CHAPTER 1: INTRODUCTION

**Background and Rationale**

The attitudes that veterinary students develop during their education are paramount to how they will interact with and treat the animals that will receive their care when they work in the profession. Assessing these attitudes during their educational careers enables the identification of areas where improvements could be made.

In Israel, there is only one veterinary school. Since its founding in 1985, there has been no academic research conducted among its students examining their attitudes on animal-related issues or the students’ mental wellbeing during their studies. This stands in stark contrast to medical students preparing to be physicians for humans, who have been the subject of many studies in Israel and around the world.

Recently, there has been an increase in scientific research on animal welfare, due to ethical concerns (Fraser et al., 1997; Main et al., 2005; Siegford et al., 2005). The public increasingly turns to scientific sources for guidance on the concerns raised about animals’ quality of life. International professional organizations of veterinarians, who are policymakers on these issues, recently updated their position (source) and stated that veterinarians have an obligation to be primary activists for the promotion of animal welfare (Endenburg et al., 2020). This shift has taken place in the context of a changing academic, professional, and social reality. In the past fifteen years, following recommendations from international institutions on veterinary education, courses dedicated to the subject of animal welfare have been introduced into the curricula of veterinary schools in many developed countries. In some schools, these courses are compulsory.

There have been few longitudinal studies that examine how students in veterinary schools perceive animals’ mental and emotional capabilities. In particular, little attention has been given to their attitudes regarding farm animals versus companion animals. Similarly, only a small number of studies have addressed the ethical dilemmas faced by medical students during the year of their clinical training, or the impact of these dilemmas on students' stress levels, although previous research has linked university students’ high levels of stress with depression, anxiety, decreased self-esteem, impaired quality of life, and other negative effects.

The current research is designed to examine these issues quantitatively, longitudinally, and laterally. The research processes are designed to assess the knowledge and attitudes of Israeli veterinary students regarding issues related to animal welfare. Further, the findings may indicate areas in which a change or adaptation of information transmitted to this population is necessary, given their distinctive nature and location in the Middle East. In this way, I hope to make an innovative and enriching contribution to the field of veterinary education in Israel.

**Research Goals and Questions**

There is no existing data on Israeli veterinary students’ attitudes towards their chosen profession or towards animal welfare in specific. Nor is there any data on their mental wellbeing or the ethical dilemmas they experience during their studies, and specifically in the clinical training year (the fourth year of their studies). To address this gap, I will focus on the following research questions.

1. What are the attitudes held by veterinary students in Israel on issues of animal welfare? Do these attitudes change during the years of study at the veterinary school, and if so, how?
2. What are the interrelationships between students' background characteristics (gender, marital status, previous academic studies, area of residence, religious beliefs, past experiences with animals, nutrition) and their attitudes on issues of animal welfare?
3. How do students perceive their mental wellbeing during their studies at veterinary school? How, and in what directions, do these perceptions change throughout the years of their studies?
4. What ethical dilemmas do students encounter during the clinical year of study? What are the interrelationships between these ethical dilemmas and students’ mental/emotional state?

LITERATURE REVIEW

In this literature review, I explore previous research in the following areas:

**Background Data on Veterinary Students around the World and in Israel**

The veterinary profession in most developed countries is undergoing significant change. One of the most notable changes is the greater representation of females in this profession (Allen, 2016; Sans et al., 2011). In the US and UK, veterinary medicine was traditionally dominated by men, but currently women make up about 80% of veterinary students. In EU countries, 82% of veterinarians under the age of 30 are women (FVE, 2019) and in Australia the figures are similar (AAVMC, 2018; Brown and Silverman, 1999; RCVS, 2015). The population of veterinarians in most developed countries is characterized by ethnic and cultural homogeneity (Elmore, 2003; Greenhill et al., 2007). The socio-demographic profile of students is predominantly white, middle-class children of parents with higher-than-average education (Heath, 1997; Sans et al., 2011; Tomlin et al., 2010). The average age of applicants for veterinary studies in the US is on the rise and currently stands at 25 (Kerr, 1995). In Europe and the UK, the average age of entry into veterinary studies is 19-22 (Andrews, 2009; Sans et al., 2011).

In Israel, the ratio between male and female students has changed from 80:20 in favor of males in 1985 (at the time of the establishment of the school), to 20:80 in favor of females by 2006. The average age of Israeli veterinary students is 26, which is somewhat older than in many other countries. The reasons for this are military service, the traditional long travels following military service, and the requirement to complete undergraduate studies prior to being admitted to veterinary school. Therefore, upon entering veterinary school, Israeli students tend to be older than their peers in the United States and Europe. Many of them are married and some have children (Shahar and Bark, 2006). They have high expectations for the veterinary school. Most veterinary students are characterized as highly accomplished, competitive, motivated, goal-oriented, and determined, with above-average academic achievement (Brown and Silverman, 1999; Kerr, 1995; Zenner et al., 2005).

**1.1 Motivations for choosing a profession**

The leading motivations for choosing veterinary studies are the desire to work with animals, interest in the profession, and fondness for animals (Dally and Erickson, 2012; Serpell, 2005; Sprecher, 2004; Tomlin et al., 2010). For many students, the decision to study veterinary medicine is made at a young age (8-12), influenced by their attitudes towards animals (Amass et al., 2011; Fraser et al., 2008; Heath et al., 2006). Most had extensive prior experience with animals as children, who primarily grew up in urban rather than rural localities (Heath et al., 1996; Morin et al., 2020). Previous studies have found that over 80% of veterinary students had pet dogs and / or cats (Dally and Erickson, 2012; Izmirli et al., 2014; Sans et al., 2010). These data are consistent with the findings of Serpell (2005), that interactions with animals, especially pets, have a significant effect on values. Further, choosing a medical profession in early childhood is likely to have significance in terms of their commitment, motivation, and investment in education (McHarg et al., 2007). Having pets in childhood and previous experience with animals has a great impact on the desire to be a veterinarian among both sexes. Males are much more likely than females to choose their profession out of a desire to work as scientists, due to the prestige of the profession, and due to the challenge of being accepted into the profession (Tomlin et al., 2010). The number of veterinary students whose parents are veterinarians is relatively low. This is in stark contrast to medical and dental students, for whom the proportion of physicians among their parents is quite high (Heath et al., 2006; Sprecher, 2004). Positive and influential experiences with veterinarians and the veterinary profession, such as watching a veterinarian in action, or volunteering or working with a veterinarian, encourage the choice to be a veterinarian (Amass et al., 2011; Morin et al. 2020). Other factors include the influence of parents and friends, even among families in which the parents did not receive higher education (Tomlin et al., 2010).

**1.2 Animal welfare studies and curricula in veterinary schools around the world and in Israel**

**1.2.1 Changes in veterinary education around the world**

The traditional concept guiding the veterinary curriculum since the inception of the field was to train veterinary students to be experts in working with all animals including small animals, horses, and food-producing animals (Pritchard, 1989). Two influential reports published in Europe (Association of Establishments for Veterinary Education, 1990; Pew Report European, 1988) recommended abandoning the idea that veterinary schools should impart to each individual the necessary knowledge and skills in all, or even most, areas of veterinary medicine. At the beginning of the millennium, these early reports were supported by recommendations in subsequent reports and studies on the economic aspects of veterinary medicine. Recommendations were made to add to the curriculum training hours on generic, nontechnical skills, such as communication, problem-solving, business and management, computer skills, research skills, ethics and values, critical thinking, etc. (Brown and Silverman, 1999; Gardner et al., 2001; Jaarsma et al., 2008; Lewis, 2002; Zenner et al., 2005).

At five North American veterinary medical institutions, the perceptions held by faculty members regarding the importance of nontechnical competencies in veterinary graduates and the inclusion of nontechnical competency development in veterinary education were assessed. Mean ratings of importance were above neutral for all competencies. Ratings were highest for ethics, critical thinking, and interpersonal and intrapersonal skills. Development of these competencies was favored in pre-veterinary and veterinary training. Female faculty members were more likely to emphasize nontechnical competency development throughout the educational process (Lane and Grady Bogue, 2010).

In the context of animal welfare issues, Knight (2010) notes that despite the growing public interest in animal welfare issues (Galon, 2009) and the public's expectation that veterinarians will be competent in these matters, knowledge about animal welfare is not a requirement in the way that these schools require other compulsory courses as a criterion for admission.

The European Directive of 1978 (European Directives, EEC 1027/78), which is still valid, requires the training of veterinarians in all branches of veterinary medicine. In contrast, veterinary schools in Western countries are beginning to implement the recommendations noted above. This change is reflected in the gradual transition to a curriculum that includes modular courses with elective tracks, so students can plan their future according to the wide range of specializations that have developed in the veterinary field (Karg, 2000; van Beukelen, 2003), and other factors such as the financial market (American National Academy of Science, 2011; Fernandes, 2005; Shimshoni, 2009).

**1.2.2 Veterinary education in Israel**

 The Koret School of Veterinary Medicine (KSVM) is the only institute to train veterinarians in Israel. KSVM is part of the Faculty of Agriculture of the Hebrew University of Jerusalem (HUJ). It was named in honor of the Koret Foundation of San Francisco, its major benefactor. Since its establishment in 1985, the school has received academic and financial support from abroad, especially from the United States. KSVM strives to be a high-quality institute of veterinary education and research center in the Middle East, and inspires to be ranked among the top veterinary schools in the world. The advisory committees advised in favor of a four-year curriculum similar to that in the US veterinary education system, rather than following the European veterinary education system, based on a five- to six-year program.

Since 2003, applicants are required to complete a Bachelor of Science (BSc) degree in life sciences, including biology, medical sciences, animal sciences, zoology or other paramedical professions prior to application (Shahar and Bark, 2006). Acceptance is based purely on academic achievement, with a minimal score of 650 in a national psychometric examination (similar to the American Graduate Record Examinations [GRE]). Following the three years necessary to complete the BSc, the core veterinary curriculum lasts an four additional years. The study program is intensive, with over 1100 hours per year of theoretical and supervised practical training in the first three years of the Doctor of Veterinary Medicine (DVM) cycle. The final fourth year consists of 3.5 semesters of exclusively clinical work. This means that the core veterinary curriculum lasts 9.5 semesters and includes many more weekly hours of contact time than in most (if not all) of the European faculties. Therefore, the Israeli veterinary curriculum may be considered equivalent to the five-year curriculum required in the EU directive 2005/36. All university students in Israel pay a flat tuition fee equivalent to €2600 per annum (meaning there are no specific financial restraints for veterinary students).

The first year of the curriculum consists of pre-clinical studies. Then, pre-clinical studies are combined with applied courses in the second year, theoretical clinical courses in the third year, and 12 consecutive months of clinical training at the Hebrew University Veterinary Hospital in the fourth year. Since its founding, the school’s curriculum has been dynamic, reflecting the changes that have taken place in veterinary studies in the United States and Europe over the past twenty years, alongside practical and budgetary considerations (Shahar and Bark, 2006; Galon, 2009). KSVM places great emphasis on the practical and clinical education of its students, with the aim of adequately preparing them to approach and solve clinical and surgical cases upon graduation. The entire faculty is dedicated to and serious about this effort, even though their already-heavy clinical work load is further increased by the expectation that they will also make significant contributions in the research field.

Recently, KSVM’s curriculum committee has been preoccupied with questions regarding the global trend for students to move away from traditional specializations such as livestock animals, and prefer to specialize in companion animals and pets (Haarhius et al., 2003; Lenarduzzi et al., 2010; National Academy of Science USA, 2011). This creates a shortage of veterinarians in the non-governmental clinical arena and the public and governmental arena (Gal-On, 2009). In light of this trend, there is a lively and ongoing discussion about defining the core curriculum and increasing elective courses.

**1.2.3 Establishment and expansion of animal welfare as a curricular and research topic**

Scientific research on animal welfare began to address the public’s reliance on scientific sources regarding ethical concerns about animals’ quality of life (Fraser et al., 1997; Main et al., 2005; Siegford et al., 2005). Animal welfare is defined by the American Veterinary Medical Association (2015) as “how an animal is coping with the conditions in which it lives.” Animal welfare is rated on a spectrum from poor to excellent (AVMA, 2015). Animal welfare is a multidimensional issue that includes ethics, values, science, economics, and politics (Lund et al., 2006). Animal welfare has been divided in to three primary areas of concern: the animal’s basic health and functioning, its affective states (such as pain, hunger, stress, and

pleasure), and the animal’s environment in terms of the animal’s ability to perform its natural behaviors (Fraser, 2008). While there is significant overlap between these three areas, emphasizing one over the others can lead to significantly different conclusions about animal welfare. In other words, how animal welfare is defined has direct implications on how scientific research on animal welfare is conducted and how animal welfare is ultimately assessed. Using the three approaches presented here, different people could assess the same animals and come to different conclusions. This could ultimately affect how those animals and others are kept and

treated subsequently.

The 1965 Brambell Report by the UK Farm Animal Welfare Advisory Council (Brambell, 1965), was one of the first attempts to identify areas of concern regarding animal welfare among farm animals. This report included the Five Freedoms of Animal Welfare, which serve as a basis for international dialogue on animal welfare. The Five Freedoms are reflected in guidelines, recommendations, codes, and legislation prepared by countries in Asia, Australasia, the European Union, and North America, and by the World Organization for Animal Health (Office International des Epizooties, OIE), to address animal welfare issues. The Five Freedoms refer to idealized states of welfare rather than standards. They emphasize that the welfare of an animal includes its physical and mental state. Good animal welfare implies both fitness and a sense of wellbeing. They developed requirements that any animal kept by humans must be protected from unnecessary suffering, at the minimum.

The Five Freedoms of Animal Welfare are:

1. Freedom from hunger and thirst. There must be ready access to fresh water and a diet that maintains full health and vigor.
2. Freedom from discomfort. An appropriate environment should be provided, including shelter and a comfortable resting area.
3. Freedom from pain, injury, or disease. This includes prevention, prompt diagnosis, and treatment.
4. Freedom to express natural behavior. This is accomplished by providing sufficient space, proper facilities, and the company of the animal’s own kind.
5. Freedom from fear and distress. This is done by ensuring conditions and treatment which avoid mental suffering.

Critics of the Five Freedoms note the focus on elimination of negative aspects of animal welfare, with no consideration for positive animal welfare (McCulloch, 2012). Additionally, this provides a theoretical framework for thinking about animal welfare, rather than a practical tool for animal welfare assessment (McCulloch, 2012). While animal welfare science provides data, the acceptable ranges for these data can only be answered with animal ethics (Fraser et al., 1997). Ultimately, a combined approach using scientific inquiry and ethical reflection regarding animal use is required to fully investigate animal welfare, since neither science nor ethics can resolve animal welfare issues alone (Fraser, 1999).

While veterinarians’ role as guardians of animal health is clearly established, their role in animal welfare is less obvious (Wilkins, 20008). This distinction has proven to be particularly noticeable following the revision of the veterinary oath by AVMA in 2010 to include the protection of animal health and welfare (Nolen, 2011). It is not surprising, then, that there is self-criticism among the veterinary community due to the mismatch between public expectations of them and the knowledge and response they can provide in this area (Appleby, 2004; Hewson, 2003, 2004). The addition of animal welfare to the curriculum at veterinary schools has been debated by educators for over thirty years (Gumbrell, 1983), but change in institutional policy in this area has been slow. The AVMA Council on Education (COE) now requires veterinary curriculums of veterinary colleges eligible for AVMA accreditation to provide “knowledge, skills, values, attitudes, aptitudes, and behaviors necessary to address responsibly the health and well-being of animals in the context of ever-changing societal expectations” but any mention of training in animal welfare science is absent from these listed requirements (AVMA, 2017). Furthermore, most veterinary schools in the United States still offer few, if any, guidelines in this area (Johnstone et al., 2019). In contrast, in most veterinary schools in Europe, Latin America, the UK, Australia, and New Zealand, animal welfare is a standard part of the curriculum (Estol, 2004; Fogle, 1999; Gumbrell, 1983; McGreevy and Dixon, 2005). In recent years, there has been increasing pressure to make animal welfare an integral part of veterinary education from various stakeholders including the public (Colonius and Swoboda, 2010) and the international professional community (Illman et al., 2014; OIE, 2012). There have been shifts in government policy, changing expectations among students, and changes in industry standards regarding animal welfare (Shivley et al., 2016).

The World Veterinary Association and the World Organization for Animal Health recommend that animal welfare studies, as a distinct subject, should be mandatory, and addressed using a multidisciplinary approach (for more on the nature of these courses see Schneider, 2004; Shivley et al., 2016; Siegford et al., 2004). animal welfare. Tesanimal welfare educationA structured curriculum usually provides scientific evidence and ethical discussion of animal welfare, but can also include a broader range of topics such as regulatory, professional, and philosophical subjects (AVMA, 2017; Magalhães-Sant'Ana, 2014).

**Animal welfare and ethics in veterinary education Israel**

At KSVM, animal welfare is included in the curriculum as part of the field of non-clinical skills, along with health management, economics, ethics, interactions with customers, etc. (Phillips, 2008). Mandatory studies in veterinary ethics and animal welfare have been gradually introduced into the veterinary curriculum in Israel. Since 2005, a course on veterinary ethics has been held at KSVM, which is taught in the first year. Since 2011, a course on animal welfare course has also been taught to first-year students.

Both courses have undergone changes in their format in order to optimally adapt them to the student population. The current form of the course Veterinary Ethics is based on frontal lectures. A grade is given on a presentation by small groups of students to the class. These are designed to train students to read about a significant ethical issue regarding animals, intelligently present the issue to the class and conduct an ethical discussion based on professional information. The objectives of this introductory course, according to the presenting lecturer at KSVM, are:

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To clarify *for ourselves* what we believe, in an informed manner. To elicit a sense of responsibility in the participant. My aim is not to reach a particular conclusion. It is to raise arguments that lead us to think about an issue in a different manner or take into consideration issues that we did not consider before. To show that there are ethical issues involved where it seems that there are none. To expose hidden ethical decisions. To know your fellow classmates better. And especially, to become aware of the diversity of values of your colleagues and in society.”

The Animal Welfare course was included in the curriculum, as part of the requirements for accreditation from the European Association of Establishments for Veterinary Education/ Federation of Veterinarians of Europe (EAEVE/FVA) course. As part of the research work for this study, I participated in the course. In its initial format, the semester-long course was based on presentations by guest lecturers who deal with various aspects of animal welfare as part of their veterinary work. Significant emphasis (four lessons) was placed on the welfare of farm animals, in particular the welfare of cows in the dairy industry, laying hens in the egg industry, and raising livestock or poultry in the meat industry. Two lessons were devoted to the welfare of dogs and cats. One lesson was devoted to the welfare of racehorses. Three lessons were devoted to animals in captivity. There was an introduction to the field of animal welfare (history, philosophy, and law). At the end of the course, there was a study tour lasting several hours to a modern dairy farm in the center of Israel, and the Biblical Zoo in Jerusalem. The test in the course included both open-ended and multiple-choice questions about the material studied. In the years since the course was first delivered, it has undergone major changes in its contents. Currently, it is almost entirely devoted to the welfare of farm animals. This is one of the few courses for veterinary students that is not taught by veterinarians, but rather by an interdisciplinary researcher who specializes in the welfare of farm animals.

**Why study attitudes of veterinary students?**

In the field of psychology, “Attitude is a psychological construct. It is a mental and emotional entity that inheres in, or characterizes, the person,” (Perloff, 2016, p. 86). Attitudes about an object are assembled from three types of information: beliefs about the object's positive or negative characteristics; feelings and emotions about the object; and information about past and current actions toward the object. Once an attitude has been formed, it becomes closely linked to the representation of the object (Smith and Mackie, 2000)

The current study investigates the attitudes of veterinary students and their relationship with behavioral intentions. Azjen and Fishbein’s (1980) Theory of Reasoned Action states that attitudes relate to intentions regarding how people will behave. However, external obstacles may impede the ability to act on intentions (Eagly and Chaiken, 1993). One potential obstacle may be cognitive dissonance (Festinger, 1957; Smith and Mackie, 2000). For example, if people need to act in a certain way to perform tasks, but those actions do not correspond with their attitudes, they may alter their attitudes through rationalization, so as to reduce cognitive dissonance and discomfort.

Attitudes toward animals are important in influencing the way animals are treated [[2](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B2-vetsci-06-00019)]. Several studies have indicated how a variety of factors influence attitudes and sensitivities of a veterinary practitioner toward animal welfare issues, including: gender [[3](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B3-vetsci-06-00019),[4](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B4-vetsci-06-00019)], animal’s disease and state of health [[5](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B5-vetsci-06-00019)], professional discipline [[6](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B6-vetsci-06-00019)], perceived responsibility, being a pet owner, membership in a society [[4](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B4-vetsci-06-00019)], and country of residence [[7](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B7-vetsci-06-00019)]. Veterinarians’ attitudes toward animal welfare derive, at least partially, from their training [[8](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B8-vetsci-06-00019),[9](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B9-vetsci-06-00019)]. Veterinary students are expected to demonstrate a high degree of professional interest in the welfare of animals. Therefore, according to Heleski et al. [[10](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6466256/%22%20%5Cl%20%22B10-vetsci-06-00019)], the understanding of veterinary students’ attitudes and perceptions toward these issues is fundamental, as it may be an indirect measure of the adequacy and effectiveness of their education.

**Attitudes of veterinary students towards AWE issues and formal education**

In the last 20 years, several surveys have been conducted to better understand veterinary students’ knowledge of welfare issues, their attitudes towards animal welfare education and their capacity for empathy towards animal suffering, pain, and overall compromised well-being (Abood and Siegford, 2012; Hazel et al., 2011; Levine et al., 2005; Lord et al., 2010; McGreevy and R. J. Dixon, 2005; Paul et al., 2000; Verrinder and Phillips, 2015). Surveys analyzing responses by DVM students enrolled in animal welfare courses have generally found that the courses have effectively challenged students to improve their ability to identify compromised welfare, discuss solutions and encouraged ethical considerations.15,17

In a survey on animal welfare knowledge conducted in 32 veterinary schools in the US, 83% of students responded that they see animal welfare as important, and noted the lack of adequate academic guidance on the subject. However, the survey indicated a large gap between the students’ high assessment of their knowledge of the subject and confidence in discussing it with future clients, as compared to their actual knowledge, which was significantly lacking (Colonius and Swoboda, 2010; Johnson et al., 2009).

In terms of gender distribution with respect to animal welfare, Serpell (2005) found that female first-year veterinary students showed significantly higher levels of concern for animal welfare and animal rights in all categories examined, as compared to male students. These findings confirm previous research on gender bias in relation to attitudes regarding the welfare and rights of animals (Driscoll, 1992; Furnham and Heyes, 1993; Galvin and Herzog, 1998; Herzog et al., 1991; Hills, 1993; Kellert and Berry, 1980; Kruse, 1999; Paul and Phillips et al., 2011; Phillips and McCulloch, 2005; Podberscek, 2000; Serpell, 2004; Shurtleff et al., 1983).

Paul and Podberscek (2000) conducted an experiment examining attitude shift among veterinary students. They recruited 319 students from two British universities to examine beliefs about animal sentience and empathy with animals. Students in their later years of study rated animals as having lower levels of sentience than did students in the early years of their program. (This was tested by asking students' opinions as to whether animals felt pain and/or boredom in ways similar to humans.) Furthermore, male students in their later years of study showed lower levels of empathy toward animals than did male students in the early years of their study. There was not a comparable significant attitude shift in the female population over time. This pioneering research is a cornerstone in the study of veterinary students’ attitudes towards animal welfare, and specifically to the possible associations between year of study in veterinary school and changing perceptions regarding animals. It was followed by several studies examining the attitudes of veterinary students towards the welfare of farm animals (Heleski et al. 2005; Magnani et al., 2017; Ostović et al., 2016;) and the use of animals for research (Sabuncuoglu and Coban, 2008). There is still paucity of longitudinal research studies dealing specifically with veterinary students’ attitudes to farm animals’ pain and sentience, and perceptions of affective traits in different species of farm animals.

**DVM students’ attitudes to farm animals’ welfare, pain, and sentience**

Recognition of animal pain is an essential prerequisite for the treatment of pain in animals (Hewson et al., 2007a; Huxley and Whay, 2006; Paul and Podberscek, 2000). Belief in “animal mind” or animal sentience refers to beliefs about the emotional lives of animals, and their capacity to think and experience feelings and emotions. These beliefs are likely to be important in the formation of attitudes towards animals (Hills, 1995; Knight et al., 2004) and how people interact with and treat them (Morris et al., 2012). Belief in animal mind has been found to be a strong determinant of attitudes towards animals (Herzog and S, 1997; Knight et al., 2004) and to positively correlate with concern for animal welfare (Broida et al., 1993).

Assessment of animal pain depends on veterinary medical education, year of graduation, attitudes to animal pain, career choice, sex, age, empathy of the individual (Capner et al., 1999; Doohoo and Doohoo 1996; Ellingsen et al., 2010; Fajt et al., 2011; Huxley and Whay, 2006; Lascelles et al., 1999; Raekallio et al., 2003).

However, most research on this subject was carried out among veterinary surgeons, not veterinary students. The few studies that tested the DVM student population were not unanimous in their findings, indicating contradicting associations between year of study and evaluation of pain across different species of animals.

Hellyer et al. (1999) carried out an exploratory survey at the Colorado State University Veterinary Teaching Hospital, to determine whether animal-related factors (such as species and breed, behavior, and clinical circumstances) and level of professional veterinary medical training were associated with attitudes toward pain management in animals. Students in the College of Veterinary Medicine and Biomedical Sciences, clinical faculty, house officers, and support staff were surveyed anonymously. There was a high degree of concordance among survey participants regarding the overall importance of treating pain in animals. The extent to which pain should be alleviated and animal factors accounted for much of the discordance among survey groups. Fourth-year veterinary students indicated that they were somewhat less likely to treat animals for pain than were second- or third-year veterinary students. The diversity of opinions regarding the necessity or desirability of treating pain in animals and the apparent decrease in the likelihood of senior veterinary students to treat animals for pain under certain circumstances raised concern regarding their competencies in pain treatment in the future (Hellyer et al., 1999).

In another study, Huxley and Whey (2006) surveyed veterinarians in Great Britain and Northern Ireland who were members of the Boehringer Ingelheim mailing list. Respondents answered questions about the pain scores they would attribute to various procedures and conditions in cattle, and frequency of pain mitigation drug use. There were significant differences between male and female practitioner responses to pain scores. In addition, more recent graduates of veterinary schools indicated higher pain scores, a finding found in surveys performed in recent years as well. Surveys performed in New Zealand and Scandinavia also found that younger veterinarians were more concerned about pain among cattle.

Clarke et al. (2017) conducted a longitudinal study among veterinary students in the UK, to test possible cohort effects of the influential cross-sectional study conducted by Paul and Podberseck (2000). The aim was to clarify whether the findings reported by the original study simply detected belief differences between student cohorts that may, for other reasons, have differed at various points during their university careers, or whether they indicated a genuine change in the beliefs of individual students during their veterinary education. The longitudinal study sampled the same students at the beginning and end of their four-year veterinary education, in regard to their belief in animal sentience. The assessed the relationship between students’ responses and their year of study. Participants in the study were enrolled at the School of Veterinary Sciences in Bristol in 2004, 2006, and 2007. The results indicate no decline in beliefs about animal sentience in general, and an increase in ratings of sentience among pigs across the same period. As found in many other studies, female students rated some species as having a greater capacity for sentience than did male students (Clarke et al., 2017).

A survey conducted in Australia (Verrinder and Phillips, 2015) yielded data that seemingly opposed the findings of Paul and Podberscek (2000). Both first-year and final-year veterinary students were found to be compassionate towards animal issues and ethical violations. However, students admitted to feeling underprepared and inexperienced in taking action to correct compromised welfare and injustice.

Another study sought to develop a tool for assessing farmers' attitudes to cattle pain conditions. The tool was tested among Norwegian veterinary students (Kielland et al., 2009). It was found that female students gave higher score to farm animals’ pain as compared to male students, which is similar to previous findings in the field (Capner et al., 1999; Glaser et al., 2007; Lascelles et al., 1999; Mich et al., 2010). It also found that male students who were fathers rated the level of pain caused by various procedures in farm animals as higher compared to their peers who did not have children (Kielland et. al., 2009).

 A recent large-scale study conducted in the UK and Ireland surveyed students studying animal-related subjects (Spencer-Thompson, 2016). The online questionnaire utilized the Five Freedoms animal welfare framework to assess students’ perceptions. Over 2,500 students from 17 academic institutions across the UK and Ireland participated, including over 1,400 veterinary medicine students from six of the seven vet schools within the UK. Participants were asked to rate:

1. **Freedom.** They rated how acceptable they think it is it for farm animals to sometimes be denied each of the Five Freedoms.
2. **Capacity to feel pain.** How they perceive the capacity of various species (humans, sheep, cattle, pigs, dogs, horses, chickens, and fish) to feel pain (from ‘*Feels no pain’* to ‘*Capacity to feel the worst pain’).*
3. **Attitudes to pain in livestock (APL).** This section assessed their level of agreement with four statements about pain in farm animals on a 5-point Likert scale: *Farm animals benefit from pain alleviation; Some degree of pain is beneficial to the animal; Pain relieving drugs are not necessary for farm animals; It is difficult to recognize pain in farm animals.*
4. **Belief in Animal Mind (BAM).** This assessedtheir level of agreement with four statements pertaining to animal sentience.

Overall, the surveyed students expressed their belief that livestock can feel pain and a strong belief in animal mind. Agriculture students however, had the lowest APL and BAM scores, and did not show any change between years of study. In contrast, veterinary students had higher APL and BAM scores and also demonstrated increased scores in their later years of study.

All of the seven animal species presented were viewed as having the capacity to feel pain. However perceived differences between species were evident, with fish and chickens being perceived as having a lower capacity for pain than the five mammal species. Veterinary students made even greater distinctions among the mammal species, viewing the pain capacity of cattle and sheep as significantly lower than that of pigs and horses.

**Categories of animals and the relationship to perception of acceptable welfare standards**

A pilot survey (Levine et al., 2005), conducted at Cornell University’s College of Veterinary Medicine, examined lower levels of concern for livestock animals among veterinary students who wish to work in food-animal industries. The survey attempted to discover a difference between veterinary students’ beliefs about the cognitive and emotional abilities of different species, specifically small companion animals as compared to livestock. The survey included questions regarding the humaneness of procedures for farm and companion animals and the cognitive abilities of these two groups of animals. Of the respondents, 10.5% were interested in practicing medical care for food animals and 49% were interested in small animal medicine. Of the students interested in small animal medicine, 15% rated procedures such as banding and castration of animals less than one week of age as humane, as compared to 56% of students aspiring to work with food animals. Overall, students interested in small animal practice rated procedures on farm and companion animals as less humane as compared to students who intended to focus on medical care for livestock. In addition, Levine et al. (2005) found that less than 90% of students believed that farm animals had cognitive abilities. Respondents also were less likely to believe that poultry and ruminants had emotional abilities as compared to dogs and cats. The study indicates strong inconsistencies between veterinary students in their perceptions of animal pain, acceptable welfare practices, and cognitive abilities of different animal species.

Mariti et al. (2018) observed that veterinary students in Italy gave greater consideration to the welfare of companion animals than that of food animals. This may affect their perception and understanding of animal welfare issues regarding food animals. Other variables associated with lower levels of concern for farm animals’ welfare among veterinary students include upbringing in a rural lifestyle, and extent of experiences with farm animals. For example, Croatian veterinary students expressed decreased levels of concern for farm animals (Ostović et al., 2017; Serpell, 2005). In contrast, students from urban locations showed greater concern (Kendall et al., 2006; Vanhonacker et al., 2007), despite having lower levels of knowledge regarding animal welfare related issues (Miele et al., 2011).

() found that students who expressed a desire to specialize in medical care for livestock animals were mostly men, and were more likely than other groups to cooperate with the clients’ desire, for example, to removing the vocal cords in dogs or cutting their ears or euthanizing healthy animals. Other studies found that students aspiring to careers caring for livestock animals pay less attention to certain aspects of the human-animal relationship (Martin et al., 2003; Martin and Taunton, 2006). Hazel et al. (2011) found that in general, students wanting to work with livestock maintained lower attitude scores for both pets and animals raised for profit.

Serpell (2005) found that owning livestock animals in the past had a significant correlation with less-negative attitudes toward performing cosmetic procedures in animals, as well as the perception that animals experience pain differently from humans. Mich et al. (2010) found that on the continuum of awareness of pain and sensitivity, students in the small-animal track were at the upper end of the spectrum, students in the general-animal track were in the middle, and students in the large-animal track were at the lower end of the spectrum.