

## RESEARCH REPORT

# Anxiety, emotions, and thoughts of veterinary medicine students during their first visit to the dissection room

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## Funding information

Fundación Universitaria San Pablo CEU, Grant/Award Number: PI07D-VV-21

## Abstract

The use of cadavers is essential for veterinary anatomy learning. However, facing an animal corpse can be stressful for veterinary students because of their empathy toward animals. The objective of this study was to evaluate veterinary medicine students' emotions, feelings, and anxiety levels related to practicals with dog cadavers. Two questionnaires were administered to 1st year students ( $n = 168$ ) at CEU Cardenal Herrera University in Valencia (Spain) before and after their first practical session with cadavers. The application of State-Trait Anxiety Inventory questionnaires showed that "state anxiety" decreased significantly ( $p < 0.05$ ), from a score of 14.8 before the practical to 10.4 after, and that female students showed higher but not significantly different levels than males. Most (64%) of the students were not willing to donate the bodies of their pets, and those students were more stressed before the practical than their peers, although their anxiety levels significantly decreased by the end of the session. The majority of the students answered positively about emotions, such as feeling calm, safe, not nervous, relaxed and not worried before the practical, and this increased significantly to more than 80% by the end of the session. The visualization of educational videos prior to the session was evaluated positively by students. These results agree with those reported in other health science disciplines, showing that students face practical sessions with corpses in a similar way and suggesting that the use of videos can help decrease anxiety and enhance their learning experience.

## KEYWORDS

animal anatomy, anxiety, dissection, dog, prosection, veterinary learning

## INTRODUCTION

The use of cadavers is essential for veterinary and human medicine studies. For hundreds of years, carrying out dissections and the study of prosections has been a crucial tool for students to learn about the

different parts and components of the body in both humans and animals.<sup>1,2</sup> Human and veterinary anatomy share similar teaching tools. Animal dissection has been, in fact, an instrument used since the dawn of medicine, and it is known that the anatomical and physiological studies of Galen were based on animal dissections.<sup>3</sup> However,

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it was not until the eighteenth century that Croissant de Garengot published what can be considered the first treatise on comparative anatomy, describing the anatomy of a man and a dog,<sup>3</sup> and even in current times, animal dissection is an important source of preparedness for medical students.<sup>4</sup>

Although dissection has been the traditional method of studying veterinary anatomy, alternative methods have been developed in recent decades, from organ plastination to the design of 3D organs or augmented reality models and virtual teaching.<sup>5</sup> Moreover, universities are making important efforts to reduce the number of animals in practicals, and alternative methods have been developed that aim to replace or complement the use of animals and carcasses in practicals.<sup>6</sup> More recently, COVID-19 has increased the development of multimedia tools to solve the pandemic-related restrictions in the best possible way. Despite this, it is generally assumed that practical classes in anatomy are essential for veterinary students, as they provide the knowledge and skills they will need to successfully progress into clinical semesters.<sup>7</sup> Although the new tools undoubtedly enrich the possibilities of teaching, the study of cadavers remains a highly valuable teaching tool for both instructors and students who consider dissection and the study of prosections important for their academic formation, providing a greater understanding of the animal body.<sup>8-10</sup> Thus, studying animal anatomy on cadavers is considered fundamental for the basic training of veterinary students and as a basis for future veterinary professionals.<sup>9-13</sup>

A wide variety of studies prove that the first visit to a dissection room can generate stress and anxiety in students from the health sciences. These reactions and feelings have been studied in medical students from different countries, such as Germany,<sup>1,14</sup> France,<sup>15</sup> Turkey,<sup>16</sup> Hungary,<sup>17</sup> Ireland,<sup>18</sup> Nigeria,<sup>19</sup> South Africa<sup>20</sup> and Spain,<sup>21,22</sup> and in students from other health science disciplines.<sup>23-26</sup> The distress is caused by different factors, such as no previous medical training, a lack of previous experience with death and dying and gender. To overcome the disruptive effects on the learning process, several interventions before, during and even after the dissection course have been recommended to reduce anxiety (reviewed by Ref. [27]).

However, while in medicine and other health sciences these aspects have been extensively studied, whether students in veterinary medicine have similar experiences when facing cadavers during practical sessions has never been specifically evaluated, and only one study has addressed some aspects of veterinary students' attitudes when using cadavers.<sup>12</sup> The work in the dissection room is also basic for veterinary anatomy learning, and even though differences are obvious when students approach a human or animal cadaver, it is important to take into account the fact that most veterinary students have a special sensitivity to companion animals.<sup>28,29</sup> Moreover, it has been described that the use of cadavers may conflict with the personal ethics of some veterinary students.<sup>10,30</sup> Since dog cadavers are commonly used in dissection practicals in veterinary anatomy classes, it is conceivable that facing corpses from this species could cause some type of stress in students.

In this context, the goal of this study was to investigate the feelings of first-year veterinary medicine students when handling cadavers during their first practical session and whether specific characteristics, such as sex, country of origin, having seen a canine cadaver before or being willing to donate their pet could influence their feelings. The hypothesis of this investigation is that veterinary students have anxiety levels similar to those of students in other health science disciplines when they face their first dissection and that these levels decrease as the practical is completed. It is also expected that sex may have some influence, with higher levels of anxiety in females, and that nationality, even with the limitations of this study, does not significantly influence student responses. However, it is hypothesized that students with higher levels of anxiety are less likely to donate their pets' bodies to science and that viewing videos related to the practical prior to the session can help students cope with it.

Evaluating the effects of confronting canine cadavers in practical anatomy sessions on students can help establish strategies to reduce anxiety and improve student learning, as has already been shown for other health science disciplines.<sup>1,27,31-34</sup>

## MATERIALS AND METHODS

### Anatomy in the veterinary medicine curriculum

In Spain, there are 13 universities teaching veterinary medicine, incorporating certain common training components: all the degree programs comprise 300 ECTS (one ECTS is equivalent to 25–30 h of total workload per student, 10 of which are either lectures or laboratory practicals, and the remaining hours are used for personal study time and homework) and take five academic years to complete.

At CEU Cardenal Herrera University, the teaching of veterinary anatomy is included in three modules of Structure and Function (SF) I, II, and III. These modules also integrate histology, physiology and biochemistry. In relation to anatomy, SF I includes content related to the locomotor apparatus and related structures of domestic animals, and it is offered in the first semester in the 1st year. Structure and Function II is offered in the second semester (1st year), and the contents correspond to the cardiorespiratory, digestive, urogenital, lymphoid, and endocrine systems. Structure and Function III is offered in the third semester (2nd year), and the contents of this topic include the central nervous system.

The students involved in this study were enrolled in Structure and Function I since veterinary students handle cadavers for the first time during practical sessions in the dissection room. Gross anatomy practicals in anatomy in SF I are organized into 10 practical sessions, with a duration of 2 h each. Four of those sessions are based on osteology, 4 sessions combine dissections and prosections of the canine locomotor apparatus, and the remaining two involve horse foot dissection (1) and surface anatomy of dogs, horses, and cows (1).

The learning objectives in the practical dissection of SF I are the identification of the main elements of the musculoskeletal system

(and auxiliary structures): bone structures, muscles, nerves, blood vessels, and lymph nodes and glands. In addition, students are required to know how to identify the bones and their parts of the main species of veterinary interest (carnivores, horses, ruminants, and pigs). In this module, the dissection of the cavities, as well as the identification of isolated viscera and their parts, is not performed since it will take place in SF II in the second semester.

Concerning practical evaluation, by the end of the first semester, there is a practical oral examination of anatomy in SF I in which the student must identify a number of anatomical structures, either from the bones or from the dissected corpses, administered by the professor.

A total of 180 students were enrolled for the first time in the SF I module (and therefore in Anatomy I) during the 2021–2022 academic course and were included in this study. Participation in this study was voluntary, and only students with no previous cadaver dissection or prosection experience were allowed to take part. The exclusion criterion was previous experience in cadaver dissection or prosection. The questionnaires were carried out before and after the first practical session in the dissection room. The main aims of the study, obtention and preparation of cadavers and health and safety protocols, were explained to students before they entered the dissection room. The dissection room complies with all relevant health and safety requirements. This study was approved by the Biomedical Research Ethics Committee of CEU Cardenal Herrera University (Valencia, Spain) (Ref CEEI21/196).

## Animal corpses

Dog corpses were acquired from Carolina Biological (Burlington, NC), which obtained cadavers from governmentally operated or regulated humane shelters (in accordance with the Animal Welfare Act, which is enforced by the U.S. Department of Agriculture). The corpses were fixed with Carolina Perfect Solution™, whose composition contains aldehydes, phenol, and alcohols. The corpses had a lively appearance and were not shaved either before or during the course of the practicals.

## Procedures

Students were divided into 15 groups for gross anatomy practical sessions with 12 students per group. These groups were further distributed into smaller groups of 3–4 students per dissection table. Students were encouraged to watch videos of prosections describing the corresponding anatomic area prior to the practical as preparation. During anatomy practicals, these small work groups worked independently but were assisted by an instructor at a ratio of 12 students per instructor.

Two anonymous questionnaires, that is, authors' own “before” and “after” and the STAI (State–Trait Anxiety Inventory)<sup>35</sup> were distributed among students before and after the first practical session

with dog cadavers, which took place between September 29, 2021, and October 8, 2021. The “before” and “after” questionnaires were designed specifically for this study, collecting variables concerning feelings and emotions in response to dissection (see [Supporting Information](#)). These questionnaires were adapted from previous studies,<sup>22,24–26</sup> which were, in turn, based on the questionnaire published by Miguel Pérez and colleagues<sup>36</sup> and had a Cronbach's  $\alpha$  of 0.32 (CI 95%: 0.15–0.48). The questionnaires were numbered with a four-digit code chosen by the student, which was later used to compare questionnaires anonymously.

The STAI is a self-administered test used to evaluate levels of anxiety.<sup>35</sup> A total of 40 questions are used to measure two different but interrelated types of anxiety. Half of the questions study the so-called “state anxiety” (STAI-SA), based on subjective and transitory feelings of tension, apprehension and fear that can change and be modified in intensity with time. The remaining 50% of the questions evaluate the so-called “trait anxiety” (STAI-TA), an emotional state that shows a personal disposition to perceive daily activities as stressful. Since “trait anxiety” is a stable personal characteristic that reflects feelings that are usual and basal,<sup>22</sup> it was only measured at the beginning of the session. “State anxiety” represents an individual's response to stress. Both questionnaires had the following options: “nothing,” “a bit,” “quite a lot,” and “a lot” (scoring 0, 1, 2, and 3 points, respectively). Since each questionnaire (STAI-SA or STAI-TA) contained 20 questions, the obtained scores ranged between 0 and 60 points per questionnaire. The STAI tests have been validated for their use in Spain and have a Cronbach's  $\alpha$  of 0.93 for the STAI-TA and 0.92 for the STAI-SA.<sup>37</sup>

## Statistical analysis

The descriptive statistical analysis used variable scale parameters (single frequency, measures of central tendency, and standard deviation). For the analysis of the distribution of variables, Kolmogorov–Smirnov tests were applied to study normal distributions. For the inferential statistical analysis of independent variables, ANOVA tests were used to study the relationship between a normal continuous variable and a nominal one. If the outcome variable was dichotomous, Student's *t* test was used. To study the differences between paired continuous variables, a paired *t* test was used, and when comparing nominal and dichotomous variables, a chi-squared test was used, and a confidence interval of 5% was established. For data analysis, the SPSS statistical package, version 28.0 for Windows (IBM Corp., Armonk, NY), was used.

## RESULTS

A total of 168 out of 180 (93.3%) enrolled students in a veterinary medicine program were included in the study, with a mean age of  $19.2 \pm 2.5$  years (minimum 17, maximum 32). Female students represented 77.4% (130 students), while male students represented 22% (37 students). There was 1 student who did not specify sex ([Table 1](#)).

The main nationality was Spanish ( $n = 130$ , 77.4%), followed by French ( $n = 23$ , 13.7%), whereas the rest (8.9%) were from El Salvador (1), Mexico (1), the United Kingdom (1), Costa Rica (1), Colombia (2), Venezuela (2), Italy (1), Morocco (1), the Dominican Republic (2), and Andorra (1); in addition, there were two students who did not answer the nationality statement (Table 1).

Regarding the STAI questionnaire, the score obtained for the STAI-TA (which indicates a personal disposition to perceive daily activities as stressful) was  $19.7 \pm 9.5$  points. Although the mean seemed higher in females ( $20.6 \pm 9.5$ ) than in males ( $16.9 \pm 9.2$ ), there were no statistically significant differences at the 0.05 level.

The results of the STAI-SA test, which represents an individual's response to stress when handling a cadaver for the first time, were  $14.8 \pm 9.2$  points before the practical session. A higher but not significantly different score was observed in females ( $15.3 \pm 8.9$ ) than in males ( $13 \pm 10.2$ ). Consequently, the total STAI score was  $34.6 \pm 17.1$  in the studied (all students) population,  $35.9 \pm 16.7$  in females and  $30.3 \pm 18.4$  in males (Figure 1).

After the first practical session with canine corpses, the STAI-SA levels significantly ( $p < 0.05$ ) decreased when compared with those obtained before, reaching  $10.4 \pm 7.9$  points in the studied group of veterinary students (all students), with  $10.8 \pm 8.3$  in females and  $9.1 \pm 6.5$  in males. Consequently, the total STAI also significantly ( $p < 0.05$ ) decreased during the practical session for the study group ( $30.3 \pm 15.7$  vs.  $34.6 \pm 17.1$ ), both for females ( $31.45 \pm 15.8$  vs.  $35.9 \pm 16.7$ ) and males ( $26.32 \pm 14.8$  vs.  $30.3 \pm 18.4$ ).

To evaluate the specific feelings veterinary students face during their first practical sessions in the dissection room, a particular questionnaire was administered to the students (Table 2). Before students

**TABLE 1** Demographic data and nationalities of students involved in this study.

Sex	N (%)	AGE mean $\pm$ standard deviation (%)
Male	37 (22)	$18.84 \pm 2.63$
Female	130 (77.4)	$19.15 \pm 2.42$
Not indicated	1 (0.6)	22
Nationalities	N (%)	
Spain	130 (77.4)	
France	23 (13.7)	
Colombia	2	
Venezuela	2	
Dominican Republic	2	
Mexico	1	
United Kingdom	1	
Costa Rica	1	
Italy	1	
Morocco	1	
El Salvador	1	
Andorra	1	
Not indicated	2	

accessed the dissection room, most felt calm (71.4%), safe (70.6%), not scared (80.5%), happy (78.6%), and satisfied (83.1%), showing that males had more significantly ( $p < 0.05$ ) positive results than females. Most students also declared not to be nervous (53.9%), to be relaxed (62.3%), and not worried (64.3%); nevertheless, a relevant percentage chose the option "indifferent." Therefore, most of the veterinary students (84.3%) were considered emotionally prepared to access the dissection room.

When students were asked about the type of feelings or expectations they felt when approaching the dissection room, the main thoughts before the practical were "curiosity" (83.8%), followed by uncertainty (27.9%), displeasure (10.4%), and fear (7.1%).

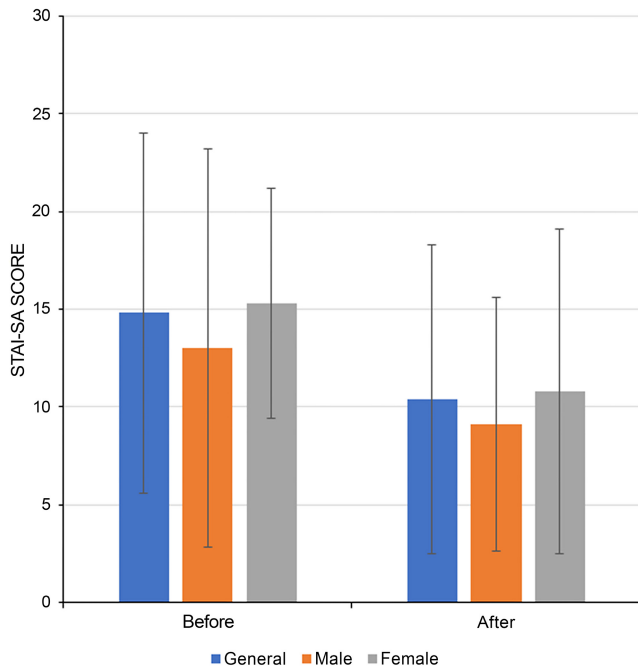
Regarding the question, "What do you think is the most (expected) unpleasant thing in the dissection room?," 69.5% of students chose the smell, 28.6% chose watching the animal's face and 11.7% chose touching the cadaver. The number of females who chose the option "watching the cadaver" was significantly ( $p < 0.05$ ) higher than that of males (40 out of 121 females vs. 4 out of 32 males).

The author's questionnaire was repeated at the end of the first practical session, and the percentage of positive thoughts and feelings increased (Table 2). The percentage of students who felt calm reached 92.7% after the practical compared with 71.4% before, and this was similar for "safe" (86.8% vs. 70.6%) and "not scared" (92.7% vs. 80.5%). The feelings of being "happy" and "satisfied" were quite similar (79.5% after vs. 78.6% before and 88.1% after vs. 83.1% before, respectively). It is important to highlight the fact that some feelings that at the beginning of the practical session had a relatively important percentage of "indifferent" responses after the session moved to a higher percentage of positive feelings: most students chose the option "not nervous" (84% after vs. 53.9% before), "relaxed" (82.7% after vs. 62.3% before) and "not worried" (74.8% after vs. 64.3% before). As a result, the total number of students who felt emotionally prepared in the room was high both before and after the session (84.3% vs. 82.1%), and most did not feel the loss of emotional control (78.7%).

Interestingly, most students (95.3%) watched the videos prior to the practical session, and most (85.4% of the total, i.e., 90.8% of those who visualized the videos) considered that this tool helped them handle their emotions before accessing the dissection room.

Overall, students were satisfied with the experience, and the mean result for the question "How would you globally rate your satisfaction with this practical session?" was  $8.9 \pm 1.0$  points out of 10, with no significant differences between males ( $8.7 \pm 0.9$ ) and females ( $8.9 \pm 1.1$ ). Next, a possible relationship between the levels of anxiety and the score given by the students to the practical was studied. The results indicate that there was a low negative correlation ( $r = -0.346$ ,  $p < 0.05$ ) between the total STAI and the score; that is, the higher the total STAI levels (and, therefore, anxiety) were, the lower the score. The correlation was higher in males ( $r = -0.496$ ,  $p < 0.05$ ) than in females ( $r = -0.315$ ,  $p < 0.05$ ).

It was also analyzed whether having already encountered a dog corpse had any effect on the different scores studied. Approximately, half of the students (51.6%) had seen a canine cadaver before, while 48.4% had not. However, that variable had no statistically significant



**FIGURE 1** Anxiety levels before and after the first practical session in the dissection room. Histograms show the mean and standard deviation of the STAI-SA scores before and after the first practical session. Significant differences ( $p < 0.05$ ) were observed between “before” and “after” but not between sexes. A total of 168 students were surveyed. The minimum and maximum scores in the general population (including males and females) were 3 and 44 in the STAI-TA questionnaire, 0 and 52 in the STAI-SA before the session, and 0 and 42 in the STAI-SA after the session.

effects on any of the studied items, either on STAI test results or on the authors' own questionnaire.

In addition, students' nationality was also evaluated to determine whether there was any interaction with the degree of stress in students during practical sessions. Once more, no statistically significant differences were found, either on the STAI or on the author's questionnaire, except when they were asked, before starting their practical, if they felt prepared for it. In this case, the percentage of foreign students who felt prepared to face the practical session was significantly lower ( $p < 0.05$ ) than that of Spanish students (74.3% vs. 87.3%).

The students were asked, at the end of the practice, if they would be willing to donate the corpse of their pet to science. The majority of students (64%) would not donate the body of their pet to science, while 35.3% would. When the STAI-SA score of both groups was analyzed (Figure 2), it was found that at the beginning of the practicals, the levels were significantly ( $p < 0.05$ ) higher for students who did not want to donate (16.50 vs. 12.77). Those scores fell significantly at the end of the practice: the group that did not want to donate experienced a statistically significant reduction ( $p < 0.05$ ), reaching 10.98 points, while the group of students who would donate the bodies of their pets was 9.83%, although the reduction was not significant at the level of 0.05 (Figure 2). On the other hand, STAI-TA levels, measured before the beginning of the session, were similar in both groups (20.35 vs. 19.34, Figure 2).

## DISCUSSION

### Animal dissection and veterinary medicine students' empathy for animals

In this article, the attitudes of veterinary students toward their first experience with a cadaver in the dissection room are analyzed. Different studies have shown that undertaking practical dissections on human cadavers can be a stressful and uncomfortable experience for health science students.<sup>16,21,23–25</sup> Learning anatomy with cadavers is also a basic and essential practice in the first years of the curriculum,<sup>2,9,12,38,39</sup> but some students question the use of corpses in teaching and consider the dissection performed on animal cadavers not ethically acceptable in terms of animal welfare.<sup>10,30</sup>

Several factors seem to influence how veterinary students value animal welfare and the importance they attach to it. Student attitudes regarding animal sentience and the use of animals in teaching are influenced by culture<sup>40,41</sup> and gender, since women generally show greater empathy.<sup>40,42</sup> The animal species in question also has a significant influence, with veterinary students being especially sensitive to companion animals' sentience, especially dogs.<sup>28,29</sup> There is some controversy about whether the level of empathy remains constant over the years or declines over the years of study. Some studies have shown that this seems to occur,<sup>41</sup> being more evident in the case of male students.<sup>42</sup> In this sense, it has been suggested that students in the later years may “counteranthropomorphize” animals<sup>43</sup> to cope with the emotional distress they expect to encounter in veterinary work.<sup>44</sup> A similar decline has been reported in the case of medical students, perhaps reflecting a systematic desensitization or habituation to emotional distress as a coping strategy to prevent, for example, burnout.<sup>45</sup> However, another study concludes differently, with no decline in students' beliefs about animal sentience over the years.<sup>28</sup> Many factors, such as the characteristics of the teaching process, may be involved in these feelings, and more research will be needed to confirm whether veterinary students change their beliefs about animal sensitivity and welfare in different settings and cultures.

Nevertheless, these results advise being very respectful of animal welfare in dissection practicals, especially when dog corpses are used. In addition, it is necessary to take into account that women, who are more sensitive in these aspects, are the majority of students in veterinary studies (77.4% in this study).

An interesting result obtained in this work is that the students who would not donate the body of their pet to science presented higher levels of anxiety at the beginning of the practice. This probably reflects a greater empathy toward animals or a greater apprehension toward working with corpses. From another point of view, the classmates who would donate the bodies of their pets face dissections in a more relaxed way. Nevertheless, the development of the practical reduces the anxiety of “non-donor” students to levels similar to those of their peers. One limitation in interpreting this result is that the same question was not asked before starting the practical, so it is not possible to know for sure if these same students

**TABLE 2** Students' thoughts and feelings before and after the first practical session with a dog cadaver at the dissection room.

	Before			After		
	No N (%)	Indifferent N (%)	Yes N (%)	No N (%)	Indifferent N (%)	Yes N (%)
I feel calm *	8 (5.2)	36 (23.4)	110 (71.4)	2 (1.3)	9 (6)	140 (92.7)
I feel safe *	8 (5.2)	37 (24.2)	108 (70.6)	3 (2)	17 (11.3)	131 (86.8)
I feel nervous *	83 (53.9)	43 (27.9)	28 (18.2)	126 (84)	16 (10.7)	8 (5.3)
I feel scared *	124 (80.5)	16 (10.4)	14 (9.1)	140 (92.7)	8 (5.3)	3 (2)
I feel happy	2 (1.3)	31 (20.1)	121 (78.6)	2 (1.3)	29 (19.2)	120 (79.5)
I feel satisfied	1 (0.6)	25 (16.2)	128 (83.1)	2 (1.3)	16 (10.6)	133 (88.1)
I feel relaxed *	12 (7.8)	46 (29.9)	96 (62.3)	4 (2.7)	22 (14.7)	124 (82.7)
I feel worried *	99 (64.3)	38 (24.7)	17 (11)	113 (74.8)	32 (21.2)	6 (4)
I feel prepared to enter the dissection room	4 (2.6)	20 (13.1)	129 (84.3)	13 (8.6)	14 (9.3)	124 (82.1)
I feel like I can lose control				118 (78.7)	1 (0.7)	31 (20.7)
I would donate my pet to science				96 (64)	1 (0.7)	53 (35.3)
I watched the videos before practical session				6 (4)	1 (0.7)	142 (95.3)
Watching the videos has helped me				5 (3.3)	17 (11.3)	129 (85.4)

Note: Figures show the number (N) and percentage (%) of students choosing each option. Asterisk (\*) indicates statistical differences at  $p < 0.05$  between the student's responses "before" and "after" the first practical session. Percentages may not sum to 100 due to rounding.

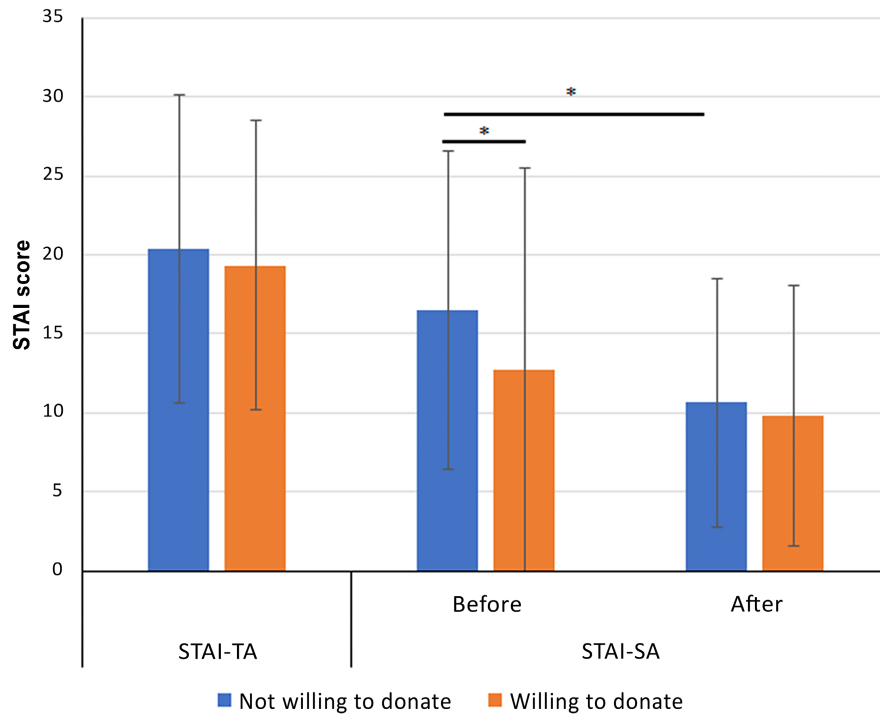
were already willing (or not) to donate before the practical or if the development of the session modified this decision. To the authors' knowledge, there are no previous works that analyze the willingness of students to donate the corpse of their pets for scientific or educational purposes, but in the case of medical students, it has been reported that those who studied anatomy showed reluctance to donate<sup>46</sup> and that the willingness to donate one's own body for anatomical purposes decreases throughout the academic year.<sup>47</sup>

### Comparison between the anxiety and stress of veterinary students and those of other health sciences disciplines

The results of the tests applied to veterinary students described in this work are similar to those described for other students from several disciplines of health sciences, but with some interesting differences. Veterinary students scored 19.7 on the STAI-TA questionnaire, which is very close to the scores of physical therapy students (19.9 points)<sup>26</sup> and medical students, whose scores on this test range between 19.1 and 22.4 points.<sup>22,48</sup> Additionally, health sciences students scored in a similar range (22.4 points),<sup>24</sup> whereas nursing students scored lower (16 points).<sup>25</sup> Higher levels (between 42.6 and 46.7) were described by Bati and colleagues in medical, pharmacy, and dental students in Turkey.<sup>16</sup> This discrepancy is because the scores on the test range from 1 to 5, obtaining total scores that are between 20 and 100. The Spanish adaptation of the test<sup>35</sup> uses scores ranging from 0 to 4; therefore, the total values are between 0 and 80, that is, 20 points below the one used in the Turkish study.

The absolute figures obtained in the STAI-SA questionnaires in this study before and after the first practice appear somewhat lower than those described in most works that applied this same questionnaire; however, the levels decreased at the end of the first practical session as in other health science students. The scores of veterinary students decreased from 14.8 to 10.4 (this study), whereas a decrease from 26.6 points to 14.2 points<sup>31</sup> or from 24.7 points to 16.7 points<sup>49</sup> has been reported in medical students. Something similar happens in nursing students, who show a decrease from 21.3 to 17.8 points,<sup>25</sup> and in health sciences students (including medicine, occupational therapy, speech therapy, and nursing students), in which it drops from 20.7 to 13.7 points.<sup>24</sup> Intriguingly, STAI-SA scores in veterinary students are closer to those of physical therapy students, who obtained mean results of 14.1 points before and 10.3 after the practical session.<sup>26</sup> Previous studies have interpreted the differences between different students of medical and health sciences in terms of the perceived importance of practicals or empathy toward patients.<sup>22</sup> However, it must be considered that most of the students in this study watched the video before the session and that this experience is considered to have lowered their anxiety levels (see below). Therefore, it cannot be ruled out that this circumstance may have been relevant in reducing anxiety levels, and consequently, the STAI-SA score before the session among the students in this study.

The decrease in anxiety levels observed in the STAI-SA questionnaire at the end of the practical session was confirmed by the responses of the veterinary students to feelings and thoughts, whose positive assessments increased at the end of the session. This is consistent with the findings of other health science students. The main thought that veterinary students felt prior to the first dissection was



**FIGURE 2** STAI scores of students based on their willingness to donate their pet's body. STAI scores (mean  $\pm$  standard deviation) in students according to whether they were willing to donate the bodies of their pets to science. The asterisk (\*) indicates statistically significant differences ( $p < 0.05$ ) between the STAI-SA score obtained before entering the practical of the students who would donate their pets and those who would not and between the students who would not donate their pets before entering the practical and after the end of it.

"curiosity" (83.8%), very close to medical students (88.5% in Ref. [21]; 84.2% in Ref. [22]), health sciences (85.1% in Ref. [24]) or physical therapy (81.8% in Ref. [26]). In addition, the most unpleasant thing that students reported was the "smell" (69.5% in this study), also close to 68.2% in physical therapy students.<sup>26</sup> Concerning medical students, some differences have been reported in the percentage of students who chose "smell" as the most unpleasant experience, varying from 38.6% to 72.5%.<sup>21,22</sup> It should be noted that the initial survey of this study was carried out in a different place from the dissection room; thus, the possible smell was basically an anticipated sensation of what the student thought he would find, as has also been suggested by other authors.<sup>21</sup> However, seeing the face of animals is a problem for a lower percentage of veterinary medicine students (28.6%) than for those of other health sciences, where it varies from 47.4% to 55.9%,<sup>21,22,26</sup> probably due to the specimen's nature.

In this study, there were no significant differences at the 0.05 level between males and females for most items. However, females showed higher values, both in STAI-TA and in STAI-SA, both before and after the practical session. In this regard, the scientific literature yields different results. Whereas most previous studies have shown that females have higher levels of stress when facing dissection,<sup>18,22,50</sup> others have not found significant gender differences.<sup>15,34</sup> The results of the present study are closer to the latter, although the consistently higher values observed in women may have some diagnostic value. Interestingly, being Spanish or another nationality did not have an important influence on the results, which only varied significantly in foreigners who felt somewhat less prepared

before the practical session compared to national students. The rest of the results (STAI and authors' own test) were very similar, which suggests that the group, despite the different nationalities, is quite homogeneous and that the possible cultural differences do not have a great impact on the students' responses. However, it must be considered that apart from Spanish, only the French nationality was represented by a relatively substantial number of students.

### The use of videos as tools to reduce anxiety and improve the learning experience

Different types of strategies have been proposed to reduce the level of stress or anxiety of practicals with cadavers in medical students, one of which is the use of videos.<sup>17,20,23,27,51</sup> Attardi and colleagues proposed YouTube-based videos that basically show the facilities in the dissection room but without the direct presence of the corpses; however, this strategy does not significantly reduce students' anxiety.<sup>52</sup> In contrast, other works have reported that the use of recordings showing dissections does have an effect on reducing students' stress levels.<sup>49,53</sup> The effect, nevertheless, can be variable depending on the feelings or attitudes studied. In this sense, visualization of a film that included images and interviews with an anatomy body donor as well as images of medical students handling and dissecting their cadavers in the anatomy laboratory resulted in an increase in negative attitudes toward dissection, but an initial reaction to the cadaver was more positive than originally anticipated.<sup>54</sup> Overall, it seems that

recordings whose content approaches the real experience that the student will have in the dissection room are effective. Dissection videos have been incorporated in many classrooms, and although evidence regarding their impact on academic performance remains uncertain, students appear to appreciate them as a resource ([55] and references therein). The creation of cadaveric videos has increased in recent years, as they have provided one option to continue teaching anatomy using cadaveric specimens, especially in a time when all in-person practical teaching was prohibited during the COVID-19 pandemic.<sup>56</sup> Indeed, this circumstance created the temporary need for pure remote education that led to an increase in the production of different types of anatomic videos, which were very appreciated by students.<sup>57</sup>

The video that the students watched in this study is a “cadaveric video” made by the instructors, as it shows a prosection of a canine cadaver and displays the contents that later, the students would have to study in the dissection room. Previous works have shown that students enjoy using cadaveric videos made by their instructors to learn anatomy.<sup>49,55,56</sup> In this sense, the vast majority (90.8%) of students of this work considered the video useful to adapt and become familiar with dissection.

In any case, the use of videos would be a complement and not the main resource, and in this sense, a study that compares the academic results of students who studied the anatomy of the bovine abdominal cavity through prosections or videos showed a better score in the first group, and the major comment in favor of cadaver prosection pertained to the sensory experience.<sup>58</sup>

Nevertheless, even though the previsualization of videos related to the practicals was shown to be a good tool to prepare students for dissection, other approaches have also been proposed. An exercise consisting of drawing how they feel about the dissection experience and discussing their drawings with their peers has been useful to normalize the variety of emotions that anatomy students experience.<sup>59</sup> Increasing the information provided about the dissection course (body donation program, techniques of body preservation, counseling services), offering open days to show the dissection room, sessions for students to share emotions, the use of other audiovisual material, peer discussions, discussions with peer teachers (tutors students) or establishing thanksgiving ceremonies at the end of the dissection course<sup>27</sup> can be useful to further reduce stress prior to anatomy sessions involving cadavers. Most of those interventions could probably be applied to veterinary students, and even though the final satisfaction of students after this first practical session in this study was high (8.9 out of 10 points), some strategies should be developed to improve students' learning experience in the dissection room and their academic results. The correlation between higher levels of anxiety and lower practice scores, although low, suggests that the reduction in students' stress and anxiety levels could also improve their opinion of the practices.

### Limitations of the study

The limitations of this study are the fact that no previous studies evaluating veterinary students' thoughts and emotions when facing

cadavers for the first time have been published with which to compare our results. On the other hand, the results related to nationalities should be interpreted with caution due to the small number of students from other countries. Finally, in this study, no open questions were raised, so no comments were obtained on the qualitative perceptions of the students.

## CONCLUSIONS

This work shows that students face anatomy teaching with positive feelings but also with some degree of stress, which decreases by the end of the first session. The anxiety levels observed in this study are slightly lower than those of students from other health science disciplines and very close to those of physical therapy students. Although females showed slightly higher anxiety levels, the differences were not statistically significant. The nationality of the students, even with the previously indicated limitations of this study, did not influence their responses. However, the levels of anxiety did influence the willingness of the students to donate the body of their pets, since those predisposed to do so had lower levels of anxiety at the beginning of the practice than those who did not. Finally, according to the students' subjective evaluation, the use of videos related to practical sessions was an effective strategy to improve the emotional preparedness of students for cadaver handling and the learning experience.

## ACKNOWLEDGMENTS

The authors would like to express their gratitude to the first-year veterinary students during the 2021–2022 academic year for their participation.

## CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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**How to cite this article:** Terrado, J., Gómez, O., Chicharro, D., García-Manzanares, M., Juárez, M., Romo-Barrientos, C., Mohedano-Moriano, A. & Criado-Álvarez, J. J. (2023). Anxiety, emotions, and thoughts of veterinary medicine students during their first visit to the dissection room. *Anatomical Sciences Education*, 00, 1–10. <https://doi.org/10.1002/ase.2258>