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**Pilot Study: The Effect of Individual Versus Group Animal-Assisted Therapy on  
Undergraduate Student Anxiety**

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## Abstract

**Purpose:** The purpose of this study was to evaluate the relationship of Animal-Assisted Therapy (AAT) on undergraduate student test anxiety; comparing an individual AAT session to a group AAT session. AAT may be a solution for decreasing anxiety for undergraduate students. The study adds empirical knowledge to the field of AAT and student anxiety coping methods. The study question was: What is the effect of one-on-one and group Animal-Assisted Therapy sessions on undergraduate student anxiety?

**Methods:** This study used a convenience sample randomly assigned to either a group of 3 to 5 students ( $n=9$ ) or an individual AAT session ( $n=10$ ) with a certified therapy dog, using a pre-test before session implementation and a post-test following an exam the same day as the session. The dog handler was present for all sessions but did not encourage any interaction between the student and dog, to avoid altering student desired activity. The State-Trait Anxiety Inventory, a validated anxiety tool, was administered via an online Qualtrics form. Online consent was presented prior to the online survey and completion of the survey implies consent.

**Results:** Animal-Assisted Therapy appears beneficial in decreasing Solo *State* anxiety ( $p < 0.001$ ) and Group *State* anxiety ( $p < 0.001$ ) in undergraduate students but does not appear to affect Solo *Trait* anxiety ( $p=0.056$ ) or Group *Trait* anxiety ( $p=0.107$ ). No statistical significance was seen when comparing post-intervention effects on *State* anxiety ( $p=.575$ ) and *Trait* anxiety ( $p=1.000$ ) in 1:1 versus group sessions.

**Discussion:** Since AAT in our study was a short, one-time event, these results were not unexpected. One-on-one sessions vs. group sessions do not appear to affect anxiety differently in this pilot study. Due to the small participant number, further research is needed. This study will

continue during Fall 2023. The implications of this study show that the ‘temporary state’ of anxiety was relieved in both session types, but the ‘general’ feeling of a participant’s anxiety did not significantly decrease.

## **Pilot Study: The Effect of Individual vs Group Animal-Assisted Therapy on Undergraduate Student Anxiety**

### **Introduction**

A variety of stressors such as academic requirements, financial strain, inadequate sleeping and eating habits, and social difficulties affect mental well-being (Kivlen, 2022). The utilization of animals as an intervention for improving psychological well-being, such as Animal-Assisted Therapy (AAT), has been “enthusiastically received by university administrators and students”(Pendry et al., 2020, p.2). AAT is defined as the “deliberate inclusion of an animal...to the surroundings of an individual, or group, with the purpose of improving physical, social, emotional, and cognitive function” (Waite et al., 2018, p.49).

The purpose of this study was to evaluate the relationship of Animal-Assisted Therapy (AAT) on undergraduate student test anxiety, comparing an individual AAT session to a group AAT session. AAT may be a solution for decreasing anxiety for undergraduate students. The study adds empirical knowledge to the field of AAT and student anxiety coping methods. Our PICOT question was: “What is the effect of one-on-one and group Animal-Assisted Therapy sessions on undergraduate student anxiety?”

### **Literature Review**

#### ***Introduction***

In the past years, the level of anxiety in university students has increased immensely. Students experience stress from a variety of things: academic requirements, financial strain, inadequate sleeping and eating habits, and social difficulties (Kivlen et al., 2023). Recently, new difficulties such as “the overwhelming stimuli of technology, employment concerns, and increasing student debt” have emerged for university students (Kivlen et al., 2023, p. 1). Despite the latest challenges, academic struggles remain one of the greatest stressors associated with

college academia, which “44% of students [claim] to be the ‘most traumatic or difficult to handle’” (Pendry et al., 2019, p. 1). The primary reason for higher-level education is to obtain a degree, in order to do that, students must dedicate a significant amount of time towards coursework to maintain passing grades and a high GPA. This extreme commitment to academics can lead to a significant impact on an individual’s well-being as “the high prevalence of mental health issues [on college campuses] is a serious problem” eliciting stress-related symptoms that “decrease students’ performance and increase risk of dropout” (Pendry et al., 2020, p. 2).

The effects of stressors associated with obtaining a university education are often exacerbated by the increasing demand to excel in coursework and examinations. Intense pressure to perform well on collegiate exams generates feelings of anxiety to surface while in the testing environment. The symptoms of anxiety that students get when related to an exam are known as ‘test anxiety’ (TA). TA is defined as “the set of phenomenological, physiological, and behavioral responses that accompany concern about possible negative consequences or failure on examination or similar evaluative situations” (Kaur et al., 2023, p. 1). The presence of TA can have detrimental effects on academic success, compromise students’ motivation and attitudes toward learning,” and increase the “risk of developing larger psychiatric problems” (Pendry et al., 2020, p. 2). To combat these issues, college campuses have developed psychological well-being resources, yet it has been found that “only 29% of [students seek] mental health services... and 20% [of university students] were interested in mental health services but did not seek or access them because of long waitlists and scheduling conflicts” (Kivlen et al., 2023, p. 2). Despite the in-person/one-on-one counseling services offered as supportive measures at universities, many students may not know how to or be comfortable with accessing and utilizing these resources.

Novel psychological services, such as Animal Visitation Programs (AVP), are currently “being implemented across a range of healthcare environments, particularly those in mental health and well-being settings” (Pendry et al., 2019, p. 2). The utilization of animals in treatment plans for improving psychological well-being, such as Animal Assisted Therapy (AAT), has been “enthusiastically received by university administrators and students” (Pendry et al., 2020, p. 2). AAT can be defined as the “introduction of an animal into the immediate surrounding of an individual, or group, as a medium of interaction with therapeutic purposes” (Waite et al., 2018, p. 1). Animals involved in AAT work to “improve the physical, social, emotional, and cognitive functions of humans” (TherapyDogs, 2018). The significant effects that AAT has on reducing anxiety is an “informal and low-cost approach to supporting student well-being” and helps the development of essential coping skills (Kivlen et al., 2023, p. 2).

A systematic review of literature concerning the effects AAT has on reducing anxiety is imperative to developing support for our honors research project on AAT’s influence on anxiety in undergraduate students. The combination of this pilot study on AAT, specifically on the effects of individual versus group AAT in undergraduate students, along with data from future research will make for a thorough analysis of information. When evaluating the articles reviewed in this paper, the following gaps were found: the consistency of how the animals were being presented to the participants, what prior training the animals and handlers had, what breed of animal was being used for AAT, the lack of standard intervention protocols, and the frequency of the programs’ implementation of interventions. Had these factors shown consistency, different outcomes could have resulted.

## ***Methods***

Fourteen articles were reviewed related to the PICOT question: “In students, how does animal-assisted therapy with dogs compare to no animal-assisted therapy with dogs affect anxiety levels within the span of a semester?” A systematic review of articles and the PRISMA 2009 checklist were utilized.

**Information Sources.** The journal articles in this review were found from the utilization of various search filters on a research database called PubMed from the National Institute of Health (NIH) National Library of Medicine. PubMed provided sources from the Multidisciplinary Digital Publishing Institute (MDPI) and Taylor Francis Online.

**Search Strategy.** When searching PubMed, the words “Animal Assisted Therapy” and “Anxiety” or “Animal Therapy” and “Anxiety” were derived from the PICOT question and placed into the search bar. It was limited by filtering out only the randomized control trial and systematic review articles to use, along with articles published from 2018 to current.

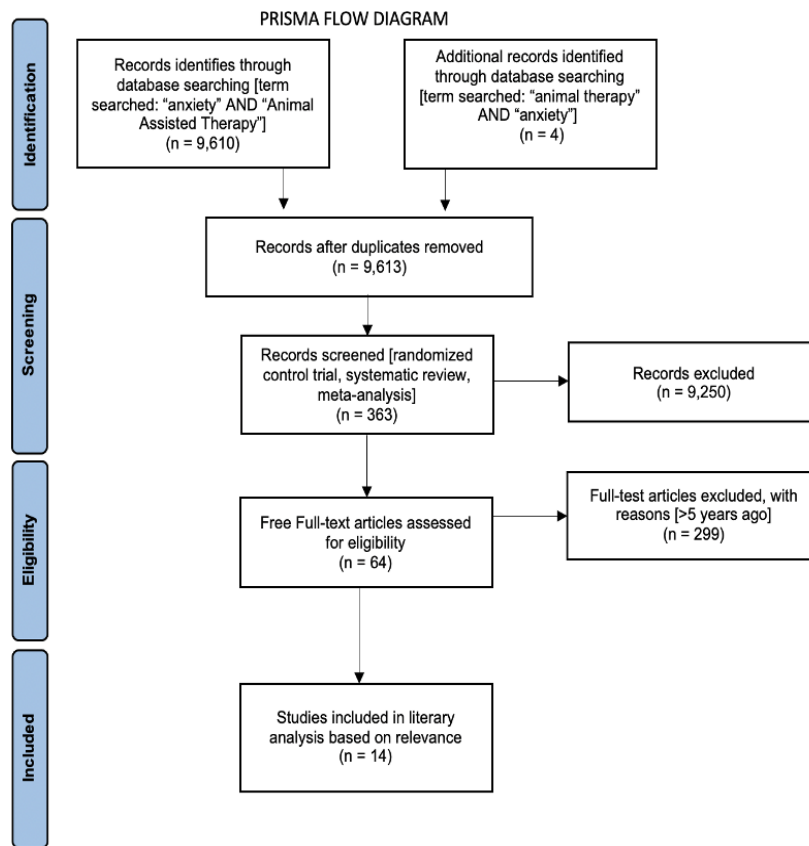
**Inclusion/Exclusion Criteria.** The articles were narrowed down due to the specific nature of the keywords placed in the search bar. However, articles were further restricted by only selecting articles that were Meta-Analyses, Randomized Controlled Trials, Systematic Reviews, published from 2018 to current, and free full text. Articles were included based on relevance to the topic of our paper, such as research on anxiety and animal-assisted therapy. Because research concerning group versus individual AAT sessions and undergraduate students is limited, we expanded our scope of research to include all ages of students and various majors, and in various countries including but not limited to the United States. We also used a combination of randomized control trials, research studies, and meta-analysis articles to assemble the articles included in our literary analysis.

**Data Extraction.** Key points from analysis of articles can be found in the synthesis table (see Table 1). The information extracted contained types of studies, sample sizes, the format of



data measured, and the findings of each. This table helped gather and compare the different studies done in one compact location. We also looked at the statistics of each study, and the background research that was done, and used that in the discussion of our paper.

**Search Results.** The search with “animal-assisted therapy” and “anxiety” yielded 9,610 articles from PubMed. There was a prior search done in a miniature literature review which yielded 4 results; this yielded one duplicate article between the two. 9,250 articles were excluded and 363 were kept through using a filter for only randomized control trials, systematic reviews, and meta-analysis articles. From that, a 5-year filter was placed, leaving only 64 articles left. 14 were chosen out of the analysis based on relevance to our study. The PRISMA Flow Diagram below demonstrates this process (see Fig. 1).



**Figure. 1.** PRISMA Flow Diagram of study screening and selection process.

## ***Results***

### **Characteristics of Included Studies.**

Anderson et al. (2021) was a quantitative design with one-way MANOVA and ANOVA which studied 90 participants and their level of stress and anxiety pre- and post-medication calculation tests in nursing students. Participants were “divided into two groups with participants randomly assigned to an intervention group and a control group” where both groups completed a Spielberger State-Trait Anxiety Inventory (STAI) questionnaire for baseline data (Anderson et al., 2021, p. 2). One group was allowed to “complete an interaction with the therapy dogs for 35-45 minutes prior to the medication calculation exam” while the control group “interacted with each other for 35-45 minutes in a separate and secluded room... without dogs present” (Anderson et al., 2021, p. 3). The STAI was completed before the interaction and after the interaction before the test and completed again “immediately following the medication calculation exam” (Anderson et al., 2021, p. 3).

Ein et al. (2018) was a meta-analysis that examined articles regarding the effects of Pet Therapy (PT) on parameters such as blood pressure, heart rate, State-Trait Anxiety Inventory (STAI), Stress Visual Analogue Scale (SVAS), Beck Anxiety Inventory (BAI), Anxiety Numeric Rating Scale (ANIS), Anxiety Visual Analog Scale (AVAS), Burns Anxiety Inventory (BAS), Stress Arousal Checklist (SAC), and the Symptom Distress Scale (SDS). The meta-analysis included “a total of 28 articles with 34 independent samples [with] a total of 1,310 participants across various ages, health conditions [and] almost all studies included only a dog as the therapeutic animal (with the exception of one study that included a cat and one study that included a cat and a dog)” (Ein et al., 2018, p. 480). Comprehensive meta-analysis software was used to examine the data and put together a comprehensive statistical analysis.

The systematic review and meta-analysis conducted by Feng et al. (2021) investigated eight articles concerning the effects AAT had on pain, anxiety, depression, stress, and blood pressure in hospitalized children and teenagers. Of the 390 total participants, 193 were in the intervention groups and 197 were in the control groups. Participants in the intervention group “received dog-assisted therapy [sessions, which] included brushing, petting, feeding, dressing, talking to, and playing with the dogs” for an average of “6-30 min...2-12x/month, just once, or [at random frequencies]” (Feng et al., 2021, p. 14). Participants in the control group “received standard care,...a plush-stuffed dog, or puzzle-assisted interventions” (Feng et al., 2021, p. 14). Data from the eight studies were measured on a variety of assessment scales and analyzed using RevMan Software.

Gebhart et al. (2020) conducted a randomized control trial that measured students ( $n = 72$ ) divided into the random following groups ( $n = 18$  each) “(i) animal-assisted therapy, (ii) music therapy, (iii) mandala painting, [or] (iv) control group” (p. 1). For the purpose of this review, the primary focus was placed on the group (i), as it holds the most relevance. In group (i) “dog intervention was carried out in small groups by four trained therapy dogs and their handlers to ensure direct contact with a dog for each participant” (Gebhart et al., 2020, p. 3). Participants in group (iv) “spent an uninstructed free hour...[in which they] were allowed to spend their time in whatever way they liked” (Gebhart et al., 2020, p. 4). The State Anxiety Inventory (STAI-State) and Visual Analogue Stress Scale (VASS) were used to measure psychological stress “on a normal school day and a couple of weeks later prior to a written examination [and then after] randomization was performed” (Gebhart et al., 2020, p. 5). Salivary IgA levels and cortisol levels were also taken at the same time as a reliable biomarker to measure physiological stress.

Grajfoner et al. (2017) included a mixed design with MANOVA with three conditions and three questionnaires studying emotions – specifically anxiety levels. The three conditions

consisted of “45 participants in a standard Thera-Pet (TP) session, where participants interacted with both a handler and their dog. 41 participants were allocated to a control condition where participants interacted with a dog only (DO); the remaining 46 participants [took] part in a control condition in which the participants interacted with a handler only (HO)” (Grajfoner et al., 2017, p. 2). Seven dogs were provided through a service called Thera-Pet, which was sponsored by Canine Concern Scotland Trust. Findings were measured with the Warwick–Edinburgh Mental Well-Being Scale (WEMWBS), State-Trait Anxiety Inventory (STAI), and UWIST Mood Adjective Check List (UMACL). Statistical analysis paired t-tests, pre-well-being tests, and post-well-being tests were utilized to establish a summary of the findings (Grajfoner et al., 2017).

The systematic review conducted by Jones et al. (2019) analyzed seven studies with a total of 134 participants from 10 to 18 years old and sought to explore the impact Canine-Assisted Psychotherapy (CAP) as a mental health treatment has on adolescents with psychological or psychiatric disorders. The seven studies included in the systematic review “[examined] a range of presenting issues including mood, anxiety, trauma, anger and disruptive behavior, self-concept, adaptive and global functioning, and clinical severity of psychiatric illness” (Jones et al., 2019, p. 7). Interventions employed in the reviewed studies included the HART curriculum with AAT curriculum ( $n = 1$ ), individual counseling ( $n = 2$ ), individual counseling with a canine followed by group counseling ( $n = 1$ ), and group-based interventions ( $n = 3$ ) (Jones et al., 2019, pp. 13-16). Results from the various CAP interventions were assessed using therapist reports, youth self-reports, observations, and qualitative thematic analyses (Jones et al., 2019).

Effective interventions to reduce test anxiety (TA) among a total of 761 participating nursing students were explored through the eleven studies included in the systematic review by

Kaur et al. (2023). Interventions differed between all eleven studies, “three compared aromatherapy hand massage to unscented hand massage, emotional freedom technique with music therapy, and music therapy with aromatherapy and combination of both” (Kaur et al., 2023, p. 5). Other studies examined interventions such as confidence training ( $n = 1$ ), coping programs ( $n = 1$ ), aromatherapy on TA ( $n = 2$ ), emotional freedom techniques ( $n = 1$ ), music therapy ( $n = 1$ ), animal-assisted therapy ( $n = 1$ ), and guided imagery ( $n = 1$ ) (Kaur et al., 2023, p. 5). Analysis of “test anxiety before and after an intervention” was completed in six studies and the remaining five studies “tested anxiety levels at the beginning of the term and then after an OSCE examination ( $n = 1$ ), before the first examination and then one week after the third examination ( $n = 1$ ), one day before the examination and one day after the examination ( $n = 1$ ), before a mid-semester examination and then just before a final examination ( $n = 1$ ), and at four different points; [in the middle of the semester, the start of the next semester, post-intervention, and post-examination] ( $n = 1$ )” (Kaur et al., 2023, pp. 11-12). Length, frequency, and anxiety assessment tools differed between the studies.

The randomized controlled trial conducted by Kivlen et al. (2023) assessed the effects of canine-assisted interventions (CAI) on student well-being, quality of life, stress, anxiety, and occupational performance. Participants ( $n = 104$ ) were randomly assigned in groups of 3 to 5 to “the experimental ( $n = 53$ ) or waitlist control ( $n = 51$ ) control” with interventions “recurring weekly 35-minute CAI on graduate students...for 8 weeks” (Kivlen et al., 2023, p. 3). Pre- and post-intervention data were collected from the experimental and waitlist control conditions using the following assessment measures: World Health Organization Quality of Life–BREF (WHOQOL–BREF), Perceived Stress Scale (PSS), Stress Visual Analogue Scale (SVAS), Patient-Reported Outcomes Measurement Information System (PROMIS), and the Canadian Occupational Performance Measure (COPM) (Kivlen et al., 2023).

Parbery-Clark et al. (2021) conducted a meta-analysis and systematic review of randomized control trials examining eleven different articles regarding improvement of mental health outcomes in higher education (Parbery-Clark et al., 2021). The studies were conducted both in the US and internationally. Studies employed both “dogs and horses” and varied between group and individual sessions. Some sessions “allowed free interaction with the animals and two used a structured format” (Parbery-Clark et al., 2021, p. 8). They also varied between single and multiple sessions.

Effects of Human-Animal Interaction (HAI) with therapy dogs in a stress management program for ‘at-risk of failing’ college students were examined through a randomized controlled trial by Pendry et al. (2020). The program was conducted over a 12-week period, utilized three composite scales – *Will*, *Skill*, and *Self-Regulation* – from the Learning and Study Strategies Inventory 2nd Edition (LASSI) diagnostic test to assess learning strategies, and randomly assigned the 309 participants ( $N_{risk} = 146$ ) to one of three conditions. The first condition ( $n = 97$ ,  $N_{risk} = 44$ ) was “Academic Stress Management (ASM) [where students] engaged in an existing, evidence-based program using content presentations, guided activities focused on enhancing self-regulation, and metacognitive skill training” (Pendry et al., 2020, p. 7). The second condition ( $n = 103$ ,  $N_{risk} = 52$ ) was “Human-Animal Interaction (HAI-O) [which] featured semi-structured HAI sessions where students engaged in animal-assisted activities...without any exposure to ASM content” (Pendry et al., 2020, p. 7). The third condition ( $n = 109$ ,  $N_{risk} = 50$ ) was “Enhanced Human-Animal Interaction (HAI-E) [in which] students divided their time equally between ASM curriculum and exposure to animal-assisted activities” (Pendry et al., 2020, pp. 7-8). The schedule of sessions for participants was as follows: “the first week spent completing baseline assessments (Week 1), followed by participation in a series of four consecutive weeks of one-hour long programming sessions (Week 2–5), followed by a week of

posttest assessments (Week 6), a hiatus of six weeks, and then follow-up assessments (Week 12)” (Pendry et al., 2020, p. 4). Participants included in the current analyses are those who attended the baseline assessment and at least one program session (Pendry, 2020).

Pendry et al. (2019) included a mixed-method design with realist thematic analysis. The various types of stress studied included “motivation, goal setting, sleep habits, and management of test anxiety,” which were then averaged into a composite score for perceived behavior change (Pendry et al., 2019, p. 8). Students ( $n = 307$ ) were placed in groups based on time spent with the animals and the different stress management information presented to them. The first group was the “Academic Stress Management condition (ASM) engaged in an existing, evidence-based program using content presentations” (Pendry et al., 2019, p. 4) The second group was the “Human-Animal Interaction condition (HAI-O) featured semi-structured HAI sessions during which students engaged in guided animal-assisted activities with therapy dogs and their handlers for the entire program period without any exposure to evidence-based stress management content” (Pendry et al., 2019, p. 4). The third group was the “Enhanced Human-Animal Interaction condition (HAI-E) [which] divided their time equally between engaging in a modified stress management curriculum... and exposure to the same animal-assisted activities... where students interacted with therapy dogs and their handlers” (Pendry et al., 2019, p. 4). These factors were then measured post-test with the Likert Scale (4 points and 5 points), Shapiro–Wilk tests, Nonparametric Kruskal–Wallis H tests, Dunn’s post hoc test with a Bonferroni correction, Braun and Clarke’s Six Phase Framework, which were analyzed into a one-way ANOVA (Pendry et al., 2019).

Ribeiro et al. (2023) conducted a systematic review of three randomized and non-randomized clinical trials with a total of 187 participants aged 18 or younger undergoing dental procedures. In all three included studies, AAT for the experimental condition was conducted

with a dog that was placed either “on a small bench near the child’s right shoulder,...near the children [in general],...or on the children’s lap” during various dental procedures (Ribeiro et al., 2023, p. 185). Anxiety levels in the children receiving AAT during dental treatments were measured through “peripheral skin temperature at 5-minute intervals” in one study and the utilization of a “Modified Childhood Dental Anxiety Scale (MCDASf) before and after procedures” in two of the studies (Ribeiro et al., 2023, p. 188).

The meta-analysis conducted by Waite et al. (2018) includes 22 articles with a total of 1,549 participants ranging from 2 to 88 years old. The studies investigate the impact of Animal Assisted Interventions (AAI) in reducing pain, anxiety, and distress in the medical setting. Analysis of the 22 studies revealed, “the average length of AAIs ranged from 8 to 1500 min, dogs were the only animal used in the AAIs, and group assignment for studies that included a control group was random for roughly half of the sample (46.5%)” (Waite et al., 2018, p. 51). Assessment of pain was measured in ten studies, assessment of anxiety was measured in ten studies, and assessment of distress was measured in nine studies (Waite et al., 2018, p. 53). Method, length, frequency, and assessment tools differed between the AAI studies included.

Wood et al. (2018) involved a pragmatic design under a therapeutic framework. It yielded 127 usable data points related to students’ stress through the State-Trait Anxiety Inventory and blood pressure levels pre- and post-intervention (Wood et al., 2018). Participants were placed with guide dogs for 15 minutes, then stats were taken. The data was analyzed with a reliable change index (RCI) and paired t-tests to show results (Wood et al., 2018).

**Summary of Findings from Included Studies.** Out of the 14 articles included, nine studied only students and the effects of animal-assisted interventions on various aspects of their psychological well-being ( $N_{anxiety} = 6$ ,  $N_{stress} = 5$ ,  $N_{other\ factors} = 4$ ) . Anderson et al. (2021),



Grajfoner et al. (2017), Kaur et al. (2023), Kivlen et al. (2023), Parbery-Clark et al. (2021), and Wood et al. (2018) all focused on anxiety levels in students and found statistical significance in animal-assisted therapy's positive effect on decreasing anxiety levels among participants in the intervention group. Of the five other included articles, the effects of AAT on variables such as emotional and behavioral symptoms (Jones et al., 2019), blood pressure and heart rate (Ein et al., 2018), pain (Feng et al., 2021), and distress (Waite et al., 2018) were measured from a range of participant ages and demographics. The articles that did not focus on students as their participants all showed that animal-assisted interventions had a statistically significant effect on the variable that was being measured. Of the 14 studies reviewed, Ein et al. (2018), Feng et al. (2021), and Ribeiro et al. (2023) showed no statistical significance in AAT reducing anxiety in their participants but did prove statistically significant data for AAT's effect on other variables that were measured.

| First Author, Year  | Conceptual Framework (if used) | Design/Method                                          | Sample/Setting                                                            | Major Variables Studied (and Their Definitions)        | Measurement                          | Data Analysis        | Findings                                                                                                   |
|---------------------|--------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------|
| [S1] Anderson, 2021 | Theoretical Framework          | Quantitative Spielberger State-Trait Anxiety Inventory | 101 students at a university, only 89 entered into final data information | Stress experienced: level of anxiety pre and post test | State-Trait Anxiety Inventory (STAI) | One-way MANOVA ANOVA | Statistically significance difference between intervention and control groups equaling the MANOVA of 0.761 |

|                 |      |                                                                                                             |                                                                                                                                                            |                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------|------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [S2] Ein, 2018  | None | Meta-Analysis                                                                                               | 28 articles with 34 independent samples, 1,310 total participants                                                                                          | Blood pressure (BP)<br>Heart Rate (HR)<br>Self-Reported Stress<br>Self-Reported Anxiety<br>Age Groups<br>Health Status<br>Presence/Absence of Stressor<br>Individual/Group<br>Pet Therapy | BP and HR<br>State-Trait<br>Anxiety<br>Intervention (STAI)<br>Stress Visual Analogue Scale (SVAS)<br>Beck Anxiety Inventory (BAI)<br>Anxiety Numeric Rating Scale (ANIS)<br>Anxiety Visual Analogue Scale (AVAS)<br>Burns Anxiety Scale (BAS)<br>Stress Arousal Checklist (SAC)<br>Symptom Distress Scale (SDS)                                                                                                                                                                                                           | Comprehensive meta-analysis software                       | Significant statistical differences found in HR, self-reported stress, and self-reported anxiety after pet therapy<br>No statistical significance related to reduction of anxiety after pet therapy found with BP                                                                                                                                                                                                         |
| [S3] Feng, 2021 | None | Systematic Review<br>Meta-Analysis<br>Analyze studies on AAT and synthesize its effects on medical outcomes | 8 studies (4 RCTs and 4 quasi-experimental studies), 348 total participants<br>Hospitalized children and teenagers receiving animal-assisted therapy (AAT) | Pain<br>Anxiety<br>Depression<br>Stress<br>Systolic Blood Pressure (SBP)<br>Diastolic Blood Pressure (DBP)<br>Heart Rate (HR)                                                             | Adapted Brunel Mood Scale (ABRUMS)<br>Anxiety, Depression, Somatic Symptoms, Hostility (A.De.Ss.O) Test<br>Blood Pressure Meter (BPM)<br>Children's Depression Inventory (CDI)<br>Child Stress Symptom Inventory (CSSI)<br>Faces Pain Scale (FPS)<br>Heart Rate Monitor (HRM)<br>Numeric Rating Scale Anxiety Intensity (NRS-AI)<br>Numeric Rating Scale Pain Intensity (NRS-PI)<br>Pediatric Quality of Life Inventory (PedsQL)<br>Pediatric Inventory for Parents (PIP)<br>Profile of Mood States (POMS)<br>State-Trait | RevMan Software<br>Cochran's Q (for judging heterogeneity) | Statistical significance of AAT effects in reduction of pain (SMD = -0.49; 95% CI, -0.77, -0.22; $p = 0.0004$ ), systolic blood pressure (MD = -4.85; 95% CI, -9.50, -0.21; $p = 0.04$ ), and diastolic blood pressure (MD = 4.95; 95% CI, 1.90, 8.00; $p = 0.001$ )<br>No statistical significance found in AAT's effects of reducing anxiety, depression, stress, and heart rate in hospitalized children and teenagers |

|                    |      |                                                                                           |                                                                                                  |                                                       |                                                                                                              |                                                                                               |                                                                                                                                                                                                                                                                                                  |
|--------------------|------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |      |                                                                                           |                                                                                                  |                                                       | Anxiety Inventory-Children (STAI-CH)<br>Wong-Baker FACES Pain Scale (WBFS)                                   |                                                                                               |                                                                                                                                                                                                                                                                                                  |
| [S4] Gebhart, 2020 | None | Randomized Control Trial<br>Students exposed to a variety of 'stress reducing' activities | 72 participants comprised of first-year students at AZW nursing school within the games of 17-49 | Self-Assigned Stress Level<br>Salivary Cortisol Level | State-Trait Anxiety Inventory (STAI)<br>Visual Analogue Stress Scale (VASS)<br>Cortisol Levels<br>IgA Levels | SPSS, Version 24<br>Lilliefors-Corrected Kolmogorov-Smirnov Test<br>Wilcoxon Signed-Rank Test | Self-reported stress levels ( $p < 0.001$ ), IgA levels ( $p < 0.001$ ), and salivary cortisol levels ( $p < 0.001$ ) had a statistically significant reduction on non-examination days where interventions were implemented<br>No statistical significance regarding stress on examination days |

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| [S5]<br>Grajfoner, 2017 | None | Quantitative<br>Mixed design:<br>TP, HO, DO<br>and three<br>questionnaires | 132 university<br>students<br>between the<br>ages 17-24                                                                                                                                                                                                | Anxiety Levels                                                                                                                                                                                                                                                                                                                                                                    | Warwick–<br>Edinburgh Mental<br>Well-Being Scale<br>(WEMWBS)<br>State-Trait<br>Anxiety Inventory<br>(STAI)<br>UWIST Mood<br>Adjective Check<br>List (UMACL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Statistical<br>Analysis:<br>Paired t-test<br>Pre-Post<br>Well-Being                                                                                                                                                          | Significant<br>reduction in anxiety<br>being witnessed<br>post-test in both of<br>the conditions<br>where dogs were<br>present (TPM<br>change = -13.73;<br>DO M change =<br>-12.98)<br>Slight decrease in<br>anxiety being<br>witnessed in the<br>handler-only<br>condition (HO M<br>change = -2.02)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| [S6]<br>Jones, 2019     | None | Systematic<br>Review of<br>Qualitative<br>and<br>Quantitative<br>Studies   | 7 studies (3<br>RCTs, 1 case-<br>controlled<br>study, 1 pre-<br>post design,<br>and 2<br>qualitative<br>studies)<br>which<br>examined<br>AAT in<br>participants<br>aged 10-18<br>years old and<br>from a range<br>of different<br>presenting<br>issues | Psychological<br>Distress (i.e.<br>depression, PTSD<br>symptoms)<br>Psychosocial<br>Functioning (self-<br>confidence,<br>subjective well-<br>being)<br>Violent Behaviors<br>(prevention of<br>animal abuse,<br>increase prosocial<br>behaviors,<br>empathy, and self-<br>awareness)<br>Anger<br>Management<br>Trauma<br>Self-Perceived<br>Emotional and<br>Behavioral<br>Symptoms | Self-Report<br>Questionnaires<br>PTSD Checklist-<br>Civilian Version<br>(PCL-C)<br>Center for<br>Epidemiologic<br>Studies<br>Depression<br>(CESD) Scale<br>Likert Scales<br>(subjective well-<br>being and coping<br>with stress)<br>State-Trait Anger<br>Scale (STAS-<br>TAS)<br>Companion<br>Animal Bonding<br>Scale (CABS)<br>Beck Depression<br>Inventory Second<br>Edition (BDI-II)<br>Subjective Mood<br>Thermometers<br>Facilitator<br>Observations<br>Beck Youth<br>Inventories<br>Second Edition<br>(BYI-II)<br>Structured<br>Interview (with<br>qualitative<br>analysis)<br>Children's Global<br>Assessment Scale<br>(C-GAS) | Pre-Post<br>Longitudinal<br>Design<br>Pre-Post<br>Experimental<br>Design<br>Cross-<br>Sectional<br>Design<br>A-B-A<br>Design<br>(A=baseline;<br>B=intervention;<br>C=outcome)<br>Randomized<br>Comparison<br>Group<br>Design | Statistically<br>significant decline<br>in PTSD symptoms<br>( $p = 0.018$ ) and risk<br>for PTSD diagnosis<br>( $p = 0.046$ )<br>following AAT<br>Statistically<br>significant decrease<br>in depression<br>symptoms within<br>the intervention<br>group ( $p = 0.02$ ),<br>but not for the<br>control group ( $p < 0.05$ )<br>Intervention groups<br>in comparison to<br>control groups had<br>a statistically<br>significant decrease<br>in subjective well-<br>being pre-<br>intervention ( $p = 0.41$ ), but not in<br>post-intervention ( $p = 0.116$ )<br>Statistically<br>significant increase<br>in the observation<br>of participant's<br>socialization with<br>adults ( $p < 0.001$ )<br>and peers ( $p < 0.001$ ), motivation<br>( $p < 0.001$ ),<br>relationships ( $p < 0.05$ ), and affect ( $p < 0.001$ ) |

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| [S7]<br>Kaur,<br>2023 | None | Systematic<br>Review | 11 studies (5<br>quasi-<br>experiments,<br>5 RCTs, 1<br>mixed-<br>method study)<br>that examined<br>the<br>effectiveness<br>of<br>interventions<br>in reducing<br>test anxiety in<br>nursing<br>students<br>(interventions<br>:<br>aromatherapy,<br>music<br>therapy,<br>emotional<br>freedom<br>technique,<br>AAT, guided<br>imagery,<br>anxiety<br>coping<br>program,<br>aromatherapy<br>hand<br>massage, and<br>confidence<br>training) | Test Anxiety<br>(refers to the set of<br>phenomenological,<br>physiological, and<br>behavioral<br>responses that<br>accompany<br>concern about<br>possible negative<br>consequences or<br>failure on an<br>examination or<br>similar evaluative<br>situation) | Informative<br>Features Form<br>(IFF)<br>State-Trait<br>Anxiety Inventory<br>(STAI)<br>Vital Sign<br>Assessment Form<br>(VSAF)<br>Skills Checklists<br>(SC)<br>Semi-Structured<br>Group Interview<br>Form<br>Student<br>Identification<br>Form<br>Situational<br>Anxiety Scale<br>Test Anxiety<br>Inventory<br>Westside TAS<br>General Self-<br>Efficacy Scale<br>(GSES)<br>Cognitive Test<br>Anxiety Scale<br>(CTAS)<br>Revised Test<br>Anxiety Scale<br>Spielberger State<br>Anxiety Inventory<br>Numeric Rating<br>Score (NRS)<br>Beck Anxiety<br>Inventory (BAI)<br>Subjective Units<br>of Distress Scale<br>(SUDS) | One-Way<br>MANOVA<br>ANOVA<br>SPSS,<br>Versions<br>16.0, 21.0,<br>22.0, and<br>23.0 | Music therapy<br>showed no<br>statistically<br>significant<br>difference between<br>pre- and post-<br>anxiety scores for<br>both the control and<br>intervention group<br>( $p > 0.05$ )<br>Statistical<br>significance<br>between<br>intervention and<br>control groups ( $p < 0.01$ ) with<br>utilization of animal<br>assisted therapy<br>Music therapy and<br>EFT has no<br>statistical<br>significance in the<br>difference of<br>anxiety levels<br>between control and<br>intervention groups<br>( $p = 0.459$ ), but had<br>statistical<br>significance in<br>decrease of pulse<br>rate ( $p < 0.05$ )<br>Statistical<br>significance in post-<br>test mean score of<br>test anxiety ( $p = 0.05$ ) with use of<br>guided imagery<br>Using anxiety<br>coping programs<br>had a significant<br>difference in the<br>mean anxiety score<br>between the groups<br>in pre- and post-<br>exam ( $p < 0.05$ )<br>Lavender and<br>lemon<br>aromatherapy had<br>no statistical<br>significance in<br>reducing test<br>anxiety ( $p > 0.05$ )<br>Significant decrease<br>in STAI scores after<br>Emotional Freedom<br>Techniques ( $p = 0.003$ )<br>Significant decrease<br>in mean test anxiety<br>scores post- |
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|  |  |  |  |  |  |  | confidence training<br>( $p < 0.05$ ) |
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| [S8]<br>Kivlen,<br>2023        | None                  | Randomized Control Trial conducted through weekly 35-minute AAT sessions for 6 weeks | 104 college students randomly assigned to either treatment condition or control condition | Quality of Life (encompasses satisfaction of physical health, psychological well-being, social relationships, and environment)<br>Stress<br>Anxiety<br>Occupational Role (satisfaction with performance of predetermined occupational or caregiving skills) | World Health Organization Quality of Life–BREF (WHOQOL-BREF)<br>Perceived Stress Scale (PSS)<br>Stress Visual Analogue Scale (SVAS)<br>Patient-Reported Outcomes Measurement Information System (PROMIS)<br>Canadian Occupational Performance Measure (COPM) | Paired t-tests<br>Analysis of Covariance (ANCOVA)                                  | Statistical significance of AAT's positive effects between treatment and control groups was found in all four quality of life domains: physical health ( $p = 0.031$ ), psychosocial wellbeing ( $p = 0.001$ ), social relationships ( $p = 0.009$ ), and environment ( $p = 0.030$ )<br>Statistical significance was found between groups according to scores on the PROMIS anxiety measure ( $p = 0.045$ ), indicating that AAT reduced anxiety<br>No significance was found between groups in measuring stress over time ( $p = 0.055$ ), however the results trended towards significance |
| [S9]<br>Parbery-Clark,<br>2021 | Theoretical Framework | Systematic Review of Randomized Control Trials Meta-Analysis                         | 11 articles included with students in higher education                                    | Stress Level<br>Anxiety Level                                                                                                                                                                                                                               | Perceived Stress Scale (PSS)<br>State-Trait Anxiety Inventory (STAI)<br>Warwick–Edinburgh Mental Well-Being Scale (WEMWBS)<br>Positive and Negative Affect Schedule (PANAS)<br>Hospital Anxiety and Depression Scale (HADS)                                  | Structured Microsoft Excel Data Extraction Form<br>Analysis of Covariance (ANCOVA) | Animal-Assisted Interventions (AAI) have statistically significant benefits for short term anxiety reduction<br>No statistical significance in AAI's effect on stress reduction                                                                                                                                                                                                                                                                                                                                                                                                               |

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| [S10]<br>Pendry,<br>2020 | None | Randomized<br>Control Trial | 309 college<br>students<br>participated in<br>a twelve-<br>week<br>academic<br>stress<br>management<br>program with<br>a random<br>assignment to<br>one of three<br>conditions:<br>Academic<br>Stress<br>Management<br>Condition<br>(ASM),<br>Human-<br>Animal<br>Interaction<br>Condition<br>(HAI-O), and<br>Enhanced<br>Human-<br>Animal<br>Interaction<br>Condition<br>(HAI-E) | Learning and<br>Study Strategies:<br>WILL – assesses<br>the degree to<br>which students<br>worry about<br>academic<br>performance<br>(subscaled to<br>anxiety, attitude,<br>and motivation)<br>SELF<br>REGULATION –<br>measures how<br>students manage<br>and control the<br>learning process<br>and use their time<br>effectively<br>(subscaled to<br>concentration,<br>self-testing, study<br>aids, and time<br>management)<br>SKILL – measures<br>students' learning<br>strategies, skills,<br>and thought<br>process and how<br>they demonstrate<br>their knowledge<br>on tests (subscaled<br>to selecting main<br>ideas, information<br>processing, and<br>test strategies) | Learning and<br>Study Strategies<br>Inventory 2nd<br>Edition (LASSI)<br>21-Item Beck<br>Anxiety Inventory<br>21-Item Beck<br>Anxiety Inventory<br>Penn State Worry<br>Questionnaire | IBM SPSS<br>Statistics for<br>Windows,<br>Version 26<br>One-Way<br>ANOVA | Post-test results<br>showed that at-risk<br>students apart of the<br>HAI-O ( $P = 0.021$ )<br>and HAI-E ( $P =$<br>$0.005$ ) condition<br>has significantly<br>higher levels of<br>WILL compared to<br>students in the<br>ASM condition<br>Significantly higher<br>levels of SELF<br>REGULATION at<br>post-test were<br>observed in at-risk<br>students apart of the<br>HAI-E condition ( $P$<br>$= 0.031$ ) than those<br>assigned to the<br>ASM condition<br>No significance<br>shown by at-risk<br>students in both the<br>HAI-E and HAI-O<br>condition compared<br>to ASM on post-test<br>SKILL statistics<br>Significant<br>interaction observed<br>in SKILL for at-risk<br>students in the HAI-<br>O condition ( $P =$<br>$0.029$ ) at follow up<br>compared to at-risk<br>students in the<br>ASM condition |
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| [S11]<br>Pendry,<br>2019  | None | Mixed<br>Methods<br>Realistic<br>Thematic<br>Analysis                                | 307<br>undergraduate<br>students of a<br>recruited in<br>classes from a<br>wide variety<br>of majors,<br>university<br>publications,<br>and by<br>university-<br>based<br>counselors to<br>attend study<br>informational<br>sessions<br>Teams<br>participated in<br>4 program<br>sessions<br>across the<br>four<br>semesters | Academic Stress<br>Motivation<br>Goal Setting<br>Sleep Habits<br>Management of<br>Test Anxiety<br>Perceived<br>Behavior Change<br>End of Program<br>Evaluation | Likert Scale (4 and<br>5-point)<br>Shapiro–Wilk Test<br>Nonparametric<br>Kruskal–Wallis H<br>Test<br>Dunn’s Post-Hoc<br>Test (with<br>Bonferroni<br>Correction)<br>Braun and<br>Clarke’s Six-Phase<br>Framework                                                                      | One-Way<br>ANOVA                                                                                                            | Incorporating HAI<br>with existing stress<br>prevention<br>programming may<br>increase participant<br>enjoyment and<br>likelihood of<br>recommendation,<br>which improves<br>student engagement<br>and the efficacy of<br>the program in<br>reducing stress and<br>improving<br>academic<br>performance<br>participants rated<br>program sessions as<br>somewhat<br>enjoyable (M<br>overall = 4.14, M<br>ASM = 3.97, M<br>HAI-E = 4.24, M<br>HAI-O = 4.17)<br>Higher level of<br>enjoyment was<br>reported when<br>participants were<br>exposed to a<br>combination of HAI<br>and stress<br>prevention content<br>compared to<br>engaging only with<br>stress prevention<br>content through<br>lectures and<br>activities |
| [S12]<br>Ribeiro,<br>2023 | None | Systematic<br>Review of<br>Randomized<br>and<br>Nonrandomiz<br>ed Clinical<br>Trials | 3 articles<br>included in<br>the systematic<br>review<br>146<br>participants<br>(children up<br>to 18 years-<br>old) were<br>assessed for<br>anxiety levels<br>before dental<br>treatment,<br>during<br>treatment, and<br>after<br>treatment<br>with the<br>utilization of<br>AAT at all<br>three stages                     | Dental Anxiety<br>(increased fear<br>over dental<br>treatment)                                                                                                 | Modified Child<br>Dental Anxiety<br>Scale - Faces<br>Edition<br>(MCDASf)<br>Frankl and<br>Modified Houpt<br>Behavior<br>Wong-Baker<br>FACES Pain<br>Assessment Scale<br>Mean Peripheral<br>Skin Temperature<br>Observational<br>Behavioral<br>Distress Scale<br>(OSBD)<br>Pulse Rate | Random-<br>Effects<br>Meta-<br>Analyses<br>(mean<br>difference<br>[MD] and<br>narrative<br>synthesis<br>[vote<br>counting]) | Utilization of AAT<br>during dental care<br>showed statistical<br>significance on<br>dental anxiety in<br>children in one out<br>of the three articles<br>Despite statistical<br>significance being<br>found in one trial, it<br>does not correlate to<br>the clinical<br>significance that<br>AAT can have on<br>dental anxiety in<br>children                                                                                                                                                                                                                                                                                                                                                                           |

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| [S13]<br>Waite,<br>2018 | None                         | Meta-<br>Analysis   | 1,549<br>participants,<br>22 articles<br>were assessed<br>and met the<br>inclusion<br>criteria<br>(assessments<br>of pain,<br>anxiety, and<br>distress<br>following the<br>utilization of<br>AAT) | Pain<br>Anxiety<br>Distress                                                                                                                                                                   | Wong-Baker<br>FACES Scale<br>Pain Numeric<br>Rating Scale<br>Visual Analog<br>Scale<br>Patient Health<br>Questionnaire<br>Anxiety Numeric<br>Rating Scale<br>State-Trait<br>Anxiety Inventory<br>State-Trait<br>Anxiety Inventory<br>for Children<br>Observational<br>Scale for Distress<br>Reynold<br>Children's<br>Depression Scale<br>Emotional Distress<br>Scale | Conduct<br>Control<br>Versus-<br>Intervention<br>Pre-Post<br>Comparisons<br>Random<br>Effects<br>Model | Treatment-control<br>group comparisons<br>and pre-post<br>comparisons in<br>relation to AAT<br>showed statistical<br>significance in its<br>positive effects on<br>pain, anxiety, and<br>stress                                                                     |
| [S14]<br>Wood,<br>2018  | Therapeuti<br>c<br>Framework | Pragmatic<br>Design | 180 students,<br>131<br>participants,<br>127 usable<br>data points                                                                                                                                | Anxiety<br>Blood Pressure<br>(BP)<br>Expressions of<br>Happiness<br>Relaxation<br>Interaction with<br>Pets<br>(new experience)<br>Request for<br>Counseling<br>Service to Repeat<br>the Event | State-Trait<br>Anxiety Inventory<br>BP                                                                                                                                                                                                                                                                                                                               | Reliable<br>Change<br>Index (RCI)<br>Paired t-tests                                                    | Significant<br>reductions in<br>systolic BP ( $p < 0.05$ ), diastolic BP<br>( $p < 0.001$ ) and<br>state anxiety ( $p = 0.001$ ) following<br>attendance at the<br>pet therapy session.<br>Large effect size<br>was recorded for<br>differences in state<br>anxiety |

**Table 1.** A synthesis table showing the data extraction and characteristics of the studies is provided.

## Discussion

The fourteen articles used in this literature review examine the effect of Animal Assisted Therapy (AAT) on the well-being of students and other participants by analyzing various psychological health determinants in both physiological and subjective manners. The articles carry a common theme that AAT has a statistically significant effect on reducing the participants' anxiety levels. This is important because stress and anxiety levels in college students are rapidly increasing due to modern-day stressors such as changing curriculum,

overstimulation from technology, rising tuition costs, and increasingly difficult coursework (Kivlen et al. 2023). Universities having insight into the significant effects AAT has on the mental health and the well-being of not just their students, but everyone on campus, serve as an encouragement to invest in their school's future through developing an AAT program.

In Anderson et al.'s (2021) article, the data shows that while students show a lower level of stress, the scores of the medication calculation tests – and likely other tested subjects – did not improve. This means that the AAT dogs provide a beneficial coping mechanism for students with chronic stress and test-related stress but did not relate to the improvement of grades for students.

From Ein et al. (2018), it was “found that age of participants, the health of population sampled, and type of PT moderate the relation between PT and various measures of stress reactivity,” which is significant in application to our study as the focus is on the undergraduate population (Ein et al., 2018, p. 487). From this study, it can be concluded that there are both physiological and subjective benefits of PT on a population, with greater benefit to those who do not have other health comorbidities.

The systematic review and meta-analysis conducted by Feng et al. (2021) examines the effects of AAT on hospitalized children and teenagers. The findings provide evidence that AAT can serve as a qualified non-pharmacological intervention for pain management in hospitalized adolescents. Furthermore, the significance related to the reduction of SBP and DBP indicates that AAT is capable of alleviating not only psychological symptoms but also physiological ones.

In Gebhart et al. (2020), the data suggested greater stress reduction in the therapy dog group compared to other forms of therapy. Although self-reported stress levels did not significantly decrease on days with examinations, levels of cortisol did decrease. With these

results, it is reasonable to assume that dog therapy is most beneficial when compared to other distraction therapies, but the other interventions should not be excluded.

In Grajfoner et al. (2017), the benefits of who the participants interact with, if they show better results with a handler, dog, or a combination of both are examined. This is beneficial for universities to demonstrate that there is not a significant need to employ more labor to be with the student and dog during individual interventions. Limitations in this study come from a limited sample size, lack of a control group, and inconsistency in the behavior of the handlers (Grajfoner et al., 2017).

The systematic review by Jones et al. (2019) provided evidence to suggest that the inclusion of CAP in adolescents' mental health treatment provides additional support in reducing symptoms of primary psychological diagnoses as well as secondary factors.

Kaur et al. (2023) is a systematic review aimed at assessing different therapeutic interventions' efficacy in reducing test anxiety in nursing students. Although most anxiety levels were collected using a valid and reliable measure – the State-Trait Anxiety Inventory (STAI) – it is important to note that it is a self-reporting anxiety measuring instrument which may generate altered results. Ultimately, this study provided a thorough explanation of test anxiety in nursing students, established statistically significant interventions for minimizing test anxiety, and suggested that future studies should assess the minimal amount of intervention that creates effects of decreased test anxiety (Kaur et al., 2023).

Findings from the randomized controlled trial carried out by Kivlen et al. (2023) show students may find stress relief while with the therapy dogs, but upon completion of the session their lack of coping skills causes symptoms of stress to reoccur. Overall, the research conducted by Kivlen et al. (2023) suggests that canine-assisted interventions have a positive effect on the mental health of graduate students in healthcare programs.

In Parbery-Clark et al. (2021), various types of animal therapy are discussed, and two different types of animals – dogs and horses – are used. While there were no statistics showing the difference between the horses and dogs, both were shown to lower anxiety and stress levels. However, the study brings up an issue: the benefit of the therapy is not long-lasting, rather it is most beneficial “within 24 hours of the intervention” with no long-lasting impact (Parbery-Clark et al., 2021, p. 8). This indicated that while the dogs prove beneficial in the short term, they would need to be brought in frequently in order to have a longer-lasting effect.

Pendry et al. (2020) examines animal-assisted interventions (AAI) on stress-related symptoms in college students that are considered ‘at-risk of failing’. Results indicate that AAI has a significant effect on increasing behaviors that promote academic success in ‘at-risk of failing’ college students both immediately post-intervention and 6 weeks after.

In Pendry et al. (2019), the effectiveness of different types of stress management and how it affects their perceived behavior change is examined. The implementation of dogs into the program proved to increase students’ enjoyment while participating in the program. With the increased enjoyment and usefulness, students are more likely to participate in the programs and recommend them to peers, which indicates AAT is a beneficial investment for universities. Limitations in this study arise from ambiguity in what kind of information the academic programs were providing.

Ribeiro et al. (2022) is a systematic review with the objective of assessing whether animal-assisted therapy (AAT) would reduce anxiety associated with dental procedures in children and teenagers. The studies included in this article contained multiple gaps in research from each other, which may have contributed to no statistical significance being found.

The meta-analysis of animal-assisted interventions (AAI) effect on pain, anxiety, and distress in medical settings by Waite et al. (2018) found that AAI has statistically significant

effects on the measures included. This study also found that AAI with only one dog and at shorter lengths of intervention had a significant effect on reducing distress in participants (Waite et al., 2018, p. 52). This finding may correlate to the idea that participants feel that more than one dog can cause an overwhelming feeling, making only one dog a calmer environment. Shorter intervention lengths having higher effect sizes indicates the possibility that participants find lengthy time with therapy dogs to be unappealing after a certain amount of time.

The objective of Wood et al. (2018) was to discover if a minimal amount of time (10-15 minutes) spent in an animal-assisted therapy session is beneficial to students in reducing stress levels both psychologically and physiologically. This study found improvement in students' mental well-being over short intervention periods, which allows for more effective AAT sessions. Limitations in the study arise when reflecting upon the volunteers included in the study; the research was conducted with participants that were likely to have pre-existing increased levels of stress. Other limitations are derived from the weather on the day of the intervention. Students were required to wait outside while it was raining and windy, which could have decreased the number of students willing to participate (Wood et al., 2018).

Gaps in these studies include the effects of the type of animal on the anxiety level of students, the stress of the animal, pet ownership, and bond with the animal. While all studies included in this literature review analyze the therapeutic effects of dogs, there are other animals that could also provide support. Not all people like dogs, or animals in general, which creates the possibility of disinterest in the prospect of utilizing dogs for AAT. Another factor that was not examined in the studies was the stress level of the animals. There is limited capability to register how the animals are feeling besides body language, which could present a safety issue if the animal acts inappropriately during a therapy session. The potential of a participant being a pet owner has the ability to change the effectiveness of AAT outcomes. This poses the question: is

AAT less effective if the participant has a pet at home that they can decompress with? The last gap within the studies is pre-established bonds with the animal. The familiarity between the animal and participant is likely to decrease nerves that could occur when meeting for the first time.

Overall, the articles analyzed in this literature review confirm animal-assisted therapy's (AAT) ability to decrease stress and anxiety levels. This is an important conclusion, as research examining the decrease of anxiety levels in participants, more specifically in students, gives valid reasoning for establishing an AAT program.

## **Methodology**

### ***Research Design***

This project was an experimental quantitative design to test to see if there was a difference between the effect of State-Trait anxiety in students in individual sessions with a therapy dog versus group sessions. The variables of this project included state anxiety and trait anxiety levels. These levels were measured by the Spielberger State-Trait Anxiety Inventory for Adults via an online survey through Qualtrics.

### ***Sample***

The population utilized a convenience sample of undergraduate students at the University of Arkansas. To be included, students must be enrolled as an undergraduate student at the University of Arkansas and have a scheduled exam the day of canine interaction. The pilot study did not exclude other majors but was targeted mainly to nursing majors.

### ***Data Collection***

Each participant was randomly assigned either a one-on-one 15-minute session or a 15-minute group session with a certified therapy dog, owned and trained by the Principal Investigator. Group sessions consisted of 3 to 5 students. An online survey, via Qualtrics, was completed prior to interaction with a therapy dog and again after interaction, following the student exam. The survey consisted of demographic questions and questions from a self-evaluation questionnaire: the *State-Trait Anxiety Inventory for Adults*. This survey provides 40 questions, the first 20 for State anxiety and the second 20 for Trait anxiety. Each question is coded with a numerical scale, and a higher score correlates to a higher index of State or Trait anxiety levels. State anxiety is considered “a temporary state influenced by the current situation where the respondent notes how he/she feels right at this moment” (Skapinakis, 2014, p.1). Trait anxiety is “a general propensity to be anxious where the respondent notes how he/she feels ‘generally’” (Skapinakis, 2014, p.1).

### ***Human Subjects***

The IRB was approved in February of 2023 by the University of Arkansas. Participation was voluntary, and completion of the online survey implied consent to participate in the study. There were no anticipated risks or discomforts in participating, and the benefits included contributing to the body of knowledge regarding AAT and student anxiety in undergraduate students. To keep information confidential, students provided a four-digit code of their choosing on the pre-intervention and post-intervention survey with no name or other identifiers required to be provided. All data was stored in Qualtrics, a secured password-protected research software program at the University of Arkansas, for data analysis and management.



### *Data Analysis*

The data was analyzed with a paired t test to examine if there was a significant difference between before and after state anxiety inventory scores.

### **Results**

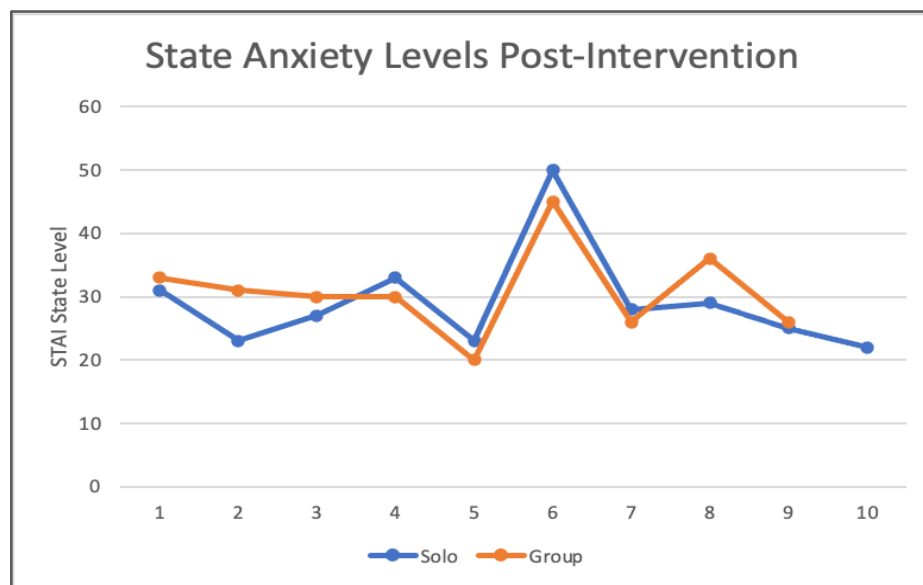
A majority of the participants in the study, about 75%, were seniors, with the next largest group consisting of juniors, and the least amount were sophomores (See Appendix A). Most participants identified as female (See Appendix A). All students that participated were candidates of the Bachelor of Science in nursing degree.

There is statistical significance in comparing the pre/post-STAI results in the solo State test ( $p < 0.001$ ) and in the group State test ( $p < 0.001$ ). However, the results were not statistically significant in comparing the STAI scores in the solo Trait test ( $p = 0.056$ ) or the group Trait test ( $p = 0.107$ ). When comparing the solo post-intervention STAI State levels with the group post-intervention STAI State levels, there was no statistical significance ( $p = 0.575$ ). When comparing the solo post-intervention STAI Trait levels with the group post-intervention STAI Trait levels there was no statistical significance ( $p = 1.000$ ) (See Table 2).

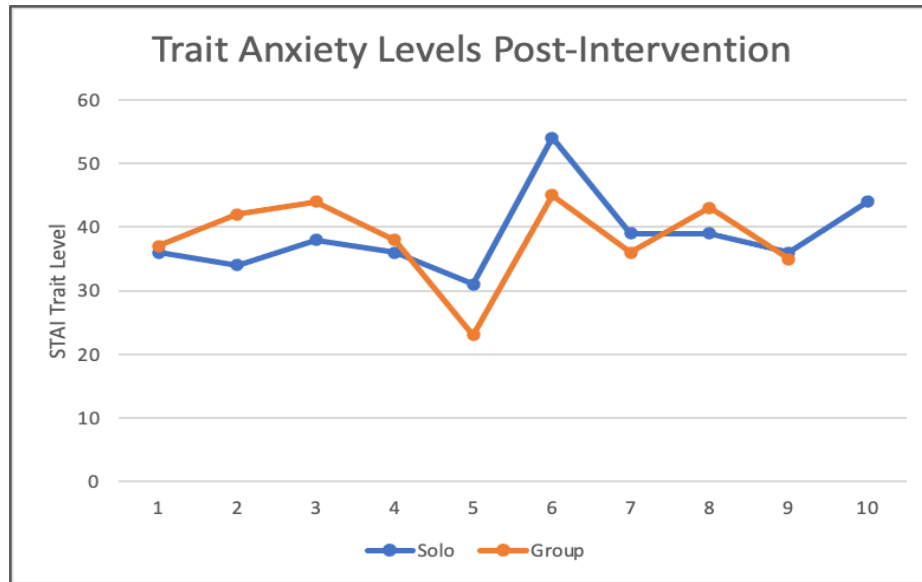
| Paired Samples Test |       |        |                |                 |                                           |        |       |    |                 |
|---------------------|-------|--------|----------------|-----------------|-------------------------------------------|--------|-------|----|-----------------|
|                     |       |        |                |                 | 95% Confidence Interval of the Difference |        |       |    |                 |
|                     |       | Mean   | Std. Deviation | Std. Error Mean | Lower                                     | Upper  | t     | df | Sig. (2-Tailed) |
| Solo State          | Q1-Q2 | 15.800 | 6.512          | 2.059           | 11.142                                    | 20.458 | 7.673 | 9  | <.001           |

|                     |            |        |       |       |        |        |       |   |       |
|---------------------|------------|--------|-------|-------|--------|--------|-------|---|-------|
| Solo Trait          | Q1-Q2      | 3.600  | 5.190 | 1.641 | -.113  | 7.313  | 2.194 | 9 | .056  |
| Group State         | Q1-Q2      | 18.667 | 7.906 | 2.635 | 12.590 | 24.744 | 7.084 | 8 | <.001 |
| Group Trait         | Q1-Q2      | 3.778  | 6.241 | 2.080 | -1.019 | 8.575  | 1.816 | 8 | .107  |
| Solo VS Group State | solo-group | -.889  | 4.567 | 1.522 | -4.400 | 2.622  | -.584 | 8 | .575  |
| Solo VS Group Trait | solo-group | .000   | 5.874 | 1.958 | -4.515 | 4.515  | .000  | 8 | 1.000 |

**Table 2.** Statistical significance of solo and group state and trait levels, and comparison of the solo versus group intervention on STAI scores



**Figure 2.** Levels of State Anxiety Post-intervention in solo (one-on-one) versus group participants



**Figure 3.** Levels of Trait Anxiety Post-intervention in solo (one-on-one) versus group participants

Figure 2. demonstrates the comparison of STAI State scores after the AAT session was held for participants in the individual sessions ( $n = 10$ ) versus the group sessions ( $n = 9$ ). Figure 3. demonstrates the comparison of STAI Trait scores after the AAT session was held for participants in the individual sessions ( $n = 10$ ) versus the group sessions ( $n = 9$ ). The results of individual versus group sessions closely reflected the same level of State and Trait anxiety in participants, showing that our hypothesis is not yet proven, a greater sample size is needed for valid results.

## Discussion

The implications of this study show that the ‘temporary state’ of anxiety was relieved in both session types, but the ‘general’ feeling of a participant’s anxiety did not significantly decrease. These findings may be because the anxiety that students feel before a test is relieved upon completion of the examination. Utilizing AAT as a one-time intervention most likely helped to relieve anxiety generated by an exam because state anxiety is situational, and AAT

helped take the students' minds off of the upcoming test, which decreased their circumstantial feelings of anxiety. If AAT interventions were offered to students at a regular frequency and on non-exam days, trait anxiety, or the 'general' feeling of anxiety, may have shown a decrease.

The limitations of this study were that 26 participants completed the pre-survey, however, only 19 participants completed the pre- and post-survey, decreasing the amount of usable data points and sample size for this study. The timing of the survey could have affected results, as previously discussed in relation to situational anxiety. Completion of the exam could have led to a decrease in the student's anxiety, resulting in their survey answers being based on finishing the exam and not on AAT interactions.

Future implications include having participants complete the post-survey directly after the sessions and not after the completion of the exam. Exploration of the need to determine the AAT animal's stress level should also be considered for future study.

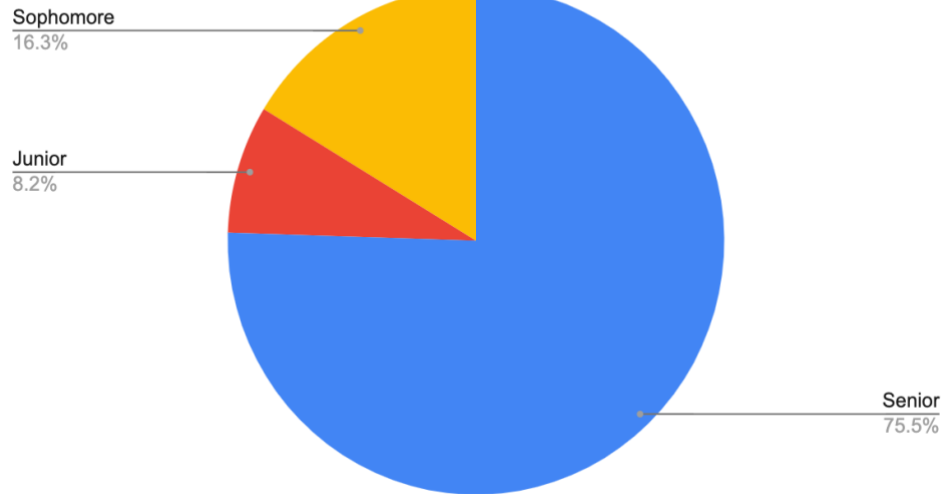
Animal-Assisted Therapy appears to be beneficial in decreasing State anxiety in undergraduate students but does not appear to affect Trait anxiety. Because the AAT in our study was a short, one-time event, these results were not unexpected due to prior findings from articles in our Review of Literature. In Waite et al. (2018), it was found that "studies with a shorter [AAT] duration had higher effect sizes," this can be explained by the notion that longer interventions can cause participants to become distracted over time, which ultimately decreased the ability to reach a therapeutic effect (p. 52). Further research regarding shorter AAT interventions was conducted by Wood et al. (2018), in which 10–15-minute therapy sessions with dogs showed statistical significance in its ability to "reduce perceived stress (state anxiety)" (pp. 266-267). These findings of State anxiety being reduced by 15 minute AAT sessions are consistent with the outcomes of our research.

One-on-one sessions vs. group sessions do not appear to affect anxiety differently in this pilot study. Due to the small participant number, further research is needed. This study will continue during Fall 2023, with potential modifications.

## Appendix A

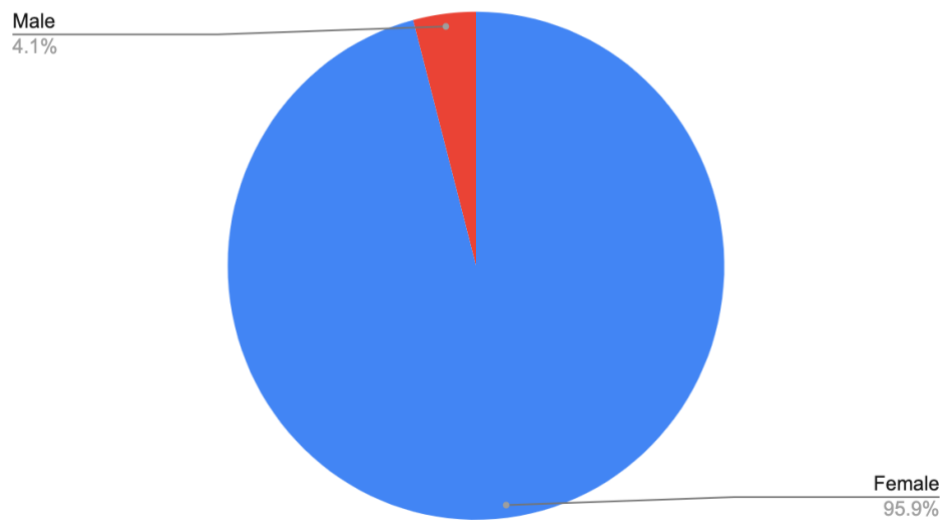
### Demographics of Participants in Study.

#### Grade Level



**Figure A1.** The demographics of the undergraduate grade levels of participants in the study

#### Gender of Participants



**Figure A2.** The demographics of the gender of participants in the study

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