

THE EFFECT OF INTERACTION WITH A THERAPY DOG ON COLLEGE STUDENT  
STRESS LEVELS AS MEASURED BY PHYSIOLOGICAL INDICATORS

By

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation of KENDRA RIEGER THEW find it satisfactory and recommend that it be accepted.

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THE EFFECT OF INTERACTION WITH A THERAPY DOG ON COLLEGE STUDENT  
STRESS LEVELS AS MEASURED BY PHYSIOLOGICAL INDICATORS

Abstract

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Although animal-assisted activities have been shown to reduce stress, few studies have examined the stress reduction effects of therapy dogs on college student stress levels. Many college students experience increased stress levels due to the unique experience of college. These higher levels of stress can have negative consequences such as increased drinking, dysfunctional coping mechanisms, and more. This creates a need for alternative methods of stress reduction. Animal assisted activities (AAA) is a growing area of interest that has many benefits including stress reduction. However, few studies provide empirical evidence for stress reduction based on physiological measures. Of the studies that have incorporated physiological measures, results have proved to be inconsistent. Furthermore, even though stress relieving programs are increasing in popularity on college campuses, few studies have examined the stress reduction effects of therapy dogs on college student stress levels. College students were recruited and randomly assigned to an experimental condition (with a therapy dog and human handler present) or a control condition (with no therapy dog or human handler present). Participants were outfitted with equipment to measure systolic blood pressure, diastolic blood pressure, and skin temperature. They watched a 10 minute video and were asked quiz questions about the content of

the video to mildly elevate their stress. The accuracy of their answers was also recorded. After the experiment, participants in the experimental condition were asked qualitative questions about their experience with the therapy dog. Data was analyzed using a Within-Between ANOVA design. Results and implications are discussed.

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## **Dedication**

For Ben Thew, without you this wouldn't exist and to my own stress relieving canines, Squirrel  
and Bean.

## CHAPTER ONE: INTRODUCTION

### **Introduction**

Human interest in interaction with animals has existed for centuries (Serpell, 2000). There has been much speculation on the basis of this interest: a need to commune with nature, fulfillment of emotional needs, and even physiological benefits (Buzzell & Chalquist, 2010; Chalquist, 2009; Friedmann, Katcher, Lynch, & Thomas, 1980; Kellert & Wilson, 1993). Regardless of what drives our need to interact, humans and animals have enjoyed lasting relationships and perceived benefits to humans. This drive has led to a field of study known as human-animal interaction (HAI). This research has expanded and can be seen in many different fields including educational, psychological, veterinary medicine, zoology, and more (Friesen, 2010; O'Callaghan & Chandler, 2011; Velde, Cipriani, & Fisher, 2005; Wesley, Minatrea, & Watson, 2009). HAI can be used as an inclusive term that incorporates animal assisted therapy (AAT), animal assisted activities (AAA), pet ownership, and more. While research and practice of HAI has expanded, there remains a need for more extensive and quantifiable research demonstrating potential benefits.

One currently expanding area of research is the potential stress reduction benefits of HAI. Specifically, several studies have used physiological measures to quantify effects on human stress levels while interaction with therapy animals (Allen, Blascovich, Tomaka, & Kelsey, 1991; Barker, Knisley, McCain, Schubert, & Pandurangi, 2010; Bjick, 2013; Henry, 2013; Nepps, Stewart, & Bruckno, 2014; Polheber & Matchock, 2014; Somervill, Kruglikova, Robertson, Hanson, & MacLin, 2008; Tsai, Friedmann, & Thomas, 2010). However, results of these studies remain mixed. This may be due to a lack of standardized procedures regarding physiological measures, a lack of control over the spontaneous interaction between humans and

animals, or may be suggestive that the benefits of HAI only work under specific conditions. These mixed results suggest a need for more standardized and experimentally rigorous studies exploring the stress reduction benefits of HAI especially in college students.

### **Statement of the Problem**

It is important to study potential stress reduction benefits for college students due to the unique and challenging aspects of being a university student. College students are a mixed population when it comes to mental health. However, the majority of students do not meet the criteria for a formal mental health diagnosis but are encountering developmentally appropriate distress (American College Health Association, 2014). Being a college student adds additional life experiences that increase stress. Students are concerned with making new friends, being away from home, doing well academically, and growing as individuals. All of these domains contribute to increased stress levels in the university setting. Due to the negative consequences of high levels of stress, alternative stress reduction models are desirable. This creates a need to generate research quantifying the effects of AAA on college student stress levels.

While several studies have been conducted regarding the benefits of AAA and stress reduction, the large amount of evidence is either anecdotal or inconsistent (Allen, Blascovich, Tomaka, & Kelsey, 1991; Barker, Knisley, McCain, Schubert, & Pandurangi, 2010; Nepps, Stewart, & Bruckno, 2014; Polheber & Matchock, 2014; Somervill, Kruglikova, Robertson, Hanson, & MacLin, 2008; Tsai, Friedmann, & Thomas, 2010). The body of literature needs more studies outlining the potential quantifiable effects of AAA. The use of physiological indicators would allow for an unbiased examination of how interaction with a therapy dog directly impacts college student stress. Additionally, a strictly controlled environment would allow for high experimental control and greater support for conclusions drawn about the results of this study.

## **Purpose of the Study**

The purpose of this study is to identify the effects of AAA on college student stress levels by analyzing systolic blood pressure, diastolic blood pressure, and skin temperature. This study will add evidence either in support of or against the growing field of HAI.

## **Research Question**

1. Does AAA reduce stress for college students?

## **Hypotheses**

1. College students interacting with registered therapy dogs will experience reduced stress as measured by systolic blood pressure, diastolic blood pressure, and skin temperature during a stressful task and when recovering from the task as compared to a control group without the presence of a registered therapy dog.
2. College students interacting with registered therapy dogs will self-report lower levels of stress than a control group without the presence of a registered therapy dog.
3. College students interacting with a therapy dog will demonstrate higher accuracy when responding to quiz questions during a stressful task than a control group without the presence of a registered therapy dog.

## **Overview of Methods**

Interested participants were provided with a screening measure inquiring about animal allergies, phobias, or past aggressive experiences with humans or animals. Contraindications included any participant with dog allergies, dog phobias, or a history of aggression toward animals or humans. Participants were randomly assigned to the experimental group or the control group.

Participants in the experimental group met this researcher and were equipped with instruments to measure systolic blood pressure, diastolic blood pressure, and skin temperature. They were then introduced to a registered therapy dog and handler and were instructed to pet the dog with their dominant hand. While petting the dog, they watched a 10 minute video about the Cold War. After the video, while continuing to pet the therapy dog, participants in the experimental group were quizzed orally about the content of the video to mildly elevate their stress. After the quiz, participants answered a few brief qualitative questions about their experience during the study and with the therapy dog. They were provided with a handout on stress reduction tips and local counseling resources.

Participants in the control group completed similar procedures with a few changes. They completed the study without the presence of a therapy dog and handler. Instead, they completed the procedure in the presence of this researcher and a research assistant. After completing the oral quiz, participants in the control group had the opportunity to schedule a time to meet with a therapy dog if desired. They were then provided with the handout of stress reduction and local counseling resources.

## CHAPTER TWO: REVIEW OF THE LITERATURE

### **Terminology**

One of the issues one should be familiar with when studying HAI is the challenging terminology. Currently, there is a lack of consistent terminology being used within the scope of practice and research (Fine, 2010; LaJoie, 2003). The often interchangeable phrases make studying existing literature and advancing the field as a whole quite difficult. For example, a research study may use terminology that means something different to other researchers creating confusion and a lack of cohesion.

Within this dissertation, the phrase HAI will be used to refer to human animal interaction more broadly. Generally speaking, HAI refers to any interaction between humans and animals as well as the potential benefits and effects related to the human-animal bond (Odendaal, 2000). Within the umbrella term HAI, there are many different phrases for practices, interventions, and techniques which are often used interchangeably (Nimer & Lundahl, 2007).

### **HAI, Animal Assisted Therapy, and Animal Assisted Activities**

HAI is an encompassing term that represents many different terms, interventions, and practices. Within the scope of HAI are two forms of intervention with therapy animals: animal assisted therapy (AAT) and animal assisted activities (AAA). However, these terms are often used interchangeably within practice and research. To define these concepts, many in the field identify terminology used by Pet Partners, an organization that trains and registers volunteer human and animal therapy teams (Fine, 2010; Henry, 2013; Pet Partners, 2012). Through Pet Partners, volunteer teams of a human handler and a therapy animal can train and take evaluations to become registered therapy teams. Pet Partners allows many animals to become therapy animals including dogs, cats, horses, rabbits, pigs, birds, and more (Pet Partners, 2012). Within

the field, the Pet Partners definition of AAT and AAA are widely recognized. Pet Partners defines AAT as:

“AAT is a goal-directed intervention in which an animal that meets specific criteria is an integral part of the treatment process. AAT is directed and/or delivered by a health/human service professional with specialized expertise, and within the scope of practice of his/her profession. AAT is designed to promote improvement in human physical, social, emotional, and/or cognitive functioning [cognitive functioning refers to thinking and intellectual skills]. AAT is provided in a variety of settings and may be group or individual in nature. This process is documented and evaluated” (Pet Partners, 2012).

In order to be defined as AAT, a specific goal must be identified, measured, evaluated, and documented within the practice of a professional (Pet Partners, 2012). Examples of AAT include a counselor incorporating a therapy animal into session, an occupational therapist incorporating an animal into rehabilitation work, an equine program designed to improve social competency in children, and more. The key features of AAT include specific identified goals and evaluation of the goals (Pet Partners, 2012).

Often, when an activity does not meet the full criteria for AAT, it falls under the term animal assisted activities (AAA). Pet Partners defines AAA as:

“AAA provides opportunities for motivational, educational, recreational, and/or therapeutic benefits to enhance quality of life. AAA are delivered in a variety of environments by specially trained professionals, paraprofessionals, and/or volunteers, in association with animals that meet specific criteria” (Pet Partners, 2012).

According to Pet Partners, AAA has three key features: 1) there are no specific goals planned, 2) any volunteers or providers are not required to take notes, and 3) the visits are

spontaneous with no specific time limit (Pet Partners, 2012). Examples of AAA include many of the college student stress reduction programs, reading with children, visiting a hospital or senior center, and more.

Within the scope of this dissertation, the term AAA and HAI will be used to refer to the interaction between participants and therapy dogs. The animals will be incorporated into a visit with a college student but will not be delivered by a “health/human service professional” (Pet Partners, 2012). Instead, volunteer teams of handlers and therapy dogs will be incorporated into the experiment. While a specific goal has been identified (stress reduction), and will be measured, without a professional operating within their practice, this study does not qualify as AAT.

Both AAT and AAA offer many benefits to humans. Dimitrijević (2009) noted several benefits in HAI including improved communication, higher self-confidence, higher quality of life, and decreased symptoms of disease. Many of these benefits have been documented within different populations and settings. Research and practice has been conducted in group homes, hospices, rehabilitation centers, with children, with college students, with adults, with the elderly, and more (Friesen, 2010; O’Callaghan & Chandler, 2011; Velde, Cipriani, & Fisher, 2005; Wesley, Minatrea, & Watson, 2009). Different benefits of HAI have been documented with all of these populations and settings.

HAI has also been documented to aid in the treatment of populations struggling with substance abuse. Wesley, Minatrea, and Watson (2009) examined the impact AAA has on the therapeutic alliance between practitioner and client. They found clients in treatment due to a court order, polysubstance abuse, cannabis, and methamphetamine dependence had a more positive view of the therapeutic alliance when HAI was incorporated (Wesley et al., 2009).

Practitioners working with populations dealing with addiction can experience difficulty forming a therapeutic alliance. The inclusion of an animal in the therapeutic process may help serve to increase the bond between practitioner and client.

Another benefit of HAI is positive health effects. While results are mixed between human interaction with therapy animals and humans and their companion animals, some promising research exists. Much of this research expanded after the Friedmann, Katcher, Lynch, and Thomas (1980) study on survival rates of pet owners and non-pet owners after coronary events. Additional work has focused on positive health benefits for non-companion animal owners. Giaquinto & Valentini (2009) noted a decrease of cardiovascular risk and blood pressure in the presence of dogs who were not companion animals. However, their findings were mixed when examining the psychological benefits. Other studies have documented significant decreases in stress as measured by physiological indicators (Allen, Blascovich, Tomaka, & Kelsey, 1991; Barker, Knisley, McCain, Schubert, & Pandurangi, 2010; Nepps, Stewart, & Bruckno, 2014; Polheber & Matchock, 2014; Somervill, Kruglikova, Robertson, Hanson, & MacLin, 2008; Tsai, Friedmann, & Thomas, 2010).

Many researchers have focused their attention on the social benefits of HAI. Berget and Braastad (2008) noted that animals can serve as attachment figures. Attachment theory posits humans have an innate need to form social connections. Humans, specifically pet owners, can form attachments to their companion animals similar to the ones formed with their friends and family members (Berget & Braastad, 2008). Forming an attachment with a therapy animal may provide similar benefits as forming an attachment with another human. Chandler (2005) notes that humans may have an easier time forming relationships with an animal versus other humans, specifically practitioners. The animal may act as a catalyst for social interaction, create bonds

between humans, or simply offer a safe topic of conversation (Adamle, Riley, & Carlson, 2009; Chandler, 2005).

While dogs are a common therapy animal, many other animals are recognized by Pet Partners as therapy animals (Pet Partners, 2012). Nimer and Lundahl (2007) conducted a meta-analysis examining all previous HAI studies. They found that dogs were incorporated most often. The results indicated that therapy dogs in research generated moderately high effect sizes, compared to other animals (Nimer & Lundahl, 2007). Positive results were found when addressing medical well-being and behavioral outcomes (Nimer & Lundahl, 2007). These promising results indicate HAI is a growing field that should be continually studied. An increase in the number of experimentally rigorous studies will contribute to the body of research and hopefully produce consistent results. This would contribute to HAI research and practice becoming more accepted and implemented.

While many promising benefits of HAI have been documented, there are several challenges when conducting research that are important to note. Many of the current research studies on HAI take an anecdotal approach. Researchers observe benefits and collect qualitative information from participants. While these accounts are generally positive, there is a lack of quantifiable evidence that HAI is an effective adjunct to treatment. One of the challenges is quantifying the unique nature of the human animal bond. It can be difficult to gather evidence for or against something that has not been operationally defined. Without a proper understanding of the mechanism of change within HAI, research is often forced to examine broader concepts such as observation of participant behavior (Henry, 2013). Additionally, inconsistent or mixed results demonstrate within documented research has created a need for more empirically sound and experimentally rigorous studies on AAA. Unfortunately, experimental control must often be

sacrificed in order to capture a spontaneous interaction between humans and animals. Further research exploring the different health effects humans receive from animals both in spontaneous and controlled interactions may provide clarity for these issues.

Another challenge to practicing or researching HAI is the potential risk to participant or animal. While there are guidelines available with suggested practice, there is no unifying or licensing body that regulates the field of HAI (Chandler, 2005; Fine, 2010). Fejsakova et al. (2009) reviewed the ethical aspects of involving animals in therapeutic settings. They noted that precaution should be taken when selecting and training specific animals to determine which animals are appropriate to become therapy animals. Fejsakova et al. noted that handlers should be aware of the stress, health, and performance of their therapy animals in order to recognize discomfort, fatigue, fear, and stress. Pet Partners (2012) attempts to regulate this practice by incorporating human handler education focused on determining animal wellbeing into the evaluation. However, research on stress behaviors and cortisol levels in therapy animals during practice has been mixed (Glenk et al. 2014; Haubenhofner & Kirchengast, 2006). While the field is beginning to quantifiably document benefits to humans in HAI, there remains a lack of research into the impact on therapy animals. Creating studies that follow ethical guidelines with animals is a unique problem.

Final challenges have to do with the incorporation of the therapy animal into research or practice within the scope of HAI and animal welfare. There is even concern about the language of HAI; whether animals are “used” or “incorporated” into research and practice (Herzog, 2011). There is also a challenge in finding appropriate animals to participate. Animals should be clean, behave appropriately, and respond to handlers (Pet Partners, 2012). Not every animal is qualified to become a therapy animal due to temperament, wellbeing, and more. On top of identifying an

appropriate animal, multiple animals should be incorporated into research and practice in order to generalize the potential effects beyond a specific animal.

Overall, research and practice within the field of HAI is flourishing. Many benefits for humans have been documented both in AAA/AAT and in owning a companion animal. In order to advance the field further, additional research and potential regulations within the field will be necessary. HAI is a promising area of study that may benefit specific populations including college students.

### **Theoretical Basis of HAI**

It is important to note that there is no standard theoretical basis or bases for the importance or benefits of the bond between humans and animals. Within the scope of this dissertation, the role of HAI in reducing human stress is explored and the following main theoretical bases fit these ideas. The three main theoretical bases informing this study and the merit of HAI include the biophilia hypothesis, the ecotherapy treatment approach, and physiological hypotheses.

Edward Wilson developed the biophilia hypothesis stating it is “the innately emotional affiliation of human beings to other living organisms” (Kellert & Wilson, 1993, p. 31). When humans are too far removed from nature, they will seek out replacement environments such as zoos. Wilson also points out that the biophilia hypothesis can trace roots back to evolutionary perspectives. A large portion of human history placed humans in the role of hunter gatherers. In order to survive, humans needed to have a clear understanding of and connection with nature. This aided in development of the innate emotional need to connect with nature and other organisms. Currently, the human connection with nature is varied within cultures and individuals (Kellert & Wilson, 1993). In some instances, great emphasis is placed on human connection to

the natural world whereas other cultures appear to avoid the natural world. In many modern Westernized cultures, the tendency of “biophobia” or a distinct lack of comfort with the natural world, is expressed (Kellert & Wilson, 1993). Within the biophilia hypothesis, mental and physical wellbeing is tied to our connection with the natural world. With American college students becoming potentially biophobic, this may lead to a decrease in mental or physical wellbeing (Kellert & Wilson, 1993).

Within the biophilia hypothesis, HAI can play a crucial role in fulfilling the human instinctive bond with nature. There is a need for expanding research within the field of HAI in order to determine whether the innate connection with animals is lacking in some human populations such as college students (Kellert & Wilson, 1993). HAI provides opportunities to connect with nature, or more specifically with animals. Through interaction with animals, humans can form identities and develop emotionally (Kellert & Wilson, 1993). With further and more experimentally rigorous methodology, HAI research can potentially create additional support for the biophilia hypothesis.

Ecotherapy is a treatment approach for psychological well-being based on the premise of using the natural world to benefit psychological wellbeing (Chalquist, 2009). More broadly, ecotherapy can be viewed as an umbrella term for any methods involving the natural world to aid in physical or psychological health. Ecotherapy is based on the premise that positive or healthy interaction with the earth will result in natural healing or development (Buzzell & Chalquist, 2010). While approaches that can be considered ecotherapy are not a fix for all psychological problems, the field appears to be growing and demonstrating efficacy in different forms. Ecotherapy states that humans are spending less time outside which has negatively impacted our personal and social wellbeing. Additionally, with human created environmental destruction and

natural habitat elimination, humans may be experiencing distress related to the loss of many natural creatures and the pollution of our world (Buzzell & Chalquist, 2010).

Ecotherapy takes many different forms and interventions. It can be as simple as hanging a picture of a natural setting in a hospital room, placing a plant in a counseling office, or incorporating an animal into a therapeutic environment (Chalquist, 2009). As humans are experiencing distress related to a lack of bonding with the natural world, a bond formed with a therapy animal can begin to heal through a secure attachment (Buzzell & Chalquist, 2010). As humans form connections with animals, they can also re-learn how to connect with one another. Ecotherapy lends credence to the presence of an animal serving as a healing factor which highlights the potential efficacy of HAI.

Finally, AAA is often praised for the hypothesized physiological benefits such as decreased heart rate, decreased blood pressure, decrease in cortisol level, increase in oxytocin level, and more. Much of the research on physiological benefits expanded after Friedmann, Katcher, Lynch, and Thomas (1980) studied the survival rate of coronary patients with and without companion animals one year after their release from a coronary care unit. The study followed 92 patients admitted for myocardial infarction or angina pectoris. One year after their release from the hospital, of the participants who owned pets, 50 were alive and 3 were deceased, whereas of the participants who did not own pets, 28 were alive and 11 were deceased. Friedmann et al. were concerned that owning dogs may have been a confounding variable as owning a dog requires physical exertion by the owner which may have influenced survival rates. This triggered another data analysis between participants who owned pets other than dogs and participants who did not own pets. Of the participants who owned pets other than dogs, 10 were alive after 1 year and 0 were deceased. The numbers for participants who did not own pets was

the same as above. Even after eliminating participants who owned dogs, results were significantly favoring pet ownership.

The Friedmann, Katcher, Lynch, and Thomas (1980) study represented a first step toward research of physiological benefits of HAI. The publication of the Friedmann et al. study fueled interest into the research of the physiological benefits of pet ownership and HAI (Fine, 2010). Friedmann herself has continued to research and publish within the scope of physiological effects of HAI (Gee, Friedmann, Stendahl, Fisk, Coglitore, 2014; Krause-Parello & Friedmann, 2014; Tsai, Friedmann, & Thomas, 2010). While research into the physiological benefits of HAI has expanded since 1980, much of the research has produced inconsistent results or has been targeted at specific populations (i.e. medical professionals, the elderly, etc.) which creates issues for generalizing these benefits.

While there are no unifying theoretical bases for the research of HAI, there are many hypotheses into the mechanisms at work that benefit humans in relationships with animals. This creates a need for further research exploring the unique aspects of these relationships in order to determine how to maximize benefits for both humans and animals. With continued experimentally rigorous research into HAI there may be potential justification for the biophilia hypothesis, ecotherapy, and the physiological benefits of animal interaction.

### **College Student Stress**

While the amount of research regarding HAI continues to expand, including use of college students as a convenience sample, there appears to be a lack of focus on incorporating AAA to address specific problems college students are facing. According to the American College Health Association (ACHA) National College Health Assessment (NCHA), 43.2% of undergraduate college students reported experiencing “more than average stress” and 10.6%

reported “tremendous stress” within the last 12 months (American College Health Association, 2014, p. 16). Many college students face difficult life stressors including making new friends, being away from home, doing well academically, and growing as individuals. All of these domains involve increased stress levels in the university setting. Due to the negative consequences of high stress levels, new stress reduction models are desirable which provides further justification for exploration of AAA.

Research on the negative effects of stress on college students is vast. Hubbs, Doyle, Bowden, and Doyle (2012) researched the relationship between self-esteem, stress, and physical activity in college students. They found an inverse relationship between stress and self-esteem. As students become more stressed and their self-esteem decreases, the ability to successfully and healthfully cope with life stressors could be diminished. Much of this could lead to problematic secondary behaviors. While Hubbs, et al. found no significant relationship between stress and physical activity, Li and Lindsey (2013) found that students experiencing higher levels of stress engaged in less health-promotion practices. These practices included healthy responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management. Once again, implications regarding coping abilities and healthful behaviors are a concern.

Other researchers have found additional concerns regarding the role of stress in diminishing coping skills in college students. Lee, Wuertz, Rogers, and Chen (2013) studied the relationship between stress and sleep in female college students. The authors found that high stress levels were correlated with more sleep disturbances, less total sleep time, higher fatigue, and more depressive symptoms. Once again, the research is troubling, considering the high amounts of stress most college students are experiencing. Lee et al. further note that sleep and

stress are especially concerning as perceived stress and sleep disturbances can both predict depressive and physical symptoms.

Research into college student stress has also demonstrated concerns regarding poor mental health. The American College Health Association reported that 33.2% or 1 in 3 college students reported feeling so depressed it was difficult to function within the past 12 months (American College Health Association, 2014). Inversely, 76.9% of college students reported they did not seek professional help for mental health diagnoses within the past 12 months (American College Health Association, 2014). While college student populations experience poor mental health with or without increased stress, there have been some researched links between increased stress and poor mental health.

Morrison and O'Connor (2005) researched the role of stress in predicting psychological distress. They found that stress predicted increases in anxiety and insomnia, which is consistent with previous findings about difficulties with secondary behaviors. In an academic setting, college students are expected to complete assignments and projects that increase their stress and minimize their perception of competency. This cycle can build on itself, creating increased pressure and difficulty to succeed academically. Research has also revealed connections between stress and deterioration of mental and physical health in college students (Pederson, 2012). Stress spillover is when stress from one domain carries over into other domains, such as school stress affecting family or work. Pederson found that college students report higher levels of school stress spillover than any other type. Pederson linked school stress spillover to an increase in the number of days of poor mental health as well as a decrease in sleep hours. Therefore, school stress has the power to negatively impact both physical and mental health of college students.

Alcohol-related consequences are another factor in college student stress levels. Rice and Van Arsdale (2010) found that drinking was a significant coping mechanism for perceived stress. They also found that maladaptive perfectionists reported higher alcohol consumption and stress. Camatta and Nagoshi (1995) explored the relationship between stress, depression, irrational beliefs, and alcohol use in college students. They found that stress was correlated with alcohol problems but not with alcohol use. This may be due to the fact that alcohol use within college populations can be developmentally normal. However, the development of alcohol problems in relation to stress is troubling. Due to the already stressful experience of college, many students may increase alcohol consumption to harmful levels.

Another potential concern of high stress levels in college students is persistence toward degree completion. Kelly, LaVergne, Boone Jr., & Boone (2012) examined several factors that decrease the likelihood of graduation, and found that 52% of students rated inability to handle stress as discouraging. Student experiences of stress and perceived stress are a risk factor for dropping out of college. Decreasing stress could potentially increase student success and degree completion. The negative consequences of stress in a stress-rich environment create a need for alternate approaches to reduce college student stress levels, including exploration of the role of animal-assisted activities.

Researchers have examined the impact of different experiences that impact college students' perceived stress. Chao (2012) explored the three way interaction between perceived stress, social support, and dysfunctional coping. Social support was defined as assistance provided by family, friends, and significant others. Dysfunctional coping was defined as coping mechanisms that have unintended negative consequences. Significant interactions were found for a two-way interaction between perceived stress and social support as well as a three-way

interaction between perceived stress, social support, and dysfunctional coping (Chao, 2012). Students who continue to engage in dysfunctional coping mechanisms will decrease the benefits of social support on perceived stress.

With college students experiencing increases in stress and the concern about many of the negative consequences of stress, the generation of alternative stress reduction treatments become necessary. AAA is one possibility to meet the needs of stressed college students. Currently, many universities have some form of a stress reduction program incorporating therapy animals. However, regardless of the popularity of these programs, research into their efficacy remains relatively sparse (Bjick, 2013; Henry, 2013; Polheber & Matchock, 2014; Somerville, Kruglikova, Robertson, Hanson, & MacLin, 2008). Additionally, many of these studies produced either mixed results or relied entirely on participant self-report. This creates a need for experimentally rigorous research into the stress reduction properties of AAA with a college student population.

### **The Effect of Stress on Performance**

In addition to impacting physical and mental health, stress has demonstrated effects on cognitive performance. In 1952, Lazarus, Deese, and Osler completed a review of the effects of stress on performance. They found the majority of publications demonstrated a degree of performance impairment related to stress (Lazarus et al., 1952). However, it is important to note which areas are being impaired (i.e. mental performance or physical performance). Several studies demonstrated a decrease in IQ scores following a stressful experience (Hutt, 1947; Lantz, 1945; Zander, 1944). Stress has also been demonstrated to impair simple mathematical performance (McKinney, 1933; Williams, 1947).

These same impairments have been found in recent literature as well. LeBlanc (2009) reviewed the literature and found elevated stress levels demonstrated impairments in dividing

attention, working memory, and retrieval of information from memory. This has significant implications for college students who are often evaluated during stressful conditions (i.e. examinations, presentations). This may be particularly evident on written exams due to stress correlating with impairments in memory and word recall (Domes, Henrichs, Rimmel, Reichwald, & Hautzinger, 2004; Kuhlmann, Piel, & Wolf, 2005). Stress has also been correlated with a decrease in academic performance for traditional, non-traditional, and international students (Buddington, 2002; Chartrand, 1992; Pritchard & Wilson, 2003; Struthers, Perry, & Menec, 2000). This may be related to poor exam performance as well as the previously mentioned difficulty dividing attention, working memory, and retrieval of information from memory.

### **Physiological Stress Measures**

There are many different options within research for measuring physiological stress. However, one important consideration is screening between normal or pathological participants. Crocetti et al. (2010) studied the differences in psychophysiological stress profiles between normal and pathological subjects. They measured electrodermal activity (GSR – as measure of skin conductance), heart rate, and electromyogram surface (EMG). Participants consisted of 20 people without psychological diagnosis and 20 pathological subjects diagnosed with either Major Depressive Disorder, Panic Attack Disorder, or Personality Disorders. Participants underwent a stress test that included a 2 minute baseline measure, a tactile stimulus (a soft single touch on the right forearm), 1 minute without the stimuli, visual stimulus, threat stimulus (for example presenting a dangerous object and threatening the subject), 1 minute rest, painful stimulus (poking a subject with a needle), 1 minute rest, 2 minutes of mental calculation (serial subtraction), 1 minute rest, and 2 minutes of rapid breathing. Results indicated differences

between normal and pathological participant groups on several physiological measures. Within normal populations compared to pathological participants, Crocetti et al. found lower GSR at baseline and lower heart rate in all conditions. This suggests that healthy or normal participants will exhibit naturally lower levels of skin conductance and heart rate. While additional physiological measures such as blood pressure and skin temperature were not recorded, there is a possibility that these measures are also different between normal and pathological participants. This may be due to physiological changes during mental health, medication interference, or other unknown variables.

While Crocetti et al. (2010) researched physiological differences between normal and pathological participants to aid in diagnosis, their results pose interesting challenges to research using physiological measures. In the future, it will be important to conduct further research to determine the potential benefit of HAI on stress reduction in pathological populations and non-pathological populations.

### **AAA and Stress Reduction**

Several studies have explored the various physiological benefits of HAI (Allen, Blascovich, Tomaka, & Kelsey, 1991; Barker, Barker, McCain, & Schubert, 2016; Barker, Knisley, McCain, Schubert, & Pandurangi, 2010; Nepps, Stewart, & Bruckno, 2014; Polheber & Matchock, 2014; Somervill, Kruglikova, Robertson, Hanson, & MacLin, 2008; Tsai, Friedmann, & Thomas, 2010). Unfortunately, this research has produced mixed results prompting a need for further research. Friedmann, Son, and Tsai (2010) wrote about the various research on the stress-reducing benefits of animal-assisted therapy and activities (AAT/A). They posit that the field needs more research on the method of AAT/A, as well as potential interventions to maximize

benefits. Additional experimentally rigorous research can shed clarity on the previously mixed results.

Several studies have demonstrated decreases in heart rate within college, adult, and child populations during HAI (Allen, Blascovich, Tomaka, & Kelsey, 1991; Barker, Knisley, McCain, Schubert, & Pandurangi, 2010; Nepps, Stewart, & Bruckno, 2014; Polheber & Matchock, 2014; Somervill, Kruglikova, Robertson, Hanson, & MacLin, 2008).

In 2012, Beetz, Uvnäs-Moberg, Julius, and Kotrschal reviewed 69 studies that measured the effects of HAI on different variables such as empathy, social interaction, hormones, and the autonomic nervous system. Inclusion criteria included publication of original research in a peer-review scientific journal. Additional criteria mandated that studies were designed so that any effects found would have a high probability of resulting from HAI than confounding variables. All studies had an  $n > 10$ . The authors explored effects on social interaction, trust and trustworthiness, empathy, reduction of aggression, reduction of depression and promotion of positive mood, anti-stress effects, effects on anxiety and pain, learning, and human health and restoration. Regarding HAI effects on reducing stress, the studies revealed that the presence of a friendly animal has been shown to reduce heart rate and blood pressure or slow down increases in these measures in anticipation of a stressor. However, more complete information regarding the effect of HAI on skin temperature has not been collected.

### **Skin temperature**

The documentation of the correlation between stress and skin temperature was initially mixed due to a 1954 study by Baker and Taylor. However, due to greater standardization of the measurement of skin temperature through finger temperature measures, a connection has been made between stress and a decrease in finger temperature. In 1954, Baker and Taylor explored

the relationship between finger temperature and stress and noted an increase in finger temperature during the stressful condition. Since their study was published, research has been published on how to better control this measure (i.e. minimizing extra movements, waiting for a longer period of time) that has demonstrated an opposite effect (i.e. decreased finger temperature during times of stress) (Boudewyns, 1976).

In 1976, Boudewyns presented an experimentally rigorous three part study exploring changes in finger temperature in response to stressful or relaxed situations. In the first experiment, 57 male and 76 female participants spent \$20 filling out demographic information and signing the consent form. Participants then sat in a recliner in the reclining position and a male experimenter attached surface electrodes to their skin surface. Participants received preliminary instructions on the study then the experimenter dimmed the lights and exited the room. After 3 minutes, participants had their finger temperatures measured to capture an “initial finger temperature”. The purpose of the first experiment was to capture initial measures of finger temperature in order to determine any demographic or timing differences. Boudewyns found that female participants had generally lower finger temperatures and that regardless of waiting in a warm room, the temperature of the weather outside had a minor impact on temperature.

In Boudewyns (1976) second experiment, ten male and eleven female participants (from the pool of participants from experiment one) completed the initial procedure of experiment one. Participants were then asked to use a “rate-o-meter” which consisted of a lever they set from 0 to 10 with 0 being “completely relaxed” and 10 being “terror”. Participants were then instructed by the experimenter to close their eyes and relax after which he left the room. Participants listened to an excerpt from the Lazarus relaxation tape for 10 minutes during which they made three arousal ratings. The ratings occurred prior to the tape starting, midway through the tape, and

right before the end of the tape. After this phase, the experimenter played a tape that informed participants they would hear a low frequency tone that would increase which would signal an impending electric shock. This phase lasted for seven minutes during which participants experienced four randomly timed electric shocks and used the “rate-o-meter” twice. After this phase, the participant was unhooked from the shock electrodes and informed there would be no more shocks. Participants then listened to the relaxation tape for 15 minutes or until they reached the baseline finger temperature measure from the first relaxation phase. Boudewyns found that finger temperature increased significantly from the initial level to the first relaxation phase, decreased significantly during the stress phase, and increased significantly during the second relaxation phase. He also found significant differences in self-reported arousal ratings via the “rate-o-meter”. The purpose of experiment two was to determine if there would be significant changes in finger temperature based on condition and to determine if there was a relationship between self-report of arousal and physiological response.

In experiment three, Boudewyns (1976) gathered 20 male and 22 female participants (once again from experiment one). Participants were randomly assigned to the control group or experimental group. The experimental group went through identical procedures to experiment two except the stress phase lasted for 15 minutes and subjects made three self-report arousal ratings in 5 minute intervals. Participants in the control group were treated the same as those in the experimental group except they did not experience electric shock delivery or instructions about shock. Boudewyns found that decreases in finger temperature from the first relaxation phase to the stress phase were significantly greater in the experimental group than control group. Additionally, a sex interaction was noted as female participants demonstrated greater decreases than male participants in the experimental group but not the control group. Boudewyns suggested

the females may take a longer time to return to baseline after a stressful condition. This series of experiments poses several interesting considerations for future measures of finger temperature including weather conditions and sex differences.

In 2011, Lin, Lin, Lin, and Huang measured the effects of stress on skin temperature. Participants underwent a stressful task where they were asked to conduct serial subtraction of the number 17 from 1,000 for three minutes. The authors found a significant decrease in finger temperature for participants in the experimental group than participants in the control group. Since 1954, research has consistently demonstrated the efficacy of using finger temperature as a measure of stress.

To date, there is a lack of research in the field of HAI exploring the impact of AAA/T on skin temperature. This may be due to concerns about the potentially prolonged time period of the effects or the difficulty in capturing a standardized measure due to sex differences or weather concerns. However, research capturing a more complete stress profile including finger temperature could add credence to the practice of HAI.

### **Blood pressure**

Much of the research on the benefits of AAT/A has focused on diastolic and systolic blood pressure. Numerous studies focus on blood pressure as a main indicator of cognitive stress, and show decreases in diastolic and systolic blood pressure during AAT (Allen, Blascovich, Tomaka, & Kelsey, 1991; Barker, Knisley, McCain, Schubert, & Pandurangi, 2010; Somerville, Kruglikova, Robertson, Hanson, & MacLin, 2008; Tsai, Friedmann, & Thomas, 2010). Tsai, et al. found that decreases in systolic blood pressure lasted after an intervention compared to a control group that did not experience AAT.

In 2010, Barker, Knisely, McCain, Schubert, and Pandurangi explored the stress management possibilities for therapy dog owners with their own dog or dog owners with an unfamiliar therapy dog. The researchers measured heart rate, systolic blood pressure, diastolic blood pressure, salivary cortisol, and salivary alpha amylase for physiological measures of stress and participants also completed the State-Trait Anxiety Inventory, Trait Form to measure trait anxiety. Participants were asked to relax in a comfortable chair for 30 minutes, then completed the Visual Analog Scales for self-reported stress and anxiety and provided saliva for cortisol and alpha-amylase. Measurements of heart rate and blood pressure were then taken before participants completed the Stroop Color Word Test to increase stress levels. After the stress test, participants once again provided the same physiological and Visual Analog Scales. Participants then had 30 minutes of interaction with a therapy dog and had heart rate, blood pressure, and Visual Analog Scales collected during the last 5 minutes with the dog. Following interaction with the therapy dog, heart rate, blood pressure, and saliva were once again measured followed by another Visual Analog Scale. Finally, participants were allowed to select one of three neutral 50 minute videos and heart rate, blood pressure, and saliva were collected at 30, 45, and 60 minutes post intervention. All participants experienced modest stress increases during the stressor and decreases from baseline following interaction with the therapy dog as measured by salivary cortisol, systolic blood pressure, diastolic blood pressure, heart rate, and self-reported anxiety and stress. Interestingly, the therapy dog owners perceived less stress and anxiety while with their therapy dog than the adult dog owners with an unfamiliar dog but the adult dog owners experienced greater reductions in physiological measures.

In the Tsai, Friedmann, and Thomas (2010) experiment, the researchers found systolic blood pressure continually decreased in the AAA group from pre, to during, to post visit. In the

comparison group, systolic blood pressure decreased from before to during but increased from during to post visit. This suggests that AAA may affect physiological stress after an intervention for several minutes.

Nepps, Stewart, and Bruckno (2014) did not find significant decreases in systolic or diastolic blood pressure between an AAT intervention and a stress management program in patients in a mental health setting. Interestingly, neither group showed significant decreases in blood pressure thus researchers determined this may be due to medication effects.

Systolic and diastolic blood pressure are accepted physiological measures of stress within HAI. It is important to measure blood pressure in addition to other physiological measures in order to determine potential effects.

### **Self-report**

Several HAI studies have used self-report measures of stress levels on questionnaires such as the State-Trait Anxiety Inventory, Burns Anxiety Inventory, Visual Analog Scale for Stress, and Perceived Stress Scale. These studies show decreases in self-reported stress when interacting with a therapy dog (Barker, Knisely, McCain, Schubert, & Pandurangi, 2010; Crossman, Kazdin, Knudson, 2015; Gonzalez-Ramirez, Ortiz-Jimenez, & Landero-Hernandez, 2013; Nepps, Stewart, & Bruckno, 2014; Tsai, Friedmann, & Thomas, 2010). While self-reported measures of stress have produced consistent results, physiological measures have been inconsistent at times.

Gonzalez-Ramirez, Ortiz-Jimenez, and Landero-Hernandez (2013) compared cognitive behavioral therapy and cognitive behavioral therapy plus AAA. They measured stress using the Visual Analogue Scale for Stress, The Perceived Stress Scale, and psychosomatic symptoms using The Patient Healthy Questionnaire. The researchers did not use any physiological

measures. Participants consisted of 30 adults split into two equivalent groups based on test scores. They attended 5 stress management sessions and AAA was incorporated into the cognitive behavioral therapy interventions for one of the groups. Unfortunately, the study suffered from high attrition and only 12 participants remained for all 5 sessions, 9 in the AAA and cognitive behavioral therapy group and 3 in the cognitive behavioral therapy group alone. When the data was weighted to equalize the groups, significant decreases were found on the measurements. Once again, AAA was found to be as good as but not better than other stress management interventions.

In order to capture complete stress reduction benefits of HAI, it is important to include qualitative or self-report measures in addition to physiological measures. Identifying potential discrepancies between perceived decreased stress and physiological stress reduction indicators could provide unique avenues for future research. Additionally, using multiple types of measures may provide a more complete understanding of the potential mechanisms underlying the effect of HAI on stress reduction.

### **AAA Stress Reduction with College Students**

The research on the stress reduction properties of AAA has been conducted with multiple populations. The same stress reduction benefits, could potentially be generalized to college students. However, the research on the stress reduction benefits of AAA within the college student population remains minimal (Barker, Barker, McCain, & Schubert, 2016; Bjick, 2013; Henry, 2013; Polheber & Matchock, 2014; Somervill, Kruglikova, Robertson, Hanson, & MacLin, 2008). Research on this specific population could provide support for animal-assisted programs on college campuses as well as provide potential alternative options for reducing stress levels for students. Other potential benefits include increased social interaction as animals may

be used as a conversation topic (Adamle, Riley, Carlson, 2009). Due to the negative consequences of stress that college students encounter, the need to find alternative options for stress reduction is increasing.

Adamle, Riley, and Carlson (2009) surveyed college student interest in animal-assisted activity programs on campus, and found that 96% of participants indicated interest in bringing animal-based programs to campus. This suggests that the college student population would be accepting of a stress reduction program using AAA. Additionally, the research suggests high college student participation in AAA events and research. There is a need for further research to capitalize on this interest in AAA programs in order to determine the level of support for bringing therapy dogs to college campuses across the nation. Reynolds and Rabschutz (2011) published an article on their successful implementation of a pet interaction event during exam week at the University of Connecticut. They noted an overwhelmingly positive student response and numerous requests to repeat the program.

Polheber and Matchock (2014) expanded on the work of Allen et al. and examined whether the presence of a dog would decrease cognitive stress compared to a human friend. Participants consisted of 48 undergraduate students randomly assigned to participate in one of three conditions: with a dog present, with a human friend present, and the control. They completed the State-Trait Anxiety Inventory Form Y, had their heart rate measured by a Garmin wireless heart rate transmitter, and provided saliva to measure cortisol levels. All participants were informed they would pretend to be interviewing for a highly competitive position and had 5 minutes to prepare for the interview with three research assistants who wore white lab coats as a symbol of status. In the group with the dog present, the dog sat within sight but out of reach of participants during the interview. In the group with the human friend present, the friend was

instructed to provide support in any possible way but not to coach the participant. The researchers found that the presence of the dog significantly decreased heart rate during the interview compared to the human friend and control groups.

Somervill, Kruglikova, Robertson, Hanson, and MacLin (2008) studied the physiological responses of college students when holding a dog or cat on their laps. There were five phases in the experiment 1) an initial baseline with no animal, 2) the first presentation of dog or cat, 3) a second baseline with no animal, 4) the second presentation of a dog or a cat, and 5) a third baseline with no animal. During phase 2 and 4 the animal was held on the lap of the participant. It was alternated to have either the dog in phase 2 and the cat in phase 4 or vice versa. Blood pressure and pulse were taken for each phase with one at the beginning of the five minute period and one at the end. Five minute intervals separated each of the 10 measures. No differences were found in the data between holding a dog and holding a cat so the datasets were combined. Differences were found between the baseline rates of blood pressure and pulse. Generally, the differences reflected a gradual reduction in blood pressure and pulse over the course of the 5 phases. However, the only significant finding was that the diastolic blood pressure was lower for the baselines immediately following the phases holding an animal. Whenever the baseline followed a phase of holding an animal there was a small but significant decrease in diastolic blood pressure. There was only partial support for the hypothesis that holding an animal would lead to a decrease in blood pressure and pulse. There is a potential explanation that holding an animal leads to delayed effects in blood pressure reduction as the measurements were only significant in the baseline phases after holding an animal.

Barker, Barker, McCain, and Schubert (2016) studied physiological stress and perceived stress of college students who met with dogs before final exams. Measurements included the

Perceived Stress Scale, Stress Visual Analog Scale, salivary nerve growth factor, and salivary alpha amylase. Participants were randomly assigned to start in either the intervention or the control condition which were each 15 minutes in length. During the intervention, participants were led to large room with 10 different therapy dog and handler teams. Participants freely interacted with the dogs for the 15 minute period. In the control condition, participants completed a Family Life-Space Diagram to control for student activity and engagement. Prior to starting the experiment, saliva was taken and the Perceived Stress Scale and the Stress Visual Analog Scale was completed. After completing the first condition, participants provided a second saliva sample and took the Stress Visual Analog Scale again. Finally, after completing the second condition, participants provided a third saliva sample and Stress Visual Analog Scale. The results demonstrated no statistically significant differences in physiological stress responses during the intervention. However, participants perceived stress significantly declined after the intervention regardless of the order of participating in the conditions. This suggests that while college students did not experience and physiologically reduced stress from interacting with therapy dogs, they perceived their stress level as lower.

In a Master of Social Work clinical research paper Bjick (2013) studied the effects of a therapy animal on college student stress and arousal levels. Bjick based her research on a 2004 study by Charnetski, Riggers, and Brennan which studied the effect of interaction with a dog on college students' immune systems. Charnetski et al. compared a control group with no animal exposure to two experimental conditions: participants petting a live dog or participants petting a stuffed dog. Results of the Charnetski et al. study demonstrated significant increases in secretory immunoglobulin A levels which correlates with increased immune system function.

Bjick (2013) randomly assigned 32 participants to one of four conditions (with eight participants per group): the control group, a group that stroked a therapy rabbit, a group that sat in a room with a therapy rabbit in a cage, and a group that stroked a stuffed rabbit. Participants were all female between the ages of 18 and over 56 years old. Participants identified their ethnicity as follows: Caucasian/White 72%, Asian/Asian Hmong 19%, Hispanic/Hispanic Latino 6%, and Black/African American 3%. In the study, participants were screened for rabbit or hay allergies. They were emailed an electronic consent form and provided a hard copy of the consent form when arriving for the experiment. Before the experiment, students completed an online questionnaire that contained The Pet Attitude Scale and the Stress Arousal Checklist. The Stress Arousal Checklist defines stress as a “subjective perception of the current situation as unpleasant or threatening” and arousal as a “generalized state of increased physiological activity without implication of positive or negative valuation of that state” (Duckro, Korytnyk, & Vandenberg, 1989, p. 239). After completing the study, participants immediately completed the Stress Arousal Checklist again. To complete the study, participants were emailed the Stress Arousal Checklist 24 hours after participant to determine any potential enduring effect.

Bjick (2013) found that all participants demonstrated a statistically significant decrease in their stress level after participation in the experiment. When compared to the control group and other experimental groups, the group of participants who held the therapy rabbit exhibited the largest decreases in stress. However, this larger decrease in stress was not statistically significantly greater than the other groups.

Bjick (2013) found that participants who either held the rabbit or sat in the room with the rabbit in the cage experienced increases in their arousal levels. However, there was no statistical significance to the arousal increases in either group when compared to the group with the stuffed

rabbit or the control group with no animal present. Bjick noted that participants appeared “talkative and happy” (Bjick, p. 42) after being exposed to the rabbit and indicated they may have received a benefit through social interaction as the rabbit may have served as a catalyst for conversation. However, Bjick did not obtain qualitative data to explore this potential benefit.

Participants were emailed the Stress Arousal Checklist 24 hours after participation in the experiment to determine any longer term beneficial effects of being exposed to the therapy rabbit (Bjick, 2013). Of the 32 participants, only 28 completed this additional measure and it is unknown which group the missing 4 participants participated in. Bjick found no changes in either stress or arousal level in any of the participants. However, this does support the immediate stress reduction benefits participants exposed to the rabbit experienced as their stress levels returned to pre-intervention levels 24 hours after the experiment. This highlights an interesting area of future research once more support for AAA has been established. If potential benefits of interaction with therapy animals, or therapy dogs, are well established, research can focus on how to maintain benefits of AAA past a 24 hour period.

Bjick’s (2013) research adds support and areas for future study to the field of AAA. However, there are several limitations within her research that could be addressed within the scope of this dissertation. One of the first limitations of this study is the participant pool. Bjick used a convenience sample from a small, private, female-only, institution in Minnesota. While this sample could provide initial findings and serve as a starting point for future research, the homogeneity of participants creates issues with generalizability to the broader population of college students. In addition to the sample being homogenous, there was a lack of exploration of cultural background of participants or the value participants place on animals. While the participants took the Pet Attitude Scale, there is some speculation within the field of HAI that

this instrument may be dated as well as attempts to modify the wording used in the scale (Munsell, Canfield, Templer, Tangan, & Arikawa, 2004; Templer & Arikawa, 2011). These researchers posit that the wording used in the scale is dated. For example, the term “pet” implies the animal may be in a subordinate role when the term “companion animal” may be more appropriate (Munsell et al., 2011). Additionally, Templer and Arikawa posit that the literature available when the scale was created (1981) was limited and has since evolved.

When conducting HAI research, it is important to remember the many cultural differences of having a relationship with an animal. In his book, *Some We Love, Some We Eat, Some We Kill*, Herzog (2011) explores the complex relationship between humans and animals and the different values placed on specific animals. For instance, Herzog explores how dogs can be family members to some, sources of danger and disease, or a source of food. Within the scope of HAI research, it is important to capture the value participants place on animals in order to determine the generalizability of results to a larger population. This can be addressed with an initial questionnaire that explores any potential animal allergies, fears, or aggression. While Bjick (2013) attempted to capture this using the Pet Attitude Scale, she may not have been able to explore the different values participants placed on human and animal relationships, specifically with rabbits.

Another potential limitation of Bjick’s study was the low stress level most participants endorsed at the beginning of the study. The study occurred between mid-February and mid-March which Bjick noted is a typically low-stress time of the academic year for participants. Additionally, two of the participants endorsed a pre-test stress score of one out of eighteen with 1 being a low level of stress. The overall low levels of stress endorsed by participants may have impacted the ability of Bjick to capture any potential stress reduction benefits of exposure to a

therapy rabbit. Without initially high levels of stress, it is increasingly difficult to determine what impact an intervention may have. This points out a potential need to increase the stress of participants during the experiment. If participants are experiencing a stressful task, the immediate benefits of potential interaction with a therapy animal may be more easily captured. Additionally, a higher level of stress may be more representative of the level of stress experienced by college students who take part in current AAA programs on college campuses as these programs often take place during mid-term or final examination weeks.

A further limitation to this study is the instrumentation used. Bjick (2013) relied on self-report measures (the Pet Attitude Scale and the Stress Arousal Checklist) to determine participants' views of animals as well as any potential stress or arousal level changes throughout the experiment. While this is an appropriate initial step in determining the potential stress reduction benefits of AAA, there is a potential for participants to skew the results. Participants drawn to participate in AAA research may fill out questionnaires according to what result they believe is occurring rather than what is actually occurring. For example, a participant who enjoys animals who was in a group exposed to the rabbit may unintentionally fill out the Stress Arousal Checklist in a way that aligns with her beliefs about HAI. Additionally, Bjick (2013) did not use any qualitative questions to capture how participants felt about being exposed to the therapy rabbit. This forced Bjick to speculate about the participants' experience with the experiment. Ideally, an experiment would make use of more reliable measures of stress as well as using several questions targeted at gathering qualitative data regarding the type of experience a participant had as well as how they felt about their interaction with the therapy animal. This methodology would provide room for quantitative exploration of potential stress reduction benefits as well as the qualitative experience a participant had. Mixing data collection methods

would also allow for exploration of discrepancies between quantitative measures as well as qualitative measures. For example, a participant may not experience any physiological changes but may perceive their stress level to be lower or vice versa.

A final limitation of Bjick's (2013) study is the therapy rabbit itself. Bjick noted a therapy rabbit was implemented as they are content to sit quietly, will not cause fear in participants as often due to small size and gentle nature, and may be more acceptable to Muslim individuals who practice Islam due to the number of students practicing in the larger population the participants were drawn from. While exposing participants to a therapy rabbit had many benefits, it also limits the generalizability of the results. First, only one animal participated in the study. There may be different benefits (or drawbacks) to interacting with different animals within the same species. Implementing a number a therapy rabbits with participants could have added strength to the conclusions Bjick could draw about exposure to therapy rabbits. Additionally, Bjick's conclusions are restricted to therapy rabbits which excludes other species of therapy animals. This poses potential limitations as therapy rabbits may have different effects on college student stress levels than therapy dogs or other animals. For example, the way a college student can interact with a therapy rabbit is restricted to gentle petting around the body while the rabbit is in a carrier. With therapy dogs, a person can pet and interact with the dog beyond petting the body. However, in order to maximize experimental control, participants may be required to interact with the animal in a certain way. This is one of the many challenges of research within HAI as experimental control may be lost due to the often spontaneous nature of the relationship between humans and animals.

Overall, Bjick's (2013) serves as a catalyst for further research in the field exploring the potential benefits of AAA on college student stress levels. Her research was empirically sound

and provided some conclusions regarding the usefulness of therapy rabbits and immediate stress reduction. While there are several limitations of her research and the conclusions she can draw, Bjick provided a foundation for future research in the field.

In a graduate dissertation, Henry (2013) researched the psychological and physiological effects of incorporating a therapy dog into mindfulness training with college students. Participants consisted of college students attending Utah State University experiencing at least mild psychological distress as measured by the Outcome Questionnaire-45. Henry required participants to have a positive attitude toward dogs as indicated by participant self-report. Of the 82 participants screened, 33 were eligible, 26 were contacted, and 21 participated in all stages of the experiment. Henry randomly assigned participants to the control group which received mindfulness-based stress reduction or the experimental group which received mindfulness-based stress reduction in the presence of a therapy dog. The age of participants ranged from 18 to 54 years old. Participants identified their ethnicity as follows: Caucasian 75%, African American, 5%, Latino 5%, Native American 5%, Multiracial 5%, Zambian 5%.

Eligible participants received a link with the informed consent statement as well as an online survey to collect demographic information (Henry, 2013). This online survey included initial baseline measures including the Pet Attitude Scale – Modified, the Outcome Questionnaire-45, the Five Facet Mindfulness Questionnaire, the Philadelphia Mindfulness Questionnaire, the Beck Anxiety Inventory, and the Beck Depression Inventory – II. For each of the six scheduled mindfulness sessions participants completed the State portion of the State/Trait Anxiety Inventory before session and the Toronto Mindfulness Scale, the Outcome Questionnaire-45, and the Session Engagement Questionnaire after each session. During the beginning of the first and last session participants completed the Five Facet Mindfulness

Questionnaire, Philadelphia Mindfulness Questionnaire, Beck Anxiety Inventory, Beck Depression Inventory – II, and the Trait portion of the State/Trait Anxiety Inventory. At the end of the last session participants completed the Client Satisfaction Questionnaire. Physiological measures included systolic and diastolic blood pressure as well as heart rate taken at the start of session, pre-mindfulness, and post-mindfulness. Each time physiological measures were collected, Henry secured a cuff to the upper arm of participants. Henry noted that prior to the first measure participants sat for approximately five or more minutes to capture stable resting heart rate and blood pressure. In the experimental condition where participants were led through mindfulness based stress reduction in the presence of a therapy dog, Henry instructed them to interact with the dog as much or as little as they liked. A single dog participated in the experimental group and was a registered Pet Partners therapy animal.

In the results section, Henry (2013) noted that six data points were missing due to random recording error but indicated this did not alter individual scores on any of the measures. Her research attempted to answer several questions. First, Henry sought evidence to determine if AAT in conjunction with mindfulness training would facilitate the development of mindfulness skills. She found no statistically significant difference between the experimental and control group although both groups demonstrated statistically significant improvements on measures of mindfulness. Henry also sought to determine if state mindfulness would differ between the groups. Once again, both groups demonstrated statistically significant improvement but there were no statistically significant differences between the groups. Another question Henry examined was whether the presence of a therapy dog would aid in reduction of anxiety. On the State/Trait Anxiety Inventory the results demonstrated a significant effect for all participants in reducing state anxiety but there were no statistically significant differences between the

experimental and control group. Physiological anxiety was reduced in both groups as noted by significant decreases in systolic blood pressure and heart rate during individual sessions. Henry did not note if there were any significant differences between the experimental or control group when analyzing physiological responses. Henry also examined whether participants would experience a decrease in psychological distress. All participants demonstrated statistically significant reductions of psychological distress but there were no statistically significant differences found between the experimental and control group. Finally, Henry explored any potential differences in client satisfaction. The results indicated there were no statistically significant differences between the experimental or control group regarding client satisfaction. Overall, the results indicated that AAT in conjunction with an established mindfulness based stress reduction program is as good as but not better than the program alone. These results are consistent with many previous studies exploring the presence of therapy animals on human stress and anxiety (Gonzalez-Ramirez, Ortiz-Jimenez, and Landero-Hernandez, 2013; Nepps, Stewart, and Bruckno, 2014).

While Henry's (2013) research added further evidence to field of potential benefits of HAI, there are several limitations that should be addressed. First, Henry implemented a single therapy dog throughout the experiment. While this may have been beneficial in establishing rapport and allowing the students to create a longer term relationship with the animal through multiple exposures, it limits the generalizability of the results. While incorporating one animal may increase experimental control, as noted by Henry, it calls into question whether there may be different benefits received from different animals. Aspects such as size, temperament, appearance, and more may impact the effect a dog has on college students. Using multiple dogs would allow researchers to generalize the conclusions to AAA or AAT as a whole. Furthermore,

Henry's sample (n = 21) may also limit the generalizability of her results. The sample included college students who met a minimum threshold for psychological distress. The results may not be generalizable to college students as a whole who are experiencing mild transitory distress. Additionally, a larger sample size would have increased statistical power.

Another potential limitation of Henry's (2013) research is amount of animal interaction each participant in the experimental group was exposed to. By not controlling for or measuring the level of participant interaction with the therapy, it is difficult to draw conclusions about the effect the animal may have had on the factors Henry measured. While it may not have been ideal to control for the level of animal interaction within a mindfulness based client session, Henry noted physical contact between the dog and the participants varied greatly from the animal lying on the floor near a participant to the animal lying on the participant's lap. Without knowledge of how much exposure and contact each participant in the experimental group had with the animal, it is nearly impossible to determine how the incorporation of a therapy dog effected the participants. Once again, this highlights the issue of sacrificing experimental control with spontaneous interaction. Further research exploring both of these aspects could highlight the specific mechanisms HAI may impact.

A final limitation in the Henry (2013) experiment is the physiological measures themselves. Henry noted that repeated application and inflation of the blood pressure cuff may have caused elevated results. Participants may have experienced distress or anxiety simply by having the cuff placed on their arm or even mild physical discomfort which would alter the results. While Henry followed recommended instructions and standards for measuring blood pressure, alternative methods may allow for more accurate measures that do not cause distress. It may be beneficial to simply leave participants hooked to a deflated cuff (or alternative form of

measurement) to reduce discomfort. Another limitation was the lack of information regarding potential statistically significant differences between the experimental and control group on the physiological measures. While Henry noted all participants experienced significant decreases in systolic blood pressure and heart rate, no group differences were commented on. While the trend in the measures suggested no group differences and it may be implied that the same applies to physiological measures, without explicitly stating this there is a lack of information regarding how AAT effected systolic blood pressure and heart rate.

Overall, Henry's (2013) research provided important information about the use of AAT within a counseling setting with college students. While the information about how AAT specifically impacted physiological measures was lacking, her methodology represented a more rigorous design that allowed for increased power and conclusions drawn about her research. Henry's research emphasizes the importance of incorporating a variety of animals, larger sample sizes, and the need for increased control or ability to measure the level of animal interaction.

While there is a large amount of evidence systolic blood pressure and diastolic blood pressure during AAA, several of these studies have provided inconsistent results. This suggests a need for continued examination of these measures. Skin temperature has not been measured to provide research about stress reduction in AAA. This dissertation combines all of these measures as well as self-reported stress in a randomized experimental design, and will pave the way for continued research on AAA with college student populations.

### **Purpose**

The purpose of this study is to identify the effects of AAA on college student stress levels by analyzing systolic blood pressure, diastolic blood pressure, and skin temperature. This study will add evidence either in support of or against the growing field of HAI.

## **Hypotheses**

1. College students interacting with registered therapy dogs will experience reduced stress as measured by systolic blood pressure, diastolic blood pressure, and skin temperature during a stressful task and when recovering from the task as compared to a control group without the presence of a registered therapy dog.
2. College students interacting with registered therapy dogs will self-report lower levels of stress than a control group without the presence of a registered therapy dog.
3. College students interacting with a therapy dog will demonstrate higher accuracy when responding to quiz questions during a stressful task than a control group without the presence of a registered therapy dog.

## CHAPTER THREE: METHODOLOGY

### **Introduction**

This study assessed the potential stress reduction benefits of animal assisted activities (AAA) for college student populations. The sample was recruited from the college student body at a major research university located in the Pacific Northwest. The study was advertised by fliers posted throughout campus locations. Interested participants contacted this researcher and were emailed a digitized informed consent statement as well as a screening questionnaire. The questionnaire was created by this researcher to screen participants for the study (see Appendix A). Participants were screened out if there are any concerns regarding their participation.

Eligible participants were randomly assigned to the experimental or control group using a random number generator. Participants in the experimental group were outfitted with equipment to measure systolic blood pressure, diastolic blood pressure, and skin temperature. After meeting a registered therapy dog and handler, participants were instructed to pet the dog with their dominant hand. They watched a video about the Cold War and were quizzed orally about the content of the video while continuing to pet the therapy dog. After the quiz, participants in the experimental group answered some qualitative questions about their experience and were provided with a handout on stress reduction tips and local counseling resources.

Participants in the control group completed similar procedures with some key changes. They completed the study in the presence of this researcher and a research assistant without the therapy dog and handler. After finishing the stressful task and having the equipment removed, participants in the control group were provided with the opportunity to schedule a time to meet with a therapy dog if desired. They were then provided with the handout on stress reduction and local counseling resources.

## Participants

A minimum sample of 64 was determined based on recommendations from Cohen (1988) based on a medium effect size of .5 and a power level of .8. The total sample consisted of 67 participants. Demographic information was collected from each participant on gender, degree sought, race/ethnicity, age, and year in school. The sample consisted of 60 female participants (89.6%) and 7 male participants (10.4%). The sample included 49 White participants (73.1%), 6 Hispanic/Latino/a participants (9%), 5 Asian participants (7.5%), 4 Multiracial participants (6%), 2 Black/African American participants (3%), and 1 American Indian/Alaska Native participant (1.5%). The sample consisted of 64 students earning a Bachelor's degree (95.5%) and 3 students earning a doctorate (4.5%). Participants were asked what year they were in school regardless of degree they were seeking. The sample included 35 first year students (52.2%), 10 second year students (14.9%), 17 third year students (25.4%), 4 fourth year students (6%), and 1 fifth year student (1.5%). Finally, the sample included 26 participants who were 18 years old (38.8%), 19 participants who were 19 years old (28.4%), 14 participants who were 20 years old (20.9%), 3 participants who were 21 years old (4.5%), 1 participant who was 22 years old (1.5%), 1 participant who was 23 years old (1.5%), 1 participant who was 27 years old (1.5%), and 2 participants who were 28 years old (3%).

Participants were recruited through a major research university located in the Pacific Northwest. Fliers detailing the study, potential times to participate, and an email address for interested participants to contact was posted around campus advertising the study (see Appendix A).

## **Therapy Dogs**

Pet Partners is a volunteer organization that registers therapy dog and handler teams with the mission of improving human health and well-being through the human-animal bond (Pet Partners, 2012). To become registered, the handler must pass a written test regarding AAA practices. The dog must pass obedience tests designed to measure temperament suitable to being a therapy dog. The registration process ensures dogs will be well behaved and up to date on their shots. Therapy dogs may not engage in any human interaction without their human handler present. A local community chapter of Pet Partners agreed to provide teams (up to 30 dog and handler teams) to participate in the study. In order to randomize the study, multiple therapy dogs of varying sizes and breeds participated in the experiment. A total of 10 different dog and handler teams participated. Handlers signed a consent form agreeing to allow their companion animal to participate in the study.

## **Instrumentation**

In this study, stress was measured with the following physiological indicators: systolic blood pressure, diastolic blood pressure, and skin temperature. All of the instruments wirelessly recorded results on a computer. The results were recorded using AcqKnowledge 4.4 software. The hardware was from BIOPAC Systems, Incorporated. Equipment and software from BIOPAC Systems, Incorporated has been used in thousands of labs, research projects, and publications and is recognized as a reliable and valid form of measurement (BIOPAC Systems, Inc., n.d.).

## Blood pressure

To measure systolic and diastolic blood pressure, the Noninvasive Blood Pressure System MRI-NIBP-MRI was used (see Figure 1). A small band was placed over the first member of the thumb on the non-dominant arm. This band measured systolic and diastolic blood pressure. This is a recommended piece of equipment as it does not tightly squeeze participants like a sphygmomanometer which can increase stress (BIOPAC Systems, Inc., n.d.).



Figure 1. The Noninvasive Blood Pressure System for MRI-NIBP-MRI

## Skin temperature

To measure skin temperature the BN-EL45-LEAD3 Electrode Lead was used (see Figure 2). Three (electrodes) were attached to the participants non-dominant arm. These have the ability to measure changes in skin temperature.



Figure 2. The BN-EL45-LEAD3 Electrode Lead

## Procedure

Interested participants emailed this researcher using the email address on the flier. They were emailed the informed consent statement (see Appendix B) and the screening questionnaire (see Appendix C). The screening questionnaire inquired about animal allergies or fears as well as any history of aggression towards animals or people. This also included a question about medical conditions that may impact measures as well as whether participants had use of both hands. Screening criteria included an endorsement of allergies or phobias of animals as well as any aggression towards people or animals. No participants were screened out. Participants completed the informed consent as well as the screening questionnaire to be included in the study. These

participants were then emailed with potential times to participate in the study. All procedures for human participation were approved through IRB and all procedures for animal participation were approved by IACUC. Dog owners signed a consent form (see Appendix D) before participating.

Participants were randomly assigned to the experimental or control group using a random number generator. Participants in the experimental group were seated at a table in a small laboratory on campus. The room was equipped with computers and lab equipment. Participants in the experimental group completed the study with this researcher and the dog and handler team present. Experimental group participants were furnished with the physiological equipment on their bodies and their non-dominant hand. Participants were asked to keep their non-dominant hand and body as still as possible. To attach the three electrodes, participants were asked to use a one inch by one inch scouring pad to gently swipe once over three one inch by one inch sections of skin on their non-dominant forearm. This left white patches of skin that had been gently abraded. Participants were informed that this maximizes measurement capability for the electrodes.

The animal and handler team were introduced to participants in the experimental group after participants had been outfitted with the equipment. Although the presence of the handler may act as a potential limitation in this study, therapy dogs cannot be present without their handlers. To increase validity of experimental control, animal handlers were told that they may minimally respond to questions from participants but to attempt to keep the focus on the dog.

After approximately 1-2 minutes to allow the participants in the experimental group to meet the dog, participants were told to sit still for 1-2 minutes to allow for capture of baseline measurements of systolic blood pressure, diastolic blood pressure, and skin temperature.

Measures were continuously recorded throughout the experiment. Participants were told to pet the dog with their dominant hand at a pace that is natural to them.

Participants completed a task which involved watching a video and being told they will be required to remember specific details. The video was displayed on a computer monitor with the participant seated approximately 5 feet away. The video was a 9 minute and 54 second long documentary on the Cold War and can be seen at <https://www.youtube.com/watch?v=HpYCplyBknI>. This task was designed to increase the stress level of the participants as they will be told they will be orally quizzed by this researcher to measure their memory of the different aspects of the video. Ideally, this reflected similar conditions to a “pop quiz” in the college environment. Correct and incorrect answers were recorded. Physiological measures during the video allowed for additional calibration of baseline systolic blood pressure, diastolic blood pressure and, skin temperature.

After the video ended, this researcher asked participants 11 questions about specific components in the video. During the oral quiz component of the study, participants in the experimental group were reminded to continue petting the dog with their dominant hand as needed. This researcher did not provide any feedback regarding correct responses to increase participant stress. When a participant answered incorrectly, they were told, “incorrect,” “that’s not right,” or “no.” Participant responses to the questions were recorded on the Response Form (see Appendix E) on a clipboard out of view of the participants. The physiological measures were recorded throughout the video and oral quiz and for two additional minutes after the stressful task was over.

After answering the questions, participants in the experimental group were stripped of the BIOPAC Systems, Incorporated equipment. Experimental group participants were allowed to

freely interact with the dog and handler teams. They were asked three qualitative questions about their experience with AAA during the experiment:

1. How stressful was this task for you on a scale of 1 (not stressed at all) to 10 (incredible amount of stress)?
2. How do you think your interaction with the dog impacted your stress level during the study?
3. Is there anything else you think we should know about your experience with the dog?

These questions aimed to evaluate participants' perception of their stress level and the effect of the therapy dog during the experiment.

Finally, participants were provided with a handout on stress reduction and self-care as well as referrals to local counseling (see Appendix F). During this time, participants were kept in the lab for at least 10 minutes of casual conversation to identify any potentially negative effects from the experiment (none were noted from either group).

Participants in the control group underwent the same procedures with a few minor differences. During the study, this researcher and a research assistant were present. The presence of the research assistant in the control group condition minimized potential confounding influences of multiple people in the room during the experimental condition. After the equipment was attached, participants in the control group also waited 1-2 minutes before watching the video to allow for baseline measurements. Participants in the control group were only asked one of the qualitative questions at the end of the procedure; "How stressful was this task for you on a scale of 1 (not stressed at all) to 10 (incredible amount of stress)?" At the end of the study, participants in the control group were informed they could email this researcher if they are interested in

scheduling a time to meet with a registered therapy dog. This allowed participants to have equal access to a potentially stress reducing activity.

### **Data Analysis**

The data was run using a Within-Between ANOVA design. This allowed comparison of the mean differences of the physiological indicators for the experimental group at baseline, stressful task (i.e. questions phase), and after the task (i.e. recovery phase). Descriptive statistics for all variables were calculated and examined for normal distribution. Measures for systolic blood pressure, diastolic blood pressure, and skin temperature were taken at baseline, throughout the study, and for 1-2 minutes after the stressful task. These phases were compared from baseline to questions phase and questions phase to recovery phase for each measure for each group. Analysis was completed using a paired sample t test when the data was normally distributed and a Wilcoxon Signed-Ranks Test when the data was not normally distributed. Next, the groups were compared at the three phases of the experiment (baseline, questions, recovery) to determine any significant differences. Analysis was completed using an independent samples t test when the data was normally distributed and a Mann Whitney U test when the data was not normally distributed. Additionally, participants estimated and reported their perception of their stress during the task on a scale from 1 (not stressed at all) to 10 (an incredible amount of stress). Self-report data was analyzed for any significant differences between the experimental and control group using an independent t test. Finally, the number of correct responses provided by participants was analyzed using an independent t test to explore differences between the experimental and control group.

This allowed for exploration of statistically significant differences in the data points over time and between groups. Data was run using IBM SPSS software. These analyses helped

answer the question about the effects of AAA on college student stress levels by exploring changes in systolic blood pressure, diastolic blood pressure, and skin temperature as well as self-reported stress and accuracy of responses.

## CHAPTER FOUR: RESULTS

Prior to addressing research question, descriptive statistics for all variables were calculated. Three data points were missing for one participant due to an error in recording the time points. The missing data points consisted of one from systolic blood pressure recovery phase, one from diastolic blood pressure recovery phase, and one from skin temperature recovery phase. Because missing data points were minimal and random, no method was used to replace the data (Tabachnick & Fidell, 2013).

### **Systolic Blood Pressure**

Systolic blood pressure was measured to explore stress response. Mean differences were compared for baseline phase to question phase and then questions phase to recovery phase for both the control and experimental group. Additionally, mean differences were compared to determine if the mean blood pressure differed between experimental and control group participants during the three time points (i.e. baseline, questions, recovery).

### **Comparisons within groups**

**Baseline phase to questions phase.** Systolic blood pressure was compared from the baseline phase to the questions phase for each group. The assumption of normality was tested and not met for the difference between baseline and question systolic blood pressure for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .803$   $df = 37$ ,  $p = .000015$ ) and skewness (2.409) and kurtosis (10.269) statistics suggested that the data is non-normal for the control group. A nonparametric Wilcoxon Signed-Ranks test was conducted due to non-normality of data to explore the null hypothesis that the means were the same for each phase. This revealed no significant differences between the baseline and question phases for systolic blood pressure for the control group ( $Z = -1.954$ ,  $p = .051$ ) with a baseline mean of 83.578 ( $SD =$

39.47) and a questions phase mean of 90.836 (SD = 37.33). Thus, the null hypothesis was accepted. Cohen's  $d$  was calculated and was 0.188937. Using Cohen's (1988) guidelines, this is interpreted as a small effect.

Similar review was conducted for the experimental group for the difference between systolic blood pressure during the baseline phase and questions phase. The Shapiro-Wilk test for normality (SW = .940, df = 30,  $p = .091$ ) and skewness (-.896) and kurtosis (.717) statistics suggested that normality was a reasonable assumption. The baseline mean was 79.741 (SD = 38.89) and the questions mean was 97.770 (SD = 40.04). Thus, systolic blood pressure for the experimental group increased from baseline to questions phase. A paired  $t$  test was conducted to determine if this difference was statistically significant. The results indicate the baseline and question means were statistically significantly different for the experimental group ( $t = -2.086$ , df = 29,  $p = .009$ ). Thus, the null hypothesis that the means were the same at both points in time was rejected at the .05 level of significance. Cohen's  $d$  was calculated and was .456738. Using Cohen's (1988) guidelines, this is interpreted as a medium effect.

**Questions phase to recovery phase.** Systolic blood pressure was compared from the questions to recovery phase for each group. The assumption of normality was tested and not met for the difference between question and recovery systolic blood pressure for the control group. Review of the Shapiro-Wilk test for normality (SW = .802 df = 36,  $p = .000018$ ) and skewness (-2.323) and kurtosis (10.251) statistics suggested that the data is non-normal for the control group. A nonparametric Wilcoxon Signed-Ranks test was conducted due to non-normality of data to explore the null hypothesis that the means were the same. This revealed significant differences between the question and recovery phases for systolic blood pressure for the control group ( $Z = -4.179$ ,  $p = .000029$ ) with a questions mean of 90.836 (SD = 37.33) and a recovery

mean of 72.80 (SD = 31.54). Thus, the null hypothesis that the means were the same at both points in time was rejected. Cohen's *d* was calculated and was .521897. Using Cohen's (1988) guidelines, this is interpreted as a medium effect.

Similar review was conducted for the experimental group for the difference between systolic blood pressure during the questions phase and recovery phase. The Shapiro-Wilk test for normality (SW = .938, df = 30, *p* = .083) and skewness (-.729) and kurtosis (2.429) statistics suggested that normality was a reasonable assumption. The question mean was 97.770 (SD = 40.04) and the recovery mean was 81.935 (SD = 33.91). Thus, systolic blood pressure for the experimental group decreased from question to recovery phase. A paired *t* test was conducted to determine if this difference was statistically significant. The results indicate the question and recovery means were statistically significantly different for the experimental group (*t* = 3.884, *df* = 29, *p* = .001). Thus, the null hypothesis that the means were the same at both points in time was rejected at the .05 level of significance. Cohen's *d* was calculated and was .42675. Using Cohen's (1988) guidelines, this is interpreted as a medium effect.

### **Comparisons between groups**

**Baseline phase.** Systolic blood pressure was compared during the baseline phase for the experimental and control group to determine whether there were any means differences pre-intervention. The assumption of normality was tested and met for the distributional shape of systolic blood pressure in the baseline phase for the control group. Review of the Shapiro-Wilk test for normality (SW = .957, *df* = 37, *p* = .159) and skewness (.362) and kurtosis (1.191) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group during the baseline phase for systolic blood pressure. The Shapiro-Wilk test for normality (SW = .984, *df* = 30, *p* = .910) and skewness (-

.043) and kurtosis (-.251) statistics suggested that normality was a reasonable assumption. Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = .015, p = .903$ ). Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 83.578 ( $SD = 39.47$ ) and the experimental group mean was 79.741 ( $SD = 38.89$ ). The independent t test indicated that the baseline systolic blood pressure means were not statistically significantly different for the control and experimental group ( $t = .398, df = 65, p = .692$ ). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's d was calculated and was 0.09793. Using Cohen's (1988) guidelines, this is interpreted as a small effect.

**Questions phase.** To explore the hypothesis about college students interacting with a registered therapy dog experiencing less stress than a control, systolic blood pressure was compared between groups during the questions phase. The assumption of normality was tested and not met for the distributional shape of systolic blood pressure in the questions phase for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .921, df = 37, p = .012$ ) and skewness (-.877) and kurtosis (1.063) statistics suggested that normality was not a reasonable assumption. Similar review was conducted for the experimental group during the questions phase for systolic blood pressure. The Shapiro-Wilk test for normality ( $SW = .977, df = 30, p = .735$ ) and skewness (-.050) and kurtosis (.136) statistics suggested that normality was a reasonable assumption. A Mann-Whitney U test was run due to the lack of normality for systolic blood pressure in the questions time point. The data met all four assumptions for a Mann-Whitney U

test including continuous level data, the independent variable consisting of two categorical and independent groups, independence of observations, and the two distributions having a similar shape (Field, 2009). For the fourth assumption, to test whether the distributions were of a similar nature, homogeneity of variance was tested. Levene's statistic was .562 ( $df=1, 64.858, p = .456$ ) suggesting the data has a similar distribution. The Mann-Whitney U test was performed and revealed no significant differences between the experimental and control group for systolic blood pressure during the questions phase ( $Z = -.403, p = .687$ ) with a control group mean of 90.836 ( $SD = 37.33$ ) and an experimental group mean of 97.770 (40.04). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's  $d$  was calculated and was 0.179133. Using Cohen's (1988) guidelines, this is interpreted as a small effect. This does not support the first hypothesis that, college students interacting with registered therapy dogs will experience reduced stress as measured by systolic blood pressure during a stressful task as compared to a control group without the presence of a registered therapy dog.

**Recovery phase.** Systolic blood pressure was compared between groups during the recovery phase. The assumption of normality was tested and met for the distributional shape of systolic blood pressure in the recovery phase for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .955, df = 36, p = .155$ ) and skewness (-.371) and kurtosis (.835) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group during the recovery phase for systolic blood pressure. The Shapiro-Wilk test for normality ( $SW = .987, df = 30, p = .965$ ) and skewness (.217) and kurtosis (-.339) statistics suggested that normality was a reasonable assumption. Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use

of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = .647, p = .424$ ). Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 72.80 ( $SD = 31.54$ ) and the experimental group mean was 81.835 ( $SD = 33.91$ ). The independent t test indicated that the recovery phase systolic blood pressure means were not statistically significantly different for the control and experimental group ( $t = -1.132, df = 64, p = .262$ ). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's d was calculated and was 0.275908. Using Cohen's (1988) guidelines, this is interpreted as a small effect. This does not support the first hypothesis that college students interacting with registered therapy dogs will experience reduced stress as measured by systolic blood pressure when recovering from a stressful task as compared to a control group without the presence of a registered therapy dog.

### **Diastolic Blood Pressure**

Diastolic blood pressure was measured to explore stress response. Mean differences were compared for baseline phase to question phase and then questions phase to recovery phase for both the control and experimental group. Additionally, mean differences were compared to determine if the mean diastolic blood pressure differed between experimental and control group participants during the three time points (i.e. baseline, questions, recovery).

#### **Comparisons within groups**

**Baseline phase to questions phase.** Diastolic blood pressure was compared from baseline to questions phase for each group. The assumption of normality was tested and met for the difference between baseline and question diastolic blood pressure for the control group.

Review of the Shapiro-Wilk test for normality ( $SW = .947$ ,  $df = 37$ ,  $p = .079$ ) and skewness (.843) and kurtosis (1.632) statistics suggested that normality is a reasonable assumption. The baseline mean was 41.105 ( $SD = 19.66$ ) and the questions mean was 50.387 ( $SD = 22.20$ ). Thus, diastolic blood pressure for the control group increased from baseline to questions phase. A paired t test was conducted to determine if this difference was statistically significant. The results indicate the baseline and question means were statistically significantly different for the control group ( $t = -2.984$ ,  $df = 36$ ,  $p = .005$ ). Thus, the null hypothesis that the means were the same at both points in time was rejected at the .05 level of significance. Cohen's d was calculated and was .442613. Using Cohen's (1988) guidelines, this is interpreted as a medium effect.

Similar review was conducted for the experimental group for the difference between diastolic blood pressure during the baseline phase and questions phase. The Shapiro-Wilk test for normality ( $SW = .909$ ,  $df = 30$ ,  $p = .014$ ) and skewness (-1.217) and kurtosis (1.637) statistics suggested that normality was not a reasonable assumption. A nonparametric Wilcoxon Signed-Ranks test was conducted due to non-normality of data. This revealed significant differences between the baseline and question phases for diastolic blood pressure for the experimental group ( $Z = -2.417$ ,  $p = .016$ ) with a baseline mean of 40.064 ( $SD = 23.93$ ) and a question mean of 49.478 ( $SD = 22.77$ ). Thus, the null hypothesis that the means were the same was rejected at the .05 level of significance. Cohen's d was calculated and was .403013. Using Cohen's (1988) guidelines, this is interpreted as a medium effect.

**Questions phase to recovery phase.** Diastolic blood pressure was compared from questions to recovery phase for each group. The assumption of normality was tested and not met for the difference between question and recovery diastolic blood pressure for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .778$ ,  $df = 36$ ,  $p = .000006$ ) and skewness

(-2.484) and kurtosis (11.486) statistics suggested that normality is not a reasonable assumption. A nonparametric Wilcoxon Signed-Ranks test was conducted due to non-normality of data. This revealed significant differences between the question and recovery phases for diastolic blood pressure for the control group ( $Z = -4.148$ ,  $p = .000034$ ) with a question mean of 50.387 (SD = 22.20) and a recovery mean of 38.859 (SD = 20.72). Thus, the null hypothesis that the means were the same was rejected at the .05 level of significance. Cohen's  $d$  was calculated and was .536802. Using Cohen's (1988) guidelines, this is interpreted as a medium effect.

Similar review was conducted for the experimental group for the difference between diastolic blood pressure during the questions phase and recovery phase. The Shapiro-Wilk test for normality ( $SW = .978$ ,  $df = 30$ ,  $p = .771$ ) and skewness (.348) and kurtosis (.198) statistics suggested that normality was a reasonable assumption. The questions mean was 49.478 (SD = 22.77) and the recovery mean was 39.714 (SD = 18.74). Thus, diastolic blood pressure for the experimental group decreased from questions to recovery phase. A paired  $t$  test was conducted to determine if this difference was statistically significant. The results indicate the questions and recovery means were statistically significantly different for the experimental group ( $t = 4.678$ ,  $df = 29$ ,  $p = .000062$ ). Thus, the null hypothesis that the means were the same at both points in time was rejected at the .05 level of significance. Cohen's  $d$  was calculated and was .468228. Using Cohen's (1988) guidelines, this is interpreted as a medium effect.

### **Comparisons between groups**

**Baseline phase.** Diastolic blood pressure was compared between groups at the baseline phase to determine whether there were any means differences pre-intervention. The assumption of normality was tested and met for the distributional shape of diastolic blood pressure in the baseline phase for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .980$ ,

df = 37,  $p = .746$ ) and skewness (-.207) and kurtosis (-.466) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group during the baseline phase for diastolic blood pressure. The Shapiro-Wilk test for normality (SW = .973, df = 30,  $p = .616$ ) and skewness (.430) and kurtosis (.201) statistics suggested that normality was a reasonable assumption. Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = .578$ ,  $p = .450$ ). Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 41.105 (SD = 19.66) and the experimental group mean was 40.064 (SD = 23.93). The independent t test indicated that the baseline diastolic blood pressure means were not statistically significantly different for the control and experimental group ( $t = .196$ , df = 65,  $p = .846$ ). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's d was calculated and was 0.047536. Using Cohen's (1988) guidelines, this is interpreted as a small effect.

**Questions phase.** Diastolic blood pressure was compared between groups during the questions phase. The assumption of normality was tested and met for the distributional shape of diastolic blood pressure in the questions phase for the control group. Review of the Shapiro-Wilk test for normality (SW = .953, df = 37,  $p = .118$ ) and skewness (-.604) and kurtosis (.319) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group during the questions phase for diastolic blood pressure. The Shapiro-Wilk test for normality (SW = .974, df = 30,  $p = .646$ ) and skewness (-

.277) and kurtosis (.047) statistics suggested that normality was a reasonable assumption.

Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = .024, p = .878$ ).

Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 50.387 ( $SD = 22.20$ ) and the experimental group mean was 49.478 ( $SD = 22.77$ ). The independent t test indicated that the questions phase diastolic blood pressure means were not statistically significantly different for the control and experimental group ( $t = .165, df = 65, p = .870$ ). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's d was calculated and was 0.040424. Using Cohen's (1988) guidelines, this is interpreted as a small effect. This does not support the hypothesis that college students interacting with registered therapy dogs will experience reduced stress as measured by diastolic blood pressure during a stressful task as compared to a control group without the presence of a registered therapy dog.

**Recovery phase.** Diastolic blood pressure was compared between the groups during the recovery phase. The assumption of normality was tested and not met for the distributional shape of diastolic blood pressure in the recovery phase for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .939, df = 36, p = .048$ ) and skewness (-.643) and kurtosis (1.505) statistics suggested that normality was not a reasonable assumption. Similar review was conducted for the experimental group during the recovery phase for diastolic blood pressure. The Shapiro-Wilk test for normality ( $SW = .969, df = 30, p = .504$ ) and skewness (.496) and kurtosis (.659) statistics suggested that normality was a reasonable assumption. A Mann-Whitney U test

was run due to the lack of normality for diastolic blood pressure in the recovery phase. The data met all four assumptions for a Mann-Whitney U test including continuous level data, the independent variable consisting of two categorical and independent groups, independence of observations, and the two distributions having a similar shape (Field, 2009). For the fourth assumption, to test whether the distributions were of a similar nature, homogeneity of variance was tested. Levene's statistic was .010 (df =1, 61.088, p = .921) suggesting the data has a similar distribution. The Mann-Whitney U test was performed and revealed no significant differences between the experimental and control group for diastolic blood pressure during the recovery phase ( $Z = -.361$ ,  $p = .718$ ) with a control group mean of 38.859 (SD = 20.72) and an experimental group mean of 39.714 (SD = 18.74). Thus, the null hypothesis that the means were the same was accepted at the .05 level of significance. Cohen's d was calculated and was 0.043281. Using Cohen's (1988) guidelines, this is interpreted as a small effect. This does not support the hypothesis that college students interacting with registered therapy dogs will experience reduced stress as measured by diastolic blood pressure when recovering from a stressful task as compared to a control group without the presence of a registered therapy dog.

### **Skin Temperature**

Skin temperature was measured to explore stress response. Mean differences were compared for baseline phase to question phase and then questions phase to recovery phase for both the control and experimental group. Additionally, mean differences were compared to determine if the mean skin temperature differed between experimental and control group participants during the three time points (i.e. baseline, questions, recovery).

## Comparisons within groups

**Baseline phase to questions phase.** Skin temperature was compared from baseline to questions phase for each group. The assumption of normality was tested and met for the difference between baseline and question skin temperature for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .979$   $df = 37$ ,  $p = .693$ ) and skewness ( $-.287$ ) and kurtosis ( $.585$ ) statistics suggested that normality is a reasonable assumption. The baseline mean was  $29.585$  ( $SD = 1.74$ ) and the questions mean was  $29.710$  ( $SD = 1.75$ ). Thus, skin temperature for the control group increased from baseline to questions phase. A paired t test was conducted to determine if this difference was statistically significant. The results indicate the baseline and question means were not statistically significantly different for the control group ( $t = -1.172$ ,  $df = 36$ ,  $p = .249$ ). Thus, the null hypothesis that the means were the same was accepted at the .05 level of significance. Cohen's d was calculated and was  $0.071633$ . Using Cohen's (1988) guidelines this is interpreted as a small effect.

Similar review was conducted for the experimental group for the difference between skin temperature during the baseline phase and questions phase. The Shapiro-Wilk test for normality ( $SW = .961$ ,  $df = 30$ ,  $p = .336$ ) and skewness ( $-.111$ ) and kurtosis ( $1.133$ ) statistics suggested that normality was a reasonable assumption. The baseline mean was  $28.880$  ( $SD = 1.86$ ) and the questions mean was  $28.978$  ( $SD = 1.87$ ). Thus, skin temperature for the experimental group increased from baseline to questions phase. A paired t test was conducted to determine if this difference was statistically significant. The results indicate the baseline and question means were not statistically significantly different for the control group ( $t = -.826$ ,  $df = 29$ ,  $p = .415$ ). Thus, the null hypothesis that the means were the same was accepted at the .05 level of significance.

Cohen's *d* was calculated and was 0.052547. Using Cohen's (1988) guidelines this is interpreted as a small effect.

**Questions phase to recovery phase.** Skin temperature was compared from the questions to recovery phase for each group. The assumption of normality was tested and not met for the difference between question and recovery skin temperature for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .847$ ,  $df = 36$ ,  $p = .000159$ ) and skewness (-1.795) and kurtosis (7.885) statistics suggested that normality is not a reasonable assumption. A nonparametric Wilcoxon Signed-Ranks test was conducted due to non-normality of data. This revealed significant differences between the question and recovery phases for skin temperature for the control group ( $Z = -2.875$ ,  $p = .004$ ) with a question mean of 29.710 ( $SD = 1.75$ ) and a recovery mean of 29.657 ( $SD = 1.57$ ). Thus, the null hypothesis that the means were the same was rejected at the .05 level of significance. Cohen's *d* was calculated and was .03208. Using Cohen's (1988) guidelines, this is interpreted as a small effect.

Similar review was conducted for the experimental group for the difference between skin temperature during the questions phase and recovery phase. The Shapiro-Wilk test for normality ( $SW = .948$ ,  $df = 30$ ,  $p = .152$ ) and skewness (-.665) and kurtosis (2.658) statistics suggested that normality was a reasonable assumption. The questions mean was 28.978 ( $SD = 1.87$ ) and the recovery mean was 28.812 ( $SD = 1.82$ ). Thus, skin temperature for the experimental group decreased from questions to recovery phase. A paired *t* test was conducted to determine if this difference was statistically significant. The results indicate the questions and recovery means were not statistically significantly different for the experimental group ( $t = 1.766$ ,  $df = 29$ ,  $p = .088$ ). Thus, the null hypothesis that the means were the same was accepted at the .05 level of

significance. Cohen's  $d$  was calculated and was 0.089965. Using Cohen's (1988) guidelines, this is interpreted as a small effect.

### **Comparisons between groups**

**Baseline phase.** Skin temperature was compared between group at the baseline phase to determine whether there were any means differences pre-intervention. The assumption of normality was tested and met for the distributional shape of skin temperature in the baseline phase for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .982$ ,  $df = 37$ ,  $p = .795$ ) and skewness (.134) and kurtosis (-.144) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group during the baseline phase for skin temperature. The Shapiro-Wilk test for normality ( $SW = .971$ ,  $df = 30$ ,  $p = .562$ ) and skewness (.456) and kurtosis (.381) statistics suggested that normality was a reasonable assumption. Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = .096$ ,  $p = .758$ ). Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 29.585 ( $SD = 1.74$ ) and the experimental group mean was 28.880 ( $SD = 1.86$ ). The independent  $t$  test indicated that the baseline skin temperature means were not statistically significantly different for the control and experimental group ( $t = 1.599$ ,  $df = 65$ ,  $p = .115$ ). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's  $d$  was calculated and was 0.391449. Using Cohen's (1988) guidelines, this is interpreted as a small to medium effect.

**Questions phase.** Skin temperature was compared between groups during the questions phase. The assumption of normality was tested and met for the distributional shape of skin temperature in the questions phase for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .958$ ,  $df = 37$ ,  $p = .174$ ) and skewness (.228) and kurtosis (.253) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group during the questions phase for skin temperature. The Shapiro-Wilk test for normality ( $SW = .972$ ,  $df = 30$ ,  $p = .602$ ) and skewness (.415) and kurtosis (.257) statistics suggested that normality was a reasonable assumption. Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = .143$ ,  $p = .707$ ). Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 29.710 ( $SD = 1.75$ ) and the experimental group mean was 28.978 ( $SD = 1.87$ ). The independent t test indicated that the questions phase skin temperature means were not statistically significantly different for the control and experimental group ( $t = 1.653$ ,  $df = 65$ ,  $p = .103$ ). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's d was calculated and was 0.404198. Using Cohen's (1988) guidelines, this is interpreted as a small to medium effect. This does not support the hypothesis that college students interacting with registered therapy dogs will experience reduced stress as measured by skin temperature during a stressful task as compared to a control group without the presence of a registered therapy dog.

**Recovery phase.** Skin temperature was compared between groups during the recovery phase. The assumption of normality was tested and met for the distributional shape of skin temperature in the recovery phase for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .957$ ,  $df = 36$ ,  $p = .175$ ) and skewness (.427) and kurtosis (-.408) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group during the recovery phase for skin temperature. The Shapiro-Wilk test for normality ( $SW = .960$ ,  $df = 30$ ,  $p = .313$ ) and skewness (.733) and kurtosis (.687) statistics suggested that normality was a reasonable assumption. Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = .469$ ,  $p = .496$ ). Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 29.657 ( $SD = 1.57$ ) and the experimental group mean was 28.812 ( $SD = 1.82$ ). The independent t test indicated that the recovery skin temperature means were statistically significantly different for the control and experimental group ( $t = 2.025$ ,  $df = 64$ ,  $p = .047$ ). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's d was calculated and was .50625. Using Cohen's (1988) guidelines, this is interpreted as a medium effect. The results provide evidence to support the conclusion that experimental and control groups differed on skin temperature during the recovery phase. More specifically, the control group had a higher skin temperature, on average, than the experimental group. This does not support the hypothesis that college students interacting with registered therapy dogs will experience reduced stress as measured by skin temperature when

recovering from a stressful task as compared to a control group without the presence of a registered therapy dog.

### **Self-reported stress**

After completing the study, all participants were asked to rate their stress level on a scale from 1 (not stressed at all) to 10 (an incredible amount of stress). An independent t test was conducted to determine if the mean self-reported stress differed between experimental and control group participants.

The assumption of normality was tested and met for the distributional shape of self-reported stress for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .954$ ,  $df = 37$ ,  $p = .131$ ) and skewness (.284) and kurtosis (-.682) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group for self-reported stress. The Shapiro-Wilk test for normality ( $SW = .952$ ,  $df = 30$ ,  $p = .189$ ) and skewness (-.441) and kurtosis (-.570) statistics suggested that normality was a reasonable assumption. Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = .559$ ,  $p = .457$ ). Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 5.203 ( $SD = 2.12$ ) and the experimental group mean was 5.067 ( $SD = 1.88$ ). The independent t test indicated that self-reported stress means were not statistically significantly different for the control and experimental group ( $t = .275$ ,  $df = 65$ ,  $p = .784$ ). Thus, the null hypothesis that the means were the same by group was accepted at the .05 level of significance. Cohen's d was calculated and

was 0.067878. Using Cohen's (1988) guidelines, this is interpreted as a small effect. This does not support the second hypothesis that college students interacting with a therapy dog will self-report lower levels of stress than a control group without the presence of a registered therapy dog.

### **Accuracy of Quiz Answers**

Accuracy of quiz answers was recorded for all participants. An independent t test was conducted to determine if the mean self-reported stress differed between experimental and control group participants.

The assumption of normality was tested and met for the distributional shape of accurate responses for the control group. Review of the Shapiro-Wilk test for normality ( $SW = .953$ ,  $df = 37$ ,  $p = .129$ ) and skewness (.283) and kurtosis (-.697) statistics suggested that normality was a reasonable assumption for the control group. Similar review was conducted for the experimental group for accuracy of responses. The Shapiro-Wilk test for normality ( $SW = .948$ ,  $df = 30$ ,  $p = .172$ ) and skewness (-.431) and kurtosis (-.590) statistics suggested that normality was a reasonable assumption. Although normality indices generally suggest the assumption is met, even if there are slight departures from normality, the effects on Type I and Type II errors will be minimal given the use of a two-tailed test (Glass, Peckham, & Sanders, 1972; Sawilowsky & Blair, 1992). According to Levene's test, the homogeneity of variance assumption was satisfied ( $F = 3.228$ ,  $p = .077$ ). Because participants were randomly assigned to the experimental or control group, the assumption of independence was met. The control group mean was 3.649 ( $SD = 2.55$ ) and the experimental group mean was 4.001 ( $SD = 2.03$ ). The independent t test indicated that accuracy of response means were not statistically significantly different for the control and experimental group ( $t = -.612$ ,  $df = 65$ ,  $p = .542$ ). Thus, the null hypothesis that the

means were the same by group was accepted at the .05 level of significance. Cohen's  $d$  was calculated and was 0.152731. Using Cohen's (1988) guidelines, this is interpreted as a small effect. This does not support the third hypothesis that college students interacting with a therapy dog will demonstrate higher accuracy when responding to quiz questions during a stressful task than a control group without the presence of a therapy dog.

### **Qualitative Data**

Experimental group participants were asked one open-ended question, "How do you think your interaction with the dog impacted your stress level during the study?" to explore their perception of their stress level and the effect of the therapy dog during the experiment. Consequently, the participants provided responses about their experience.

The qualitative data from the 30 experimental group participants was analyzed using a process of thematic analysis (Braun & Clarke, 2006). Braun and Clarke recommend using a six step process as follows:

1. "Familiarizing yourself with your data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report"

For Step 1 of the process, Braun and Clarke (2006) recommend multiple readings of the data as well as transcription of responses. The data was transcribed and read by this author. Throughout multiple readings, initial ideas and themes were noted to be considered later during the process. For Step 2, Braun and Clarke recommend coding features of the data in a systematic

fashion. The data was coded based on semantic features to help organize meaningful groups. For example, the statement, “He was cute and he kept licking at my hand. It helped me not think about the test” was coded into 1) visual presence of the dog, 2) tactile experience with the dog, and 3) positive distraction.

For Step 3, Braun and Clarke (2006) recommend organizing the codes into potential themes and subthemes. Semantic themes were explored to capture the explicit meaning of each statement. These themes were selected as they demonstrated patterns of responses across participants and provided important information about participants’ subjective experiences with the dogs (Braun & Clarke). Main themes included positive experiences based on the presence of the dog and negative experiences based on the presence of the dog. For Step 4, there are two processes. Braun and Clarke recommend reviewing the coded data extracts for each theme to review coherence. Second, the remaining themes were reviewed to determine coherence with the overall data set (Braun & Clarke).

Step 5 includes defining and refining each theme and exploring potential sub-themes (Braun & Clarke, 2006). Within the theme of negative experiences based on the presence of the dog, two subthemes were identified. The first sub-theme was physical discomfort with the process. One participant noted, “when [the dog] laid down it was uncomfortable for me.” The second sub-theme was seeing the dog as a negative distraction for the required task. One participant noted, “I had to focus on keeping contact with him.” Of the 30 participants in the experimental group, only 4 provided data that was coded into a negative experience based on the presence of the dog.

Three sub-themes were identified from the positive experiences based on the presence of the dog theme. The sub-themes were 1) viewing the dog as a positive distraction, 2) praise for

the tactile experience of petting the dog, and 3) general comfort from the presence of the dog. Participants who viewed the dog as a positive distraction noted that they lost track of the video at times but were not as concerned as they would have been without the presence of the dog. Additionally, they noted the presence of the dog distracted them from their stress during the question period. One participant noted, “It was weird because I knew I wanted to get the questions correct but he distracted me and calmed me.” Participants who commented on the positive aspect of the tactile experience of the dog often spoke about the warmth and the softness of the dogs. Several participants also commented on the experience of being able to do something with their hands as stress reducing. One participant noted, “It was something to do with my hands. She’s so soft.” Finally, participants commented on experiencing a general comfort from the presence of the dog noting an experience of feeling calm or perceiving their stress as decreasing while petting the dog. One participant commented, “I think it helped especially when you gave me the questions – when I got a wrong answer it was like, whatever. It helped me feel calmer.”

Braun and Clarke (2006) have a final step in their analysis process regarding how best to report qualitative data. This includes ways to best capture the essence of what was identified within the data. For this set, the themes and sub-themes were chosen based on recommendations to best capture the meaning of the data (Braun & Clarke).

## CHAPTER FIVE: DISCUSSION

The purpose of this study was to identify the effects of AAA on college student stress levels by analyzing systolic blood pressure, diastolic blood pressure, and skin temperature. This study attempted to address gaps in the literature by offering a methodologically rigorous study utilizing a control group and random assignment. Additionally, this study sought to provide evidence of the effectiveness of AAA during different phases of stress (i.e during a stressful task and while recovering from a stressful task).

### **Summary of the Results**

In general, the results demonstrated some significant differences between phases of the procedure for both the experimental and control group. Specifically, the experimental group participants demonstrated a statistically significant increase in systolic blood pressure from baseline to questions phase while the control group did not. Both groups demonstrated a statistically significant decrease in systolic blood pressure from questions to recovery phase. However, when comparing the groups to one another, there were no statistical differences in systolic blood pressure at any point from baseline to questions to recovery phase. This suggests that the significant increase in systolic blood pressure for the experimental group from baseline to questions phase was not statistically large enough to suggest a difference from the control group. All together, these results suggest the experimental group did not experience any significant stress reduction benefits as measured by systolic blood pressure.

For diastolic blood pressure, both control and experimental group participants demonstrated significant increases in diastolic blood pressure from baseline to questions phase. Additionally, both groups demonstrated statistically significant decreases from questions to recovery phase. When examining differences between both groups at the three time points, there

were no significant differences. This suggests the experimental group participants did not experience any stress reduction benefits as measured by diastolic blood pressure when compared to the control group. It suggests both groups experienced similar amounts of physiological stress as measured by diastolic blood pressure.

For skin temperature, neither group demonstrated a statistically significant change in skin temperature from baseline to questions phase. However, the control group demonstrated a small but significant decrease in skin temperature from the questions to recovery phase (compared to the experimental group which did not have any significant difference). This suggests the control group experienced an increase in stress as measured by skin temperature at the end of the experiment. When exploring differences between groups, there were no statistically significant differences during the baseline or questions phase. However, during the recovery phase, the control group experienced a statistically significantly higher skin temperature than the experimental group suggesting participants in the control group were experiencing less stress. These results suggest that while the control group experienced an increase in stress, they experienced lower stress at the end of the experiment as measured by skin temperature. This suggests the experimental group did not experience any stress reduction benefits from AAA compared to the control group as measured by skin temperature.

Participants in both groups also estimated and self-reported their stress level on a scale from 1 – 10. When examining these measures, there was no significant difference in self-reported stress. This suggests that participant perception of their stress level as well as their physiologically measured stress levels suggested no differences between groups that indicated AAA was an effective stress reduction intervention.

While there were some inconsistencies, when examining all the measures of stress, it appears the groups did not differ on their stress response from one another at different points in time. This is demonstrated in both the physiological measures as well as their self-reported estimation of stress. This suggests AAA did not have an impact on the physiological stress of participants regardless of the group they were assigned.

The results from the physiological measures and self-reported stress measures may provide information to interpret the quantitative results. Participants in the experimental group were asked “How do you think your interaction with the dog impacted your stress level during the study?” This allowed participants to provide information regarding their subjective experience with the presence of the dog.

Participants identified two challenges related to their experience with the dog. First, they noted some physical discomfort when petting the dog. This may be related to the experimental protocol of keeping their body still except for their non-dominant hand. If the dog ever moved out of reach or attempted to lay down, this put participants in an awkward position of attempting to maintain contact with the dog while reducing body movement. The second challenge noted in the qualitative data was the dog becoming a negative distraction while watching the video and answering questions. Participants noted they would become distracted by the presence of the dog or the task of petting the dog and would miss important information from the video. While participant responses indicated enjoyment related to the presence of the dog, it may have hampered their ability to attend to the video. It is worth noting that only 4 of the 30 experimental group participants provided responses related to these challenges suggesting only a small number identified challenges related to the presence of the dog.

Participants identified three positive aspects related to their experience with the dog. First, they noted the dog was a positive distraction during the procedure. They explained that the dog was sometimes a distraction during the video portion of the procedure but did not find this concerning. Additionally, they noted the dog was helpful in distracting them from their nervousness or distress during the questions portion of the procedure. This suggests that while the dog had been identified as a challenge when maintaining attention on the video, the presence of the dog later allowed them to answer the questions with less perceived stress. The second positive aspect identified was praise for the tactile experience of petting the dog. Participants made note of the physical sensation of petting the dog and the enjoyment from this experience. These sensations may not have had an impact on their stress level, but became a notably enjoyable aspect of the procedure. Finally, participants identified a general sense of comfort from the presence of the dog. They noted the dog provided them with a sense of calm or even a sense of stress relief

The qualitative results are interesting in light of the quantitative data. The quantitative data does not suggest the presence of the dog provided any physiological stress reduction. Additionally, according to participant self-report, there were no differences in estimated stress between experimental and control group participants. However, when examining qualitative responses, the majority of participants (27 of 29) noted a positive experience related to the presence of the dog. An important distinction is made between participant perception of the effect of the dog and the actual experience of stress. This leads to questions about how the perception of stress reduction may be benefiting participants (if not physiologically).

Finally, participant answers to the test questions were recorded to determine accuracy. There were no statistically significant differences in participant answer accuracy by group. This

suggests that neither group performed better or worse than the other and the presence of the dog had no impact on the quiz. This is interesting when taken with the qualitative data. One of the challenges related to the presence of the dog was distraction from the video. However, when exploring accuracy of response, there appeared to be no negative impact on quiz performance.

### **Limitations, Implications, and Future Research**

#### **Theoretical**

With no consistent theoretical basis regarding the benefits of HAI, it is difficult to measure the effects of AAA/T. Currently, as noted by Henry (2013) there is no true understanding of the mechanism of change when humans and animals interact. This poses many challenges when exploring this research, conducting this research, and drawing conclusions about the effectiveness of HAI. While this dissertation relied on the biophilia hypothesis, ecotherapy, and physiological benefits underlying HAI, the methodology may have lacked the key component(s) necessary for effective and therapeutic HAI.

One area for further study is possible moderator variables within HAI. In addition to the lack of understanding regarding variables that add to the success of HAI, there is no understanding regarding variables that may diminish the effectiveness of HAI. Barton and Adesope (2017) conducted a meta-analysis of the effects of dogs on learning and found several moderator variables. For example, one significant moderator variable was how much freedom the dog had during the study. Dogs who were restricted to the activity of the study (versus unstructured interactions) demonstrated larger effect sizes. This has interesting implications for the type and length of interaction that is most effective. Additional exploration of variables that increase or decrease the effectiveness of HAI may provide for more consistent results in the

future. This would require increased methodological rigor as well as measurement of dog and participant characteristics.

### **Methodological**

This study had a number of methodological limitations that could be addressed in future research. First, the participants were a relatively homogenous sample. This may have limited the effectiveness of AAA. At the least, it prevented exploration of how effective AAA is with different populations based on age, gender, race/ethnicity, and more. Future research with larger and more diverse samples could provide more evidence about the effectiveness of AAA with different populations which could then lead to stronger conclusions about generalizability of the effectiveness of AAA. One option would be controlling for participant interest in AAA, previous relationships with animals, attachment to animals, and more.

There are several notable limitations within the methodology of this study. First, there was no measurement of participant familiarity with the material being presented in the video. Without controlling for this, it is difficult to determine whether the stressful task was equally impactful for each group of participants. For example, some participants may have had prior interest and knowledge of the Cold War which may have made the task enjoyable rather than stressful. Without measuring prior knowledge, it is difficult to determine whether this had an effect on the overall results.

One challenge in conducting research into the effectiveness of AAA/T is increasing experimental rigor. Much of the literature has relied on anecdotal accounts or self-reported measures from participants. While this provided important initial information regarding these interventions, it has made it difficult to truly understand the effectiveness of HAI. This study attempted to increase experimental rigor by implementing strict protocols to standardize

procedures. While this ultimately provided more experimental control, it may have minimized the effectiveness of the intervention for the experimental group. The lack of understanding of the mechanism of change involved in HAI makes research difficult to conduct. However, with continued research and critical examination of the existing research, we can gain further understanding of the human animal bond.

Another possible limitation was the strict protocol to increase experimental rigor. As stated before, this study attempted to increase experimental control to provide quantitative evidence about the effectiveness of AAA. In order to standardize procedures and capture clean data, participants were limited to sitting with their whole body still, and for those in the experimental group, only petting the dog with their dominant hand. While this increased experimental rigor, it may have limited the effectiveness of the intervention. The effectiveness of AAA may be related to spontaneous interactions with the dogs which may not have been captured due to the strict protocol. Additionally, the restriction on body movement may have created some discomfort for participants. This may have limited the effectiveness of stress reduction or even increased stress in some cases. However, this creates a challenge for future research as the literature and the instruments utilized recommended movements to be as limited as possible to gather clean data. Additional research exploring alternative body positions or allowing for more different interactions with the dogs would provide additional evidence about the effectiveness of AAA. Other instruments may allow greater freedom of movement which could allow for further interaction with the animal than petting.

In exploring the type of interaction that may be effective, further studies aimed at increasing experimental control and studying different interactions with animals (i.e. holding an animal, sitting next to an animal, hugging an animal) may provide additional evidence about the

effectiveness of these interventions. As Friedmann, Son, and Tsai (2010) suggest, more research exploring the method of AAA/T as well as potential interventions could provide information about any mechanism of stress reduction for participants. In addition to studies aimed at exploring different body positioning, less restricted movement, additional ways of interacting with the dog, or increased spontaneity, controlling for the time of interaction with the dog may provide different results. These factors may be contributing to the mixed results for the effectiveness of AAA in the literature.

Another limitation related to increasing experimental control may relate to the dog and handler teams in the experiment. Different teams and dogs were incorporated into the experiment in order to increase generalizability of the results instead of drawing conclusions based on interactions with one animal. However, this may have introduced too much variability into a study this size. A larger study with multiple teams may allow for study of how different dog breeds, sizes, and temperaments may influence the effectiveness of AAA. Additionally, the human handler half of the team may have also introduced variability into the experimental condition. While handlers were instructed to minimally interact with the participants and only respond to direct questions, some handlers followed these instructions more closely than others. While all human handlers limited their responding to direct questions from participants, some provided lengthy interactions while others kept their responses brief. One unmeasured aspect of human animal interaction is how much influence the human handler has on the effectiveness of this intervention. Again, a larger study may provide more information about how different ways of interacting with human handlers influences the effectiveness of AAA as a whole.

## **Practical**

Overall, the results add to the inconsistency of evidence for AAA/T. Consistent with other studies, the physiological data demonstrated no differences between the experimental and control group. However, participant perception of the effectiveness of the presence of the dog contradicts this information. This aligns with the recent Barker, Barker, McCain, and Schubert (2016) study which demonstrated no changes in physiological measures but a perception that stress had reduced. This generates questions about whether AAA/T reduces stress or simply provides the impression of effectiveness. If this is the case, further research into how the perception of stress reduction effects overall wellbeing within the context of AAA/T could be beneficial. The contradiction between physiological stress and perceived stress also raises the question of delayed effectiveness of physiological stress reduction. Somervill, Kruglikova, Robertson, Hanson, and MacLin (2008) found evidence for this in their study with college students holding either a dog or cat on their lap. Increasing the length of the intervention as well as the length of time measuring physiological indicators may provide different results.

This has implications for the current popularity of HAI events on college campuses. These events are often quite popular with students and are frequently advertised as events to decrease stress. The current inconsistencies in the literature as well as the lack of understanding regarding the mechanism of change makes it difficult to support these claims. However, students have rated enjoyment of these events in the literature (Adamle, Riley, & Carlson, 2009) and may perceive them as stress reducing. Additionally, these events may provide a social outlet for students, a chance to take a break from studying during stressful exam prep weeks, and more. Again, further methodologically rigorous studies with measurement of moderator variables may provide much needed information about the effectiveness of HAI.

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APPENDIX

Appendix A

Need to reduce your

Do you love dogs?



If you answered yes to either question, you may enjoy participating in a study exploring the relationship between petting dogs and stress!

The study takes place here on campus and will take only about an hour of your time.

If interested, please contact [WSUdogstudy@gmail.com](mailto:WSUdogstudy@gmail.com) for information.

## Appendix B

### WASHINGTON STATE UNIVERSITY

*Department of Educational Leadership and Counseling Psychology*

## Research Study Consent Form

**Study Title:** The effect of interaction with a therapy dog on college student stress levels as measured by physiological indicators

### Researchers:

*Phyllis Erdman, Ph.D., Principal Investigator, Executive Associate Dean For Academic Affairs, 509-335-1738*

*Kendra Thew, Ph.D. Candidate, Co-Investigator, Counseling Psychology, 206-940-9220*

You are being asked to take part in a research study carried out by Phyllis Erdman, Ph.D., and Kendra Thew, Ph.D. Candidate. This form explains the research study and your part in it if you decide to join the study. Please read the form carefully, taking as much time as you need. Ask the researcher to explain anything you don't understand. You can decide not to join the study. If you join the study, you can change your mind later or quit at any time. There will be no penalty or loss of services or benefits if you decide to not take part in the study or quit later. This study has been approved for human subject participation by the Washington State University Institutional Review Board.

### What is this study about?

This research study is being done to explore the stress reduction benefits of college students interacting with therapy dogs.

You are being asked to take part because you are a currently enrolled college student.

Taking part in the study will take about 1 hour of your time.

You cannot take part in this study if you are under 18, are not a currently enrolled college student, and/or cannot allow use of both arms (both arms will be used in the study to attachment instruments and pet a therapy dog).

### What will I be asked to do if I am in this study?

If you take part in the study, you will be asked to complete a screening measure that will inquire about any animal allergies, phobias, or aggressive experiences with animals/humans. Please be aware that a report may be made to Child Protective Services or Adult Protective Services of any abuse toward children (under 18) or vulnerable adults (with physical or mental limitations). If you choose to participate, you

will be randomly assigned to a group. In one group you will be asked to come to a room on campus and be outfitted with physiological measurement equipment. The equipment will measure blood pressure, heart rate, respiration, skin temperature, and skin conductance. A document detailing these measurements will be saved to a confidential external hard drive. Some of the measurement equipment will require you to gently rub a scouring pad once over a one by one inch piece of skin on your arm which may leave redness and possibly bleeding. After putting on the equipment, you will be introduced to a therapy dog and his/her human handler. You will be asked to gently pet the dog with your right hand at a speed that is natural to you. You will then watch a brief (10 minute) video and be asked to orally answer some questions about the video. After answering the questions, the equipment will be removed. You will answer a few additional questions about your experience with the dog and be provided with a handout on stress reduction tips and local counseling resources. If you are assigned to the other group you will be asked to come to a room on campus and be outfitted with physiological measurement equipment. The equipment will measure blood pressure, heart rate, respiration, skin temperature, and skin conductance. A document detailing these measurements will be saved to a confidential external hard drive. Some of the measurement equipment will require you to gently rub a scouring pad once over a one by one inch piece of skin on your arm which may leave redness and possibly bleeding. You will then watch a brief (10 minute) video and be asked to orally answer some questions about the video. After answering the questions, the equipment will be removed. You will be provided with an opportunity to schedule an additional time to meet with a registered therapy dog and handler if you are interested. Finally, you will be provided with a handout on stress reduction tips as well as local counseling resources. This whole process should take approximately 1 hour to complete. You have the right to refuse to answer any question on the screening measure or during the experiment.

### **Are there any benefits to me if I am in this study?**

The potential benefits to you for taking part in this study are potential stress reduction benefits, the option of meeting and interaction with a registered therapy dog and handler (during the study or afterwards), and attainment of a handout detailing stress reduction tips and local counseling resources.

### **Are there any risks to me if I am in this study?**

The potential risks from taking part in this study are possible redness or bleeding when you gently abrade your skin before attaching the equipment, a mild increase in stress while answering oral questions about a video, possible discomfort when answering questions about past aggression towards animals or humans, a possibility that a researcher will need to make a mandated report of past abuse toward a child under 18 or vulnerable adult (physical or mental limitations), and interaction with dogs creates a minimal risk for a scratch, bite, or zoonotic disease although all animals will be trained therapy dogs up to date on their shots

### **Will my information be kept private?**

The data for this study will be kept confidential to the extent allowed by federal and state law. All data will be coded by the group you participate in with no identifying information attached. No published results will identify you, and your name will not be associated with the findings. Under certain circumstances, information that identifies you may be released in the case of a need for mandated report of child abuse or abuse of a vulnerable adult (physical or mental limitations). Data will be stored on a password protected external hard drive that is kept in a locked room on campus. The only people accessing the hard drive are the researchers.

The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain anonymous

The data for this study will be kept for 3 years.

### **Are there any costs or payments for being in this study?**

There will be no costs to you for taking part in this study.

You will not receive money or any other form of compensation for taking part in this study.

### **Who can I talk to if I have questions?**

If you have questions about this study or the information in this form, please contact the researcher Kendra Thew, 206-940-9220, [WSUdogstudy@gmail.com](mailto:WSUdogstudy@gmail.com). If you have questions about your rights as a research participant, or would like to report a concern or complaint about this study, please contact the Washington State University Institutional Review Board at (509) 335-3668, or e-mail [irb@wsu.edu](mailto:irb@wsu.edu), or regular mail at: Albrook 205, PO Box 643005, Pullman, WA 99164-3005.

### **What are my rights as a research study volunteer?**

Your participation in this research study is completely voluntary. You may choose not to be a part of this study. There will be no penalty to you if you choose not to take part. You may choose not to answer specific questions or to stop participating at any time.

### **What does my signature on this consent form mean?**

Your signature on this form means that:

- You understand the information given to you in this form
- You have been able to ask the researcher questions and state any concerns
- The researcher has responded to your questions and concerns
- You believe you understand the research study and the potential benefits and risks that are involved.

---

**Statement of Consent**

I give my voluntary consent to take part in this study. I will be given a copy of this consent document for my records.

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Participant

**Statement of Person Obtaining Informed Consent**

I have carefully explained to the person taking part in the study what he or she can expect.

I certify that when this person signs this form, to the best of my knowledge, he or she understands the purpose, procedures, potential benefits, and potential risks of participation.

I also certify that he or she:

- Speaks the language used to explain this research
- Reads well enough to understand this form or, if not, this person is able to hear and understand when the form is read to him or her
- Does not have any problems that could make it hard to understand what it means to take part in this research.

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Person Obtaining Consent

\_\_\_\_\_  
Role in the Research Study

## Appendix C

### Participant Screening form

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Do you have any of the following?

\_\_\_\_\_ Animal Allergies. Which animals? \_\_\_\_\_

\_\_\_\_\_ Animal fears or phobias. Which animals? \_\_\_\_\_

\_\_\_\_\_ History of aggression or abuse toward animals. \_\_\_\_\_

\_\_\_\_\_ History of aggression or abuse toward people. \_\_\_\_\_

\_\_\_\_\_ Current medical conditions? \_\_\_\_\_

Animals you have had as pets: \_\_\_\_\_

Any negative experiences with animals: \_\_\_\_\_

\_\_\_\_\_

Any positive experiences with animals: \_\_\_\_\_

\_\_\_\_\_

Would you like to participate in animal assisted therapy? \_\_\_\_ Y \_\_\_\_ N

On a scale of 1-10 (1 being mild to no stress and 10 being incredibly high levels of stress), how would you rate your stress level over the past week? \_\_\_\_\_

Do you have use of both arms? \_\_\_\_\_

Additional information: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- Please be aware that a report may be made of any abuse toward children (under 18) or vulnerable adults (with physical or mental limitations).

Would you like to participate in an activity that would involve petting a dog while answering questions ? \_\_\_\_ Y \_\_\_\_ N

Demographic Information:

Age \_\_\_\_\_

Gender \_\_\_\_\_

Year in School \_\_\_\_\_

Type of Degree Sought (B.A., B.S., M.A., Ph.D., etc) \_\_\_\_\_

School Status (Full time or Part time) \_\_\_\_\_

Race/Ethnicity, Please Select One:

\_\_\_\_ Hispanic or Latino/a

\_\_\_\_ American Indian or Alaska Native

\_\_\_\_ Asian

\_\_\_\_ Black or African American

\_\_\_\_ Native Hawaiian or Other Pacific Islander

\_\_\_\_ Middle Eastern or North African

\_\_\_\_ White

## Appendix D

### WASHINGTON STATE UNIVERSITY Informed Consent Form for Animal Owners

Some research projects in Veterinary Teaching Hospital involve client-owned animals. WSU Institutional Animal Care and Use Committee (IACUC) does not control the inclusion of specific animals in the research. As a part of the approval process for the research, IACUC requires that owners are informed and consent for research is freely granted by reviewing and signing the form below. This step should be completed before an animal is used in any research activity.

#### TEMPLATE CONSENT FORM

**Researcher:** Kendra Thew & Dr. Phyllis Erdman, Educational Leadership and Counseling Psychology

**24- hour Emergency number:** -----, **Name of person answering the call, Designation**

**Animal Number** \_\_\_\_\_

**Case Number** \_\_\_\_\_

**Owner or Custodian** \_\_\_\_\_

#### Purpose of this form

We would like to include your dog in an on-going research study designed to measure physiological indicators of stress in college students while they pet therapy dogs. This form is to provide information to help you decide whether you want your dog to be in the study or not. **Please read this form carefully. You can ask questions** about the purpose of the study, the possible risks and benefits, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want your dog to be in the study or not.

#### Purpose of this Study

This study is being done to understand the stress reduction benefits of petting a therapy dog for college students. Students will be outfitted with equipment designed to measure blood pressure, heart rate, respiration, skin conductance, and skin temperature. They will then be introduced to you and your dog. The student will be instructed to pet your dog while watching a video on the Cold War. They will continue petting your dog after the video while answering orally presented quiz questions. At the end of the experiment, students will be allowed to spontaneously interact with you and your animal while answering a few questions about their experience. This whole process should take approximately one hour.

The potential benefits of participating in this study include gaining volunteer hours and providing a service to college students in an effort to reduce stress. There are no fees to participate in this study. Your dog may benefit through enjoyment of interacting with the student and putting their training to use.

The potential risks to your dog from participating in the study are minimal. Your dog may get restless or bored during the study. There is a possibility the college student may attempt to act negatively toward your animal but you will be able to intervene and withdraw your dog at any point. Additionally, all college students will have completed a screening questionnaire to rule out past aggression towards animals or humans. Finally, Kendra Thew will be present at all times to provide additional supervision.

The data for this study will be kept confidential to the extent allowed by federal and state law. No published results will identify you, and your name will not be associated with the findings. Under certain circumstances, information that identifies you may be released for internal and external reviews of this project.

You will receive an information sheet regarding the **The effect of interaction with a therapy dog on college student stress levels as measured by physiological indicators** study.

Enrolling your dog in this study is voluntary and you can withdraw permission and your dog from the study at any time. You also understand that your dog can be withdrawn from the study if the investigators find it

necessary. If your dog is withdrawn from the study for any reason, data already collected may continue to be used for research purposes.

Your dog will not be treated differently if you decline to participate in the study. Your decision to participate, not participate, or withdraw your dog from the study will not affect your relationship with WSU or any other treatment your (animal) is receiving.

Name of PI Dr. Phyllis Erdman Signature \_\_\_\_\_ Date: \_\_\_\_\_

**Subject's Statement**

This study has been explained to me. I agree that my dog can take part in this research. I have had a chance to ask general questions about the research, with the researcher listed above. If I have additional concerns, I can call the WSU Institutional Animal Care and Use Committee (IACUC) at (509) 335-7951. This study has been reviewed and approved by the WSU IACUC for using client owned animals for research. I will receive a copy of this consent form.

I certify that I am the legal owner or custodian of the dog and have the authority to consent medical treatment for this dog.

Name of the subject \_\_\_\_\_ Signature \_\_\_\_\_ Date: \_\_\_\_\_

**Paste Information Sheet Below**

**Information Sheet**

I am a fourth year graduate student earning a Ph.D. in Counseling Psychology at Washington State University. I would love to have you and your dog participate in this study about animal assisted activities and college student stress levels. This study could provide evidence for the physiological stress reduction of interaction with a therapy dog. In this study, 60 students will undergo a stressful task (watching an informational video and being quizzed on the content). Half of these students will complete this task while petting a registered therapy dog. Students in the other group will also have the opportunity to schedule a time to meet a registered therapy dog after completing the study. This study will take place at Washington State University (room 240 of Cleveland Hall). Students will attend one session for 60 minutes. You, your dog, or the student can withdraw from the study at any point.

We hope to identify possible stress reduction benefits of animal assisted activities. All dogs incorporated into this study have been trained and tested for obedience and are registered therapy dogs with Pet Partners. All dogs will be on a leash with their registered handler at all times. We value your participation and hope this study can provide meaningful evidence for the field of animal assisted therapy.

*Participants in this study*

1. Cannot have allergies to dogs.
2. Cannot have phobias of dogs.
3. Cannot have previously exhibited violence toward animals.
4. Cannot have previously exhibited violence toward humans.

Thank you!

Kendra Rieger Thew

(206) 940-9220

kendra.rieger@wsu.edu

## Appendix E

### Response Form

1. What is the name of the conference held in 1945 between President Truman, Winston Churchill, and Joseph Stalin? (Potsdam Conference)
2. Name some of the issues facing President Truman at the end of World War I. (Control of defeated Germany, post war boundaries, winning the war with japan, securing lasting peace for Europe)
3. What year did World War I begin? (1914)
4. What event triggered the February Revolution of 1917? (A public demonstration about the bread ration)
5. Name the exiled Russian who lived in Switzerland and planned a revolution? (Vladimir Lenin)
6. Whose writing was Lenin's revolution based on? (Karl Marx)
7. What was the name of Karl Marx's written document from 1848 (Communist Manifesto)
8. What was the name of Lenin's revolution? (October Revolution, 1917)
9. Name some of the ways Lenin punished dissenters after his revolution. (Arrest without a charge, imprisonment without a trial, disappearance without explanation)
10. What were the two opposing ideologies discussed in the video (Democracy and Communism)
11. What was the name of the man in charge of the Manhattan Project (Robert Oppenheimer)

## Appendix F

### Stress Reduction and Self-Care (Information from Washington State University Counseling and Psychological Services)

#### Practice relaxation and/or meditation

- Relaxation and meditation activate the relaxation response of the nervous system.
- Regular practice of relaxation and meditation will improve your mental clarity, boost your immunity to illnesses and increase feelings of well-being.

#### Drink no or only one caffeinated beverage

- Caffeine increases nervousness.
- If you must drink caffeine, drink it before 2:00 pm so it does not interfere with sleep and do not drink more than one cup before a stressful event, such as an exam.

#### Exercise

- Exercise is one of the best things you can do to reduce your stress.
- Try to get a combination of stretching, strengthening and aerobic exercise, but anything is better than nothing.

#### Get good sleep

- Develop good sleep habits by winding down an hour before bedtime.
- Avoid excitement from things like horror films or hip-hop music just before bed.

#### Eat less sugar and have regular meals

- Sugar amps you up and can increase jitteriness.
- Lack of protein can cause poor concentration and symptoms that feel like nervousness.

#### Little or no alcohol

- Alcohol disrupts sleep.
- Once alcohol wears off, you may feel like you are getting a jolt of tension.

#### Balance work with fun

- Distracting yourself from the source of your stress is important.
- The happier you are, the more resilient you will be against stress.

#### Talk to friends

- Having someone who understands you or relates to your life can be a great outlet and support.
- Feeling connected and close to other people can actually stimulate feel good neurochemicals in the body.

#### Find meaning in life by helping others less fortunate than you

- Volunteering can help us feel good about ourselves when we help others.
- Seeing others less fortunate than ourselves may put our own problems into perspective.

#### If you feel too overwhelmed, talk to a counselor

### **Washington State University Counseling and Psychological Services**

Washington Building, third floor

PO Box 642333

Pullman, WA 99164-2333

<http://counsel.wsu.edu/>

Additional information, scheduling and rescheduling: 509-335-4511

After hours crisis services: 509-335-2159