Stress and Depression among Veterinary Medical Students

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ABSTRACT

While existing literature suggests that professional students (e.g., medical, dental, law, nursing, etc.) experience high levels of stress and depression, the experiences of veterinary medical students have been less well examined. The purpose of this study was to explore the levels of stress and depression among veterinary medical students and to examine the relationship between these variables. Study participants were 1,245 veterinary medical students from North America. The findings provide support for the assertion that veterinary medical students experience high levels of stress and depression. Results also indicated that there is a correlation between stress and depression for veterinary medical students and that female students experience higher levels of stress and depression than their male counterparts.

Key words: student health, well-being, mental health, stress, depression

Professional degree programs such as medical school, nursing school, dental school, law school, and veterinary medical school are often considered very rigorous and demanding.[1–6] Competition,[7] heavy course workload,[3,6] financial pressures,[3,8–10] and sleep deprivation[11,12] can make such programs particularly challenging for students. While students generally appear to experience stress in professional programs, there is some evidence that veterinary medical students suffer higher rates of depression and anxiety than students in other professional programs.[13] The purpose of this study is to examine the levels and nature of stress and depression found among veterinary medical students.

STRESS, DEPRESSION, AND VETERINARY MEDICAL TRAINING

The construct of stress has been defined in many ways. For the purposes of this study, stress refers to the physiologic and emotional changes brought on by stress hormones (e.g., adrenaline, noradrenaline, and cortisol). While the onset of stress (e.g., increased heart rate, glycogen, breathing) is an adaptive short-term biological response, the body's failure to return to a state of homeostasis can lead to chronic stress and elevated hormone levels. Chronic stress can deplete the body and contribute to or exacerbate mental and physical illness.[14]

Practice and training in veterinary medicine poses some unique challenges. Veterinary medical students must become proficient in diagnosis and treatment of many animal species, requiring extensive coursework across species.[15] In addition to accurately diagnosing and treating patients, students must also navigate human interactions with the pet owners,[16] who often present with strong emotions, including grief and anger. Ethical dilemmas and responsibilities that arise regarding performing euthanasia[17,18] or procedures that they feel are unnecessary (e.g., cosmetic procedures such as ear cropping)[19] can be challenging for students. Finally, students face possible physical harm by the animals they are caring for through bites, kicks, scratches, or exposure to serious diseases such as rabies.[20]

While a certain amount of stress can enhance learning,[21] excessive stress can negatively affect cognitive functioning and learning by decreasing attention,[22] reducing concentration,[15,22–24] impinging on decision making,[25] and reducing students' ability to establish good relationships with patients.[26] In addition, stress can negatively affect physical health (e.g., by increasing one's risk for heart disease) and mental health.[14,27]

Chronic and untreated stress has been linked to the onset of potentially debilitating conditions such as depression.[28] Indeed, research has found that up to 38% of veterinary medical students in any given year report feeling depressed[29] and report levels of depression that are significantly higher than the general population.[16]

The present study investigates the psychological health of veterinary medical students, with a particular focus on the experiences of stress and depression. Of primary focus are the following research questions and hypotheses:

1. Do veterinary medical students suffer from elevated levels of stress? We hypothesized that students would suffer from elevated levels of stress and that there would be differences in stress based on gender and academic year in the program.
2. Do veterinary medical students suffer from elevated levels of depression? We hypothesized that students

would suffer from elevated levels of depression and that there would be differences in depression based on gender and year in program.
3. Is there a relationship between stress and levels of depression? We hypothesized that there would be a strong, positive relationship between stress scores and depression scores.
4. Are some types of stressors more predictive of depression than others and are there differences by year? This was an exploratory question and hence we offered no hypotheses.

METHODS

Participants and Procedures

This study was approved by the Institutional Review Board at the first and fourth authors' former university and by the AAVMC Survey Committee. Participants were 1,385 students from 33 colleges of veterinary medicine in North America. A total of 1,245 participants completed at least 90% of the measures and were included in the data analyses. Ninety percent of participants were enrolled in training programs in the United States and 10% in Canada. The majority of participants were female (88.4% female; 11.2% male) and their ages ranged from 18 to 54 ($M = 25.62$, $SD = 3.69$). Participants self-identified their ethnicity as the following: 89.3% White (not Hispanic), 2.4% Hispanic/Latino, 3.1% Asian/Pacific Islander/Asian American, 2.5% Bi-racial, >1% African American/Black, and >1% Other (1% did not respond). Year in program was represented fairly evenly across year 1 (25.7%), year 2 (25.8%), year 3 (22.4%), and year 4 (22.1%).

Measures

Stress—Stress was measured using the Veterinary Medical Stressors Inventory (VMSI).[30] The VMSI consists of 55 items across three subscales (Clinical Graduation, Academic, and Negative Evaluation) that students rate on a scale of 1 to 7, with higher scores indicating elevated levels of stress. Level of stress was determined using a mean score, whereby a mean of 4 or above indicated a moderate level of stress. Previous research reported a Cronbach's alpha of .92 and subscale reliability alphas of .92, .91, and .83, respectively.

Depression—Depression was measured using the Center for Epidemiological Studies Depression Scale (CES-D).[31] This 20-item inventory measures cognitive, affective, and behavioral symptoms of depression using a 4-point Likert scale. Scores range from 0 to 60, with higher scores indicating greater depression and a score of 16 or above indicative of mild to moderate depression. Previous research reported a Cronbach's alpha of .80, with test–retest reliability coefficients ranging from .51 to .57 over 2 to 8 weeks.[31] An alpha reliability of .89 was achieved in this study.

RESULTS

A one-way between-groups multivariate ANOVA (MANOVA) was performed to determine significant differences between students from the United States and Canada. As there were no statistically significant differences between these groups on the combined dependent variables of stress and depression ($F[2, 1{,}239] = 0.84$, $p = .432$; Wilks's lambda = .10; partial eta squared = .00), the sample was retained and analyzed as a North American sample of veterinary medical students.

Research question 1—The percentage of students endorsing moderate levels of stress ($M \geq 4$) on the VMSI was compared with the prevalence of stress among college students. The percentage of participants endorsing moderate levels of stress (49.1%) was similar to that of college students in general according to the literature.[32] Thus, it appears that, like many college students, veterinary medical students suffer from elevated levels of stress. To identify differences by gender and year, a 2 (gender) × 4 (year) ANOVA was performed. Significant main effects were found for gender ($F[1, 1230] = 29.12$, $p < .001$) and year ($F[3, 1230] = 5.77$, $p = .001$), although no significant interaction was found. The medium-sized effect ($d = -0.47$) for gender indicated that female students endorsed higher levels of stress. Post hoc comparisons using the Bonferroni correction indicated the mean stress score for first-year students ($M = 176.83$, $SD = 48.26$) was significantly lower than the mean stress scores reported by second-year students ($M = 193.43$, $SD = 45.83$; $d = -0.34$), third-year students ($M = 196.62$, $SD = 49.17$; $d = -0.41$), and fourth-year students ($M = 188.24$, $SD = 48.79$; $d = -0.23$). Results provide support for the hypothesis that level of stress among veterinary medical students would vary by gender and year.

Research question 2—The mean depression score ($M = 21.55$, $SD = 10.89$) on the CES-D indicated that the average student in the sample was at least mildly to moderately depressed, with 66.4% of the sample reporting scores that fall in the mild to moderate depression range (16 or higher). The scores on the CES-D in this study were higher than those of veterinary medical students in other studies (32%),[13] college students (41%),[31] and human medical students (23%).[33] To test for differences by gender and year, a 2 (gender) × 4 (year) ANOVA was performed. There were statistically significant main effects for gender ($F[1, 1230] = 7.11$, $p = .008$) and year ($F[3, 1230] = 4.80$, $p = .002$); however, no significant interaction was found. The small but meaningful main effect ($d = .24$) for gender indicated that female students in this study endorsed higher levels of depression than male students. Post hoc pairwise comparisons using the Bonferroni correction were performed to examine the simple effect. Results indicated the mean depression score for fourth-year students ($M = 19.08$, $SD = 11.14$) was significantly lower than for second- ($M = 23.50$, $SD = 10.55$; $d = .41$) and third-year students ($M = 21.85$, $SD = 11.11$; $d = .25$). Results provide support for the hypothesis that level of depression among veterinary medical students would vary by gender and year.

Research question 3—The relationship between stress and depression was examined using *r*. Results indicated a strong ($r = .53$) relationship between stress and depression. The strength of this relationship was similar for participants regardless of gender (males: $r = .57$; females:

Table 1: Unique contribution of stressors in the prediction of depression

	R^2	*B*	*R*	sr^2
Year 1	.35			
Clinical Graduation Subscale		−.06	.04	.00
Academic Subscale		.59*	.51	.26
Negative Evaluation Items Subscale		.05	.04	.00
Year 2	.30			
Clinical Graduation Subscale		−.09	−.08	.01
Academic Subscale		.54*	.47	.22
Negative Evaluation Items Subscale		.08	.07	.01
Year 3	.27			
Clinical Graduation Subscale		.10	.08	.01
Academic Subscale		.47*	.38	.14
Negative Evaluation Items Subscale		−.02	−.02	.00
Year 4	.26			
Clinical Graduation Subscale		.16*	.12	.01
Academic Subscale		.38†	.26	.07
Negative Evaluation Items Subscale		.03	.02	.00

* $p < .001$
† $p < .01$

$r = .52$) or year in the program (year 1: $r = .51$; year 2: $r = .51$; year 3: $r = .56$; year 4: $r = .57$).

Research question 4—Research question 4 sought to determine whether type of stress was differentially predictive of depression. Four separate multiple regressions were performed (one for each of the 4 years in the program) with the predictor of depression and the criteria of Clinical Graduation Subscale, Negative Evaluation Subscale, and Academic Subscale. Results indicated that the Academic Subscale predicted depression in all 4 years (see Table 1): year 1 ($F[3, 315] = 56.32$, $p < .001$), year 2 ($F[3, 341] = 48.10$, $p < .001$), year 3 ($F[3, 299] = 36.72$, $p < .001$), and year 4 ($F[3, 271] = 32.62$, $p < .001$). The Clinical Graduation Subscale predicted depression in year 4 only ($F[3, 271] = 32.62$, $p < .001$). The Negative Evaluation Subscale did not predict depression in any year.

DISCUSSION

This study examined the experiences of stress and depression among veterinary medical students, with a particular focus on the experiences of stress and depression. Using a sample of students in 33 different veterinary medical schools in North America, results indicated stress levels similar to those reported by college students in general and depression levels that reach the level of mild to moderate in just over 66% of the sample. Differences in stress and depression scores were found by both gender and year in the program. Further, different types of stress were predictive of depression across years in the program.

Level of Stress

Nearly half of the students surveyed (49%) were experiencing at least a moderate amount of stress ($M \geq 4$) on the VMSI. Though this percentage seems high, conclusions regarding differences between veterinary medical students and other professional or college students are unclear across the literature due to differences in how stress is defined, measured, categorized (e.g., personal, academic, professional identity), and reported.[34] One recent large study of over 90,000 college students that reported on overall level of stress found that nearly 43% of college students felt "more than average stress." It is important to note, however, that college samples may not be representative of veterinary medical students. Moreover, highly competitive (typically less than 50%) admissions rates[35] among training programs might suggest that, as a high-achieving group, veterinary medical students may be able to tolerate a much higher level of stress before they would identify themselves as stressed.

Gender—In the current study, women had higher basal levels of stress at year 1 and experienced higher levels of stress (51%) than men (37%) throughout their 4 years of veterinary medical school, which is consistent with the broader literature on professional students.[36–38] In a recent large study of over 90,000 college students, more women (46%) than men (37%) reported "more than average stress."[32] Moreover, longitudinal investigation found that female students had a higher mean distress score than men at both entrance to medical school and after the first year.[8] Thus, it seems that veterinary medical students, females in particular, experience elevated levels of stress, as is the case with college students and professional students.

Year—In this study, students in their first year of study reported significantly less stress than student in years 2 to 4. This may suggest that stress is cumulative in nature. In most veterinary programs, first-year students have not begun clinical rotations and thus have not encountered the many stressors related to clinical work (e.g., angry

clients, diagnostic errors, pet death). This finding is consistent with results reported by Cawunder and Hugh-Jones[39] and by Kelman (1978),[40] yet differs from those reported by Strand et al.[16] It appears that additional investigation is warranted in this area.

Level of Depression

Sixty-six percent of the sample had symptoms suggesting they may be mildly to moderately depressed. This rate of clinically significant CES-D depression scores is higher than in other studies of veterinary medical students (32%),[13] college students (41%),[31] and human medical students (23%).[33] While the rate of clinically significant CES-D scores is higher for the veterinary medical students included in this study than for those included in the Hafen et al. study,[13] it is important to note that the latter study included only 78 participants, all from the same university. The present study included over 15 times the number of participants from 33 different veterinary medical schools. Thus, it is likely that the result reported here is more representative of the veterinary medical student population.

Gender—The female students in this study scored significantly higher on the depression inventory than males across all 4 years of study. This result is consistent with findings among professional students indicating that women experience higher levels of depression than men while in school.[18,37,38,41]

Year—Rates of depression were highest in year 2 and year 3 and lowest in year 1 and year 4. These rates of depression mirror the rates of stress found in the present study, which is further support for the hypothesis that some years of veterinary medical school are experienced as more stressful than others. Since chronic stress has been shown to lead to depression,[42] it makes sense that if women are already feeling high levels of stress when entering veterinary medical school, they are also more likely to experience high levels of depression.

Stress Predicting Depression

We found a strong correlation between stress and depression, which is consistent with the available literature.[42,43] Notably, this relationship was similar regardless of year or gender. Source of stress was an important predictor of depression. Given the intensity and rigor of veterinary medical education, it is not surprising that the Academic Subscale items predicted depression scores across all 4 years of veterinary medical training. Also logical was the finding that items on the Clinical Graduation Subscale predicted depression more strongly in students' final year of training than in the previous 3 years. Curious, however, was the result that the Negative Evaluation Subscale was not a significant predictor of stress, as might be expected from Kent-Arce's model. Given the ongoing nature of evaluation during veterinary medical training, one would likely expect to find that fears of negative evaluation would contribute to negative emotions among students. Further research is needed to better understand the nature of stress caused by negative evaluation fears.

CONCLUSION

The results of this study indicated that veterinary medical students suffer from high levels of stress and symptoms of depression throughout all 4 years of study. Further, the severity of stress and depression differs by gender, with females experiencing higher levels than males throughout all 4 years of training. Moreover, differences by year suggest that years 2 and 3 are most distressing and years 1 and 4 are least. It is logical that year 3 would be experienced as most stressful because students assume more clinical responsibility (e.g., involvement in surgery, teaching hospital clinical rotations) and consequent challenges and stressors (e.g., diagnostic errors, patient death, managing diverse clients). It is possible that among second-year students, the "honeymoon" period of year 1 is supplanted by additional pressure to keep up academically. This study also revealed a correlation between stress and depression. Finally, stress predicted depression, and the type of stress was differentially predictive for some years of the sample.

IMPLICATIONS, LIMITATIONS, AND FUTURE DIRECTIONS

As results of this study indicated that many students experience at least moderate levels of stress and depression, there are several implications for training and practice. Primarily, interventions should be targeted to meet the needs of all veterinary medical students, in particular females and students in years 2 and 3. Moreover, as these subgroups are at higher risk, it is prudent to examine and reduce barriers to accessing mental health services.

Despite its strengths, several limitations of this study can be identified. The sample employed in this study was not random and therefore carries risk of selection bias. While invitations were sent to all 33 schools of veterinary medicine, anonymous reporting procedures precluded our knowledge of how well the population of training programs was represented. In addition, all measures in this study were self-reported and the data were collected simultaneously rather than over a series of data collection events. Finally, it is inherently difficult to conclude whether veterinary medical students experience higher levels of stress than other professional or college students due to the lack of consistency across studies in definition and measurement of stress.

This study points to several directions for future research to better understand the relationship between stress and depression among veterinary medical students. First, to assess if veterinary medical students experience higher levels of stress than their peers in other professional programs, future researchers may want to collect independent comparison groups of multiple professional student populations, including veterinary medical students. Further, development of a standardized stress assessment would allow for such investigation. Future research should also seek to better understand the types of stressors that lead to depression for these students, such as major life events that have been shown to lead to depression (e.g., personal illness, death of a family member).[44–47]

This particular strand of future scholarship may be critical; several students in this study mentioned these types of events as the main source of their stress. Finally, several gaps in the current literature on the mental health of veterinary medical students could be addressed through a large cohort study to better understand the differences in students' levels of stress and depression depending on their year in the program. Such a study could also explore the effectiveness of services aimed at reducing stress and depression. As with the current study, this type of future research will continue to build upon the current knowledge of stress and depression among students and provide valuable information for those responsible for educating and caring for veterinary medical students.

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