

## ANIMAL-ASSISTED INTERVENTION ON COLLEGE CAMPUSES

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### **ABSTRACT**

The present analysis explores the existing literature regarding animal-assisted interventions (AAI) in a college campus setting. Mental health is a growing concern in this population, and forms of AAI including animal-assisted activities (AAA) and animal-assisted therapy (AAT) provide an opportunity for supplemental treatment on college campuses. Prior research was analyzed based upon interventions, measurements, methodology, and results of the interventions. Overall, research in this area has shown that AAI is popular among college students and is effective at reducing stress, homesickness, and negative affect. Qualitative measures with subjective responses had the most success in proving the effectiveness of AAI, whereas physiological measures (such as cortisol levels and blood pressure) were the weakest. While there are many limitations in this field and more research is necessary to further the findings and determine best practices, the existing evidence suggests that AAI is an effective method to aid in the treatment of mental health problems on college campuses.

### **INTRODUCTION**

The mental health of college students has become a pressing issue across the world. The statistics regarding mental health in this population are concerning and require immediate attention. For individuals aged 15-24 in the United States, suicide is the second leading cause of death (National Institute of Mental Health, n.d.). The 18-25 demographic has the highest rate of suicide attempts in the past year at 1.8%, compared to 0.5% and 0.2% in those aged 26-49 and 50+, respectively (National Institute of Mental Health, n.d.). University and college counseling centers report that since the 1990s, the needs of students shifted from developmental and informational needs to psychological problems (American Psychological Association, n.d.)

During the 2015-2016 school year, data from 139 collegiate institutions indicated that: 61% of students experienced anxiety, 49% experienced depression, 45.3% experienced stress. Further, 50% attended counseling for mental health concerns, 32.8% took medication for mental health concerns, 25.5% purposely injured themselves without suicidal intent, and 33.2% seriously considered attempting suicide ("Center for Collegiate Mental Health", 2016). The majority of these figures represent an increase from prior years. Undoubtedly, mental health among college students is a growing problem that needs further attention.

Despite the prevalence and severity of mental health concerns across individuals in college, many students do not receive the help they need. The cost of traditional treatment is often expensive, which may hinder students who lack financial resources or have limited health insurance from seeking treatment. Many colleges and universities are unable to provide enough counselors and treatment for all of the students who seek help due to financial constraints and an increase in demand (Simon, 2017). Even when colleges offer free short-term psychotherapy, anywhere from 37-84% of students with positive screens for depression or anxiety do not receive treatment, depending on the disorder (Eisenberg, Golberstein & Gollust, 2007). Predictors of not seeking treatment include "lack of perceived need, being unaware of services or insurance coverage, skepticism about treatment effectiveness, low socioeconomic background, and being Asian or Pacific Islander" (Eisenberg et al., 2007, p. 598). Evidently, many college students are not receiving the treatment they need and additional treatments need to be considered.

### ANIMAL-ASSISTED INTERVENTION

While receiving mental health care from a professional is imperative to the success of the treatment, it is feasible that the use of animal-assisted interventions (AAI) can act as an effective supplement to a college student's treatment. Simply spending time with an animal will not cure a student's anxiety or depression, but it is likely that AAI can be used to assist in the process. Whether that involves lowering the anxiety levels a student experiences while spending time with an animal, using the animal to teach students coping mechanisms, or simply bringing awareness to the mental health resources on campus, it is important to explore AAI as a supplement to mental health treatment in college populations.

AAI is an umbrella term used to describe a wide range of interactions with animals. Two of the most common forms of AAI used on college campuses are animal-assisted activities (AAA) and animal-assisted therapies (AAT). AAA involves using animals for motivational, educational, recreational, or therapeutic benefits to the humans involved (Marino, 2012). It is usually unstructured and allows humans and animals to interact freely. AAA can be supervised by volunteers, paraprofessionals or professionals. AAA is applicable to a broad group of individuals and most of the AAI that is available on college campuses fall under this category, such as an informal event that allows students to visit with and pet or play with an animal.

AAT is dissimilar from recreational interactions of animals because an emotional response (such as an enjoyment) alone does not qualify as therapy (Kruger & Serpell, 2006). AAT is more structured with a specific therapeutic objective for the interaction and integration of the interaction into a larger therapeutic plan (Marino, 2012). Consequently, AAT is overseen by a health or human services provider and is individualized to assist in addressing one client's particular concerns and goals. AAT may involve the presence of an animal in a therapy session or using the animal for a specific purpose, such as using equine-assisted therapy to represent overcoming challenges by leading the horse through a maze of physical obstacles (Morgan, 2017). In general, AAT is less common on campus due to the highly specified nature of the therapy.

### THEORETICAL FRAMEWORK OF AAI

While there are many explanations as to why AAI is able to support humans in addressing a wide range of goals, there are two predominant theories relevant to AAI on college campuses - social support and biophilia.

#### **Social support**

College students often face a lack of social support due to busy schedules, homesickness, and uncertainty with social standing in school. Unfortunately, without social support, students are at higher risk for both physical and psychological problems. However, animals can facilitate this social support (O'Haire, 2010). Animals provide constant availability, nonjudgmental support and unconditional love, and thus can reduce loneliness and improve the overall well-being of people they spend time with. It has additionally been hypothesized that animals may provide a distraction for college students from their problems, which then facilitates a positive mood (Muckle & Lasikiewicz, 2017). The social support hypothesis is studied in AAI on college campuses when researchers examine the effects that animals have on improving measures that are affected by social support, such as homesickness or perceived stress.

#### **Biophilia**

This theory suggests that due to evolution and the intent of increasing chances of survival, humans have a natural tendency to be drawn to animals and other living things (O'Haire, 2010). Today, this translates into animals providing a pleasant external focus which can calm and relax people. Simply looking at animals in a fish tank can lower heart rate and blood pressure (O'Haire, 2010). The biophilia hypothesis is utilized in studies regarding AAI on college campuses when researchers examine physiological and mental indicators of stress after spending time with animals.

## **ANALYSIS OF EXISTING LITERATURE**

Though the use of AAI on college campuses is becoming more popular, little research has been conducted to assess its effectiveness and best practices for implementation. Therefore, an analysis of the known, existing studies in the field was completed in order to draw conclusions about AAI on college campuses, the accuracy and validity of the methods used, the success of the different approaches, and potential areas of future research. A detailed table including the sample size, inclusion criteria, research design, program characteristics and duration/total time spent with animals for each of the 12 studies appears in Table 1.

## **CHARACTERISTICS AND PROCESS OF THE INTERVENTIONS**

### **Standardization of intervention**

Generally, the types of AAI interactions on college campuses can be split into two categories- large or small groups. For the larger groups, little regulation took place and students could freely interact with animals (Barker, Barker, McCain & Schubert, 2016; Stewart, Dispenza, Parker, Chang, & Cunnien, 2014). The larger groups typically occurred as a one-time event that included many humans with a group of dogs. In the smaller, more structured groups, participants often registered for the event allowing for control over duration and number of participant (Binfet, 2017), or the animals were used as a supplement to therapy (Folse, Minder, Aycock & Santana, 1994).

### **Duration and length of intervention**

The time spent with animals varied drastically across studies. Some AAA were a one-time event in which students could spend a few minutes to an hour with a dog (Dell et al., 2015), while others used a more structured format (e.g., 20 minutes with the dog) over the course of two months (Binfet & Passmore, 2016). However, most of the studies (nine out of 12) focused on a particular event that took place over one or a few days.

### **Table 1**

#### ***AAI on College Campuses- Intervention Characteristics***

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Researchers (Year)	Sample Size	Inclusion Criteria	Design	Program Characteristics	Duration/ Total Sessions
Adams et al. (2010)	246	Freshman college students attending orientation sessions	One group post-test	Each session averaged 50 students and 6 pet therapy teams; students sat through presentation and then mingled with dogs so they could have physical contact	Unclear; 1 session
Barker et al. (2016)	78	Students recruited from electronic message boards, print & social media	Pre- and post-test design with control group (random assignment to condition)	Event held week before finals; ten therapy dogs present and students were permitted to freely interact with dog teams (observe, pet, hold); control group completed Family Life-Space diagram	15 minutes; 1 session
Binfet (2017)	163	First-year students recruited from undergraduate psychology classes	Pre- and post-test design with control group (random assignment to condition)	Each session had 50-60 students with 14 dog-handler pairs (assigned to smaller 20 groups of 3-4 students); handlers asked open-ended questions while students interacted with dogs	20 minutes; 1 session
Binfet & Passmore (2016)	86, 44	First-year students who self-identified as homesick were recruited via email	Pre- and post-design with wait-list control  Feasibility and Main Study	<i>Feasibility Study:</i> participants were randomly assigned to dog and handler in groups of 3-4. First 30 minutes consisted of small group interactions between participants and dog/handler; last 15 minutes participants were free to visit any of dogs. <i>Main Study:</i> 22 students assigned to treatment, 22 assigned to wait-list. Each week the students were assigned to a different dog and handler. same structure of 30 minutes with dog/handler and 15 minutes of free time	45 minutes; 8 sessions
Crossman et al. (2015)	67	Students enrolled in School of Medicine	Pre/post design with random assignment to experimental condition, no- interaction control, and no-treatment control	<i>Experimental:</i> freely interact with dog (pet, play) 1-on-1. <i>No-Interaction:</i> Viewed images of same dog (unclear if it was photos or video). <i>No-Treatment:</i> asked to wait for logistical delay	7 to 10 minutes; 1 session
Crump & Derting (2015)	27, 61	First year undergraduates	Study 1: Crossover design with control; Study 2: Pre- and post-test design with control	<i>Study 1:</i> Sessions scheduled 2 weeks before midterms and finals, dogs sat in center of group (2 dogs for 4 participants) while control completed non-stressful activities (cards, reading). <i>Study 2:</i> same timeframe and experimental interactions as Study 1 (except now 3-4 dogs for 4 participants) and control group completed coloring/drawing.	Study 1: 15 minutes; 1 session Study 2: 30 minutes; 1 session
Dell et al. (2015)	726	Convenience sampling at three universities (90% students)	Exploratory pilot evaluation with post-test and 3 month follow-up	Events at each of the universities took place over multiple days and were often part of a larger stress management/ reduction programs. Dogs were recruited from SJA Therapy dogs.	A few minutes to 1 hour; 1 to 2 sessions
Foix et al. (1994)	44	BDI administered to students in group settings to select those with measurable levels of depression (51 out of 129)	Pre- and post-test design with control (no random assignment)	<i>Directive group:</i> group psychotherapy with dog present to ameliorate discomfort associated with group therapy. <i>Non-directive group:</i> no formal structure, dog's behavior was most often the focus. <i>Control:</i> received neither AAT nor group psychotherapy.	45 minutes; 6 to 7 sessions
Morgan (2017)	42	Students at 2 year college were recruited based on classes	Quasi-experimental design with comparison group	As part of a larger stress management exposure (that included 3 weeks of yoga and 3 weeks of mindfulness hiking), students completed 3 weeks of equine-assisted therapy (EAGALA, groundwork).	45 minutes; 3 sessions
Muckle & Lasikiewics (2017)	62	Students recruited via poster on campus	Pre- and post-test design with comparison sessions	Session included 15 dogs and included general interactions (petting, hugging, feeding, tricks, photo taking). Subset of subjects participated in comparison session (quiet reading for 1 hour)	60 minutes; 1 session
Somervill et al. (2008)	62	Students screened from introduction psychology courses, excluded if allergic/ afraid of cats & dogs or had hypertension	One group, multi-stage pre- and post-test	Students' blood pressure and pulse were taken after an initial baseline, first presentation of dog or cat, second baseline with no animal, second presentation of dog or cat, and third baseline with no animal (all intervals were five minutes)	10 minutes spent with animals; 1 session
Stewart et al. (2014)	55	Undergraduate students who voluntarily attended event in residence hall lobby	Within-subjects pre- and post-test field-initiated design	Therapy dog stationed at college counseling center-sponsored AAT outreach program for 2 hours; students dropped by for 10-15 minutes and interacted with dog freely (petting, hugging, taking photos)	5 minutes to 2 hours; 1 session

**Total time**

As a result of the inconsistencies in the standardization of intervention and the duration/length of the intervention, the total time spent using the AAA ranged anywhere from a few minutes to hours. This discrepancy in total time spent with animals raises concerns regarding the results of these different methods, as it may be difficult to achieve similar effects after spending a few minutes with an animal compared to spending hours with an animal over the course of multiple months.

**Number of clients in a meeting**

Similarly, there is a wide range in the number of clients present in a meeting. At the larger events, there were often anywhere from 10 to 50 students with the dogs at once (Adamle, Riley & Carlson, 2010; Barker et al., 2016; Dell et al., 2015; Muckle & Lasikiewicz, 2017; Stewart et al., 2014). In the studies that used a more structured approach, there were fewer students (generally individual or groups of 2-4) interacting with the animals at once (Binfet, 2017; Binfet & Passmore, 2016; Crossman Kazdin & Knudson, 2015; Crump & Derting, 2015; Somervill, Kruglikova, Robertson, Hanson & MacLin, 2008).

**Animals used**

The vast majority of the studies (10 out of 12) used only dogs, while one study employed cats and dogs (Somervill et al., 2008) and another used horses (Morgan, 2017). Most of the animals came from either a specific therapy animal group, such as Therapy Dogs Singapore (Muckle & Lasikiewicz, 2017) or through the university's therapy animal program, such as "Dogs on Call" (Barker et al., 2016). These programs typically involve annual recertification and ensure that the animals meet basic standards regarding temperament, obedience, and health (Therapy Dogs International, n.d.). However, some of the studies did not specify where the animals came from or whether they were certified (Crossman et al., 2015). One researcher chose animals based on temperament (Folse et al., 1994), and another researcher used animals from a local humane shelter (Somervill et al., 2008).

**RESEARCH METHODS**

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**Methodological controls**

Due to the nature of working with animals in a college setting, it is nearly impossible to create true experimental control. However, many of the studies introduced as much control over the research as was feasible. Ten out of 12 studies used a pre-and post-test design to account for the effects of the AAI. The remaining two studies collected qualitative data (Adamle et al., 2010; Dell et al., 2015). Additionally, some of researchers chose to utilize a control group that involved either a wait-list (Binfet & Passmore, 2016) or a relaxing activity that did not involve interactions with animals, such as playing cards, coloring or quiet reading (Crump & Derting, 2015; Muckle & Lasikiewicz, 2017).

Another study chose to use a "business-as-usual-model" for the control group, which involved participants studying information from a course they were taking (Binfet, 2017). One study added an additional level called the "No Interaction Control" in which participants looked at pictures of the dog that was used in the treatment group, as opposed to the "No Treatment Control" which simply waited due to "logistical delays" (Crossman et al., 2015). Though the methodological controls are not perfect, almost all of the researchers made an attempt to control the study as best as possible given the circumstances, which is not always common in other areas of AAI.

**Threats to internal validity**

Almost all of the participants in each study were recruited using convenience sampling. Many students were first years who participated in the study for a class or a freshman seminar (Adamle et al., 2010; Binfet, 2017; Morgan, 2017; Somervill et al., 2008). Others attended the AAI event because it was in a popular location (Dell et al., 2015; Stewart et al., 2014). Thus, all participants were self-selected.

As with all forms of AAI, the presence of the therapy animal handler acts as a confound. Since the handler must be present, it is difficult to determine whether the animal is the sole cause of any beneficial outcomes. A potential solution to this problem would be to assess the effects of the handler speaking with the college students by themselves and then compare the results to the effects of the

handler and their animal. Similarly, in most of the studies participants interacted with the animals in groups of other students, in which case the animal may have acted as a social lubricant and facilitated conversation, which adds an additional confound (O’Haire, 2010).

## **MEASUREMENT OUTCOMES**

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### **Liking of animals**

A few of the studies began with a measure to identify the degree to which a participant liked animals or whether they had a pet at home (Adamle et al., 2010; Crossman et al., 2015; Muckle & Laskiewicz, 2017). This was done for a variety of reasons including inclusion criteria and to examine if there were correlations between liking of animals and the effectiveness of the AAA. However, due to the self-selected nature of these studies, it is assumed that there will always be at least a basic level of liking because someone who had strong negative attitudes towards animals or was afraid of animals would be unlikely to voluntarily participate.

### **Open-ended response**

To obtain a more qualitative understanding of the participants’ experience, a handful of the studies used open-ended responses, the use of journals, or researchers/observers recording responses or notes about the interactions (Adamle et al., 2010; Binfet & Passmore, 2016; Dell et al., 2015; and Morgan, 2017).

### **Self-report measures**

Most studies used self-report measures among students. The most common being the Perceived Stress Scale (PSS), which was used in five of the studies (Barker et al., 2016; Binfet, 2017; Crump and Derting, 2015; Morgan, 2017; Muckle & Laskiewicz, 2017). Other self-report scales included Homesickness Questionnaire (Binfet, 2017; Binfet and Passmore, 2016), State/Trait Anxiety Inventory (STAI) and Positive and Negative Affect Schedule (PANAS) (Crossman et al., 2015), Stress Visual Analog Scale (SVAS) (Barker et al., 2016), Beck Depression Inventory (Folse et al., 1994), and Burns Anxiety Inventory (Stewart et al., 2014).

### **Physiological measures**

Some of the studies used physiological measures to determine if the AAI reduced biological symptoms of mental distress. These included salivary nerve growth factor (sNFG) and salivary alpha amylase (sAA) through saliva analysis (Barker et al., 2016), blood pressure and/or heart rate (Crump and Derting, 2015; Muckle & Laskiewicz, 2017; Somervill et al., 2015) and cortisol levels (Crump and Derting, 2015).

### **Follow-up**

Only two of the studies used a follow up measurement to examine the lasting effects of the AAA. Binfet (2017) examined the results of the three measures (PSS, Homesickness Questionnaire, and Sense of Belonging in School) both immediately after the intervention and two-weeks later. Dell et al. (2015) asked three open ended questions three months after the interaction to examine what participants remembered about the event and if it had any impact on the way they handle stress. In both studies, the follow up completion rates were lower than the initial completion rate.

## **RESULTS**

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The vast majority of the presented studies found results that indicated a positive effect for college students. The following assessment analyzes the results based upon the measurement outcomes, as well as a comparison between the different event types.

### **Liking of animals**

As expected, participants who like dogs or have a dog at home indicated overwhelming support of the event and that they received comfort from the therapy animals (Adamle et al., 2010). However, one study found that participants who were originally unsure of dogs had a greater reduction in systolic blood pressure than those who had stronger positive attitudes towards dogs (Muckle & Lasikiewicz, 2017).

Consequently, research indicates that both individuals who like animals and individuals who are neutral/unsure can benefit from AAI.

### **Open-ended responses**

In the studies using open-ended or qualitative responses, there was an overwhelming positive response from participants. Students indicated that the AAI had a positive impact on their lives and they were interested in a pet therapy program on campus (Adamle et al., 2010; Binfet & Passmore, 2016; Dell et al., 2015). Observers and handlers at one event believed that the attendees felt loved and spending time with the therapy dogs made them feel supported (Dell et al., 2015).

### **Self-report measures**

Self-report measures generally had very successful results in these studies. Overall trends include a decrease in stress and anxiety based on scores from the PSS, SVAS, STAI, PANAS, and Burns Anxiety Inventory (Barker et al., 2016; Crossman et al., 2015; Morgan et al., 2017; Muckle and Lasikiewicz, 2017; Stewart et al., 2014). Students also reported reductions in homesickness (Binfet, 2017; Binfet & Passmore, 2016). However, it is important to be critical of some of these measures. The novelty of the AAI event and social desirability in responding may contribute to positive findings. Further research with more repetition and, ideally, more time spent with the animals is needed in order to prove the validity of these results.

Folse et al. found a significant decrease in depression scores on the BDI over a seven-week period between the non-directive group (which included no formal structure with a focus on the dog's behavior) and the control (which received neither AAT nor group psychotherapy), but not between the directive group (which received group psychotherapy with dog to relieve discomfort from group therapy) and the control (1994). Additionally, not all self-reports produced positive results. Barker et al. did not find significant differences on the PSS (2016) and there were no significant differences in negative affect between the experimental and no-interaction control in Crossman et al. (2015).

### **Physiological measures**

The physiological measures generally found less success than the other measures. In the study that examined saliva, sNFG was not detectable in most students and therefore could not be analyzed and there were no significant differences in sAA (Barker et al., 2016). Cortisol levels were not significantly different after spending time with therapy dogs (Crump & Derting, 2015).

However, blood pressure and heart rate generally found more successful results. One study found decreases in physiological arousal (based upon heart rate and blood pressure) between the experimental and control groups (Crump & Derting, 2015). Both systolic and diastolic blood pressure significantly decreased in the experimental condition but not the control condition in one study (Muckle & Lasikiewicz, 2017) and Somervill et al. found a decrease in blood systolic blood pressure in the five-minute period immediately after participants held a cat or dog (2008).

It is important to note, though, that using physiological measures when studying AAI may not be the most effective indicator of reductions in stress or anxiety. In the moment, participants may have increased body functions (such as heart rate, cortisol levels) due to excitement and additional movement (moving around with the animals, playing fetch, etc.). This does not necessarily mean that they are still stressed or anxious. Therefore, physiological measures may be more beneficial for long-term assessments of reductions of stress, such as reduced heart rate hours after the AAI interaction.

### **Follow-up**

In Binfet's follow-up, there were no significant changes over time and the results on the PSS, Homesickness Questionnaire, and Sense of Belonging in School scales did not sustain over the two week follow-up period (2017). However, 81% of participants in Dell et al.'s study reported the animal therapy event had a positive impact on how they handled stress long-term in the three month follow up (2015). Thus, the overall results of the long-term effects of AAI on college campuses are mixed.

**COMPARISON OF EVENTS**

In an attempt to analyze the success of the different structures and methods used by each of the researchers, the studies were categorized on three dimensions (size, total duration, measures used), as well as overall results. This classification is located in Table 2. Size of intervention was determined by the number of participants interacting with an animal at once, such that below 10 participants was considered small and over 10 was considered large. Total duration examined whether an event was short-term or long-term (a one-or two-day event versus a repeated weekly activity). Measures used considered three of the categories of tools used to assess the results- qualitative, self-report, and physiological. The overall results examined how well a study met its hypotheses or whether or not a study had significant findings.

After assessing the overall results based on the three categories, some patterns were detected. However, these are tentative generalizations considering the number of studies examined is small and that all of the studies found at least some success (as opposed to complete failures).

**Size of intervention**

Generally, larger events found more successful results than smaller events (four of the five large interventions found positive results whereas only three of seven small interventions had positive results). However, this should be taken lightly as these large studies had more generalized or qualitative measures.

**Table 2**  
*AAI on College Campuses- Comparison of Studies and Results*

Researcher (Year)	Size of Intervention	Total Duration	Measures Used	Overall Results
Adamle et al. (2010)	Large	Short-term	Qualitative	Positive
Barker et al. (2016)	Large	Short-term	Self-report, physiological	Mixed
Binfet (2017)	Small	Short-term	Self-report	Positive
Binfet & Passmore (2016)	Small	Long-term	Self-report	Positive
Crossman et al. (2015)	Small	Short-term	Self-report	Mixed
Crump & Derting (2015)	Small	Short-term	Self-report, physiological	Mixed
Dell et al. (2015)	Large	Short-term	Qualitative	Positive
Folse et al. (1994)	Small	Long-term	Self-report	Mixed
Morgan (2017)	Small	Long-term	Self-report	Positive
Muckle & Lasikiewics (2017)	Large	Short-term	Self-report, physiological	Positive
Somervill et al. (2008)	Small	Short-term	Physiological	Mixed
Stewart et al. (2014)	Large	Short-term	Self-report	Positive

**Total duration**

There was not a discernable pattern regarding total duration. Of the nine short-term studies, five had positive results and four had mixed results. Similarly, two of the long-term studies had positive results while the other had mixed. Thus, more research is needed in this area to make any conclusions regarding the success of AAI based on duration spent with animals.

**Measures used**

Qualitative measures had the highest success rate, as both the studies found positive results. However, these measures were also generally the weakest at providing an accurate reading as to actual measures of



stress reduction. Self-report measures had mostly positive results. As mentioned previously, physiological measurements were the least successful. Of the four studies that used physiological measures, only one had positive results while the rest had mixed.

## **DISCUSSION**

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### **Limitations**

There is a lack of consistency in the existing literature. Between the actual intervention with the animals, session duration, the number of sessions, the number of participants in each session, the animals used, and the forms of measurement, there is very little uniformity. Therefore, it is difficult to generalize regarding the efficacy of AAI on campus because the studies vary so much from one another.

As previously mentioned, it is challenging to measure the effect of only the animal due to social influences of handlers and other human participants. Furthermore, since many studies used convenience sampling with first year psychology students, a large portion of the participants were female. In fact, one of the studies was entirely female (Crump & Derting, 2015). Interestingly, one study discovered females were more likely to respond positively (“Strongly Agree”) to items on the Likert-scale than males, which suggests that the samples with high portions of females may be skewed (Dell et al., 2015). Studies with a more diverse sample are needed in the future.

### **Costs of the Interventions**

Using AAI on a college campus is a cost-effective way to help improve the mental health of students. Depending on how the AAI is used, the cost can range anywhere from free to relatively inexpensive. If the college is able to contact a certified therapy dog or animal group and ask them to volunteer at events before exams or for a set schedule for visits, there would be no or minimal costs.

## **FUTURE AREAS OF RESEARCH**

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### **Defined duration**

The widest gap in the existing literature lies in the total amount of time participants spend with the animals. It is extremely difficult to compare studies in which participants either spend five minutes (Stewart et al., 2014) or six hours (Binfet & Passmore, 2016) with the animals. Ideally, a minimum session time could be established because it is unlikely that five minutes will create large differences, especially for studies examining depression and state traits.

Though five minutes to six hours is a massive difference, an even more concerning challenge occurs when the participants decide themselves how long they spend with the animals (i.e., one student stays for five minutes while another student in the same study stays for an hour). In order to determine the effectiveness of time spent with animals (i.e., How much time is needed to obtain the desired effects? Do benefits decay over time?), more studies are needed that structured the time spent with animals.

### **Use of follow-up**

Of the two studies with a follow-up portion, there were mixed results suggesting a need for future research. Of note, the study with a qualitative approach found long-term effects (Dell et al., 2015), whereas the quantitative approach did not (Binfet, 2017). To more effectively use AAI on college campuses, we must understand the long-term effects of time spent with animals (i.e., How long do the effects last? Does the intervention need to be repeated to retain desired results? Are the long-term results only sustained in subjective measures, not objective measures?).

### **Best animals**

Only two of the studies used animals other than dogs, therefore it would be interesting to determine whether there are additional animals that could be used as effectively or if one animal is more beneficial than another (i.e., Is a dog more effective at reducing homesickness than a fish?). No significant differences in the effects of holding an animal on blood pressure were found between cats and dogs in Somervill et al. (2008), suggesting that other animals can be just as effective and perhaps more cost efficient. Furthermore, researchers found the three selected modalities- horse, yoga, or nature walks -

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were equally beneficial in stress reduction (Morgan, 2017). Thus, more research is needed to assess the best animal to use for AAI, if an animal is needed at all.

### Role of culture

Muckle and Lasikiewicz's 2017 study in Singapore is the only study outside the United States or Canada. The researchers mention that AAI is on the rise in Asia, but still not as popular as in Western countries. Additionally, there were several differences based on culture that could have impacted the results. Asian countries do not view dogs the same way that Western countries do (their value is derived based upon utility, not as a family member) and the purpose of the study was revealed to participants before they began due to religious reasons. More studies need to examine the role that culture plays in the effectiveness of AAI on college campuses.

### CONCLUSIONS

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As mental health continues to pose problems on college campuses, it is necessary to find methods to address this crisis. Previous research has shown that AAI with college students can reduce anxiety (both psychological and physical symptoms), decrease homesickness, decrease negative affect, improve positive affect and decrease depressive symptoms. Many students who participated in these studies noted the positive impact the interactions with animals had on their stress-management and expressed interest in having a permanent pet therapy program on their campus.

However, future research is greatly needed to determine more about how to best implement AAI on college campuses. In the currently available research, there are massive inconsistencies regarding the duration and standardization of interventions used. Results indicate that most time frames and practices that occur during the AAI produce positive outcomes, but more definitive research and replication are needed to determine the accuracy of these results. Additionally, current research indicates that other animals (such as cats) may be as effective as dogs in AAI, and thus more research is needed to determine what animals are effective and in what situations. Despite these challenges, research shows that AAI on college campuses is successful and deserves additional attention and research.

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