-verbal humans, and will be audio recorded and transcribed. You will be sent a copy of the transcription afterwards.

What is in it for me?

In addition to refreshments and an opportunity to participate in research which will influence undergraduate training, you will get:

- **An opportunity to reflect upon and discuss your views on pain**
- **A full typed interview transcript which you can upload to your ePortfolio**
- **A certificate of participation which you can upload to your ePortfolio**
- **A full report on completion of the study**

Ethical issues

Written approval for the study has been obtained from the College Committee for the Ethical Use of Students in Research. Any responses you give will be treated in strictest confidence. Recordings and transcripts will be stored securely and all analyses or direct quotes will be anonymous.

Contact details

If you are happy to be involved in this research or have any further questions please contact me,

Email:
Office number: **0131 650 8806**

Juliet Duncan
Large Animal Hospital
Royal (Dick) School of Veterinary Studies
Easter Bush Campus

Appendix 7

Certificate of Participation in Research

This is to certify that

.....

has taken part in research on 'Veterinary and Medical Undergraduate
Student Attitudes Towards Pain in Non-verbal Subjects'

Date 07/10/2013

Signature Juliet Duncan
BVM&S MSc DipECVAA MRCVS



centre for
medical
education

THE ROYAL
(DICK) SCHOOL
OF VETERINARY
STUDIES




Appendix 8



INTERVIEW CONSENT FORM
THE UNIVERSITY OF EDINBURGH
ROYAL (DICK) SCHOOL OF VETERINARY STUDIES
&
CENTRE FOR MEDICAL EDUCATION

Project Title: Veterinary & Medical undergraduate attitudes to pain in non-verbal subjects.

Date and time: _____

Researcher: _____

Participant name: _____

& Contact details: _____

1. I agree to participate in an interview undertaken by The University of Edinburgh Royal (Dick) School of Veterinary Studies & Centre for Medical Education and their research collaborators.
2. I have been given a full explanation of the nature, purpose and likely duration of the interview and have been given the opportunity to ask questions about these.
3. I have been assured that my participation is entirely voluntary and I understand that I am free to withdraw my participation at any time without needing to justify my decision. I can also ask afterwards for specific comments not to be used in the research.
4. I do not in any way feel pressured into participating in this research, and will try to respond openly and honestly to questions.
5. I understand that notes will be taken and the interview / focus group will be audio-recorded and transcribed. These will be treated in strictest confidence and will only be accessible to the research team. They will be destroyed when no longer required for the research.
6. I understand that anonymous data from this interview may be published as research findings, including anonymised quotes, in journal articles, book chapters, on the world wide web or in a thesis / dissertation. I am aware that I can see any such material before publication upon request.

Signed by the Participant: _____

Date: _____

Appendix 9

General interview guide [follow up interviews semester autumn 2016/spring 2017]

Preparation

1. *The purpose of this conversation (interview?) is to follow up on the interview you did in autumn 2013 on pain in non-verbal patients. I am interested in your thoughts about pain in both animals and non-verbal humans and how you think medical/veterinary school may have influenced you.*
2. *I am going to record our conversation today and make notes. Any audio or written data will be kept confidentially and anonymously.*
3. *I may ask you some general questions to get the conversation started, but feel free to elaborate your answers as much as you like. If you can think of anything interesting about your attitude to pain or the teaching of the subject at University please talk about this.*
4. *I estimate the interview will be between 40-60 minutes.*
5. *Any questions before we start?*

General questions to relax interviewee e.g.

- Have you enjoyed your time at University so far?
- What discipline/type of practice would you like to work in?
- Has medical/veterinary school fulfilled your expectations?

NB. Remember research question

"How does attitude to pain in non-verbal subjects change during undergraduate training?"

Question	Prompt
Have you seen people (non-verbal)/animals in pain?	Tell me about it. How did you feel? Why did you feel that?
Do you think your attitude has changed since starting Uni?	How? Why? Can you pinpoint cause of change? Previous transcript – discuss?
What has influenced/ changed your attitude to pain?	Positive influences? Negative influences?
Do you feel you're well prepared for seeing clinical cases (non-verbal) in pain?	Why? How could you be better prepared? What could be improved in training? What did you find useful?

Appendix 10

Pain interviews Autumn 2013 (Students stating Autumn 2012; graduating Summer 2017)

Name: Date: Time: Location:

Interview schedule

1. Go through confidentiality
2. Explain reason for interview
3. Topics & questions

Topics/ questions	Question prompts
Q. Can you tell me about your experience with animals? Q. Have you experience of people that are less able to communicate e.g. children? elderly? Etc.	1. Did you grow up in the countryside? Town? suburbs? 2. Did you keep any animals? If so, what 3. Have you any experience of working with animals? 4. Have you worked with/cared for children, elderly etc.? 5. Which area of medicine/ veterinary would you like to pursue?
Q. What is your experience of pain yourself/ in other people / animals?	1. Have you previously experienced pain? Describe.... 2. Have you seen another person in pain? 3. What is your attitude towards pain in other people? 4. Did any of your own animals have a painful experience which you remember? Describe... 5. Did you see any animals in pain whilst working with them? (if applicable) 6. What is your experience of pain relief?
Q. Some people believe that not all animals and people are capable of experiencing the same degree of pain. What do you think?	1. Do you think animals can experience pain? How do you know? 2. Do you think all animals are able to experience equal amounts of pain? What about different classes e.g. fish, insects, birds What about production animals, e.g. cattle, sheep, pigs 3. Do you think all humans are able to experience equal amounts of pain? E.g. males vs females 4. Do you think that age affects how much pain you can experience?

Pain interviews Autumn 2013 (Students stating Autumn 2012; graduating Summer 2017)

Q. Can you see any benefits of pain?	
Q. What do you think has influenced your views on pain?	1. What did you learn about pain in school/ college? 2. Apart from an academic setting, have you learnt about pain from anywhere else? Media, own experience, culture 3. Did the culture you grew up in have particular attitudes to pain in animals? In people? 4. How did your family influence your attitude to pain?
Q. Do you think the purpose of an animal has any bearing on whether we perceive it is in pain? For example production animals?	
Q. Do you think anyone else in your year would have different views to you? Q. Do you have any thoughts or comments on this interview?	