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Effects of Canines on Humans' Physiological and Perceived Stress

Beth Marie Bowin
Walden University

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Walden University

College of Social and Behavioral Sciences

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Beth Bowin

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2019

Abstract

Effects of Canines on Humans' Physiological and Perceived Stress

by

Beth Bowin

MS, Northeastern State University, 2004

BS, Oklahoma State University, 1983

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Psychology

Walden University

August 2019

Abstract

The bond between pet and owner has been shown to decrease stress-related physical, mental, and emotional disorders by lowering blood pressure and heart rate. The purpose of this study was to examine whether a nonpet canine would have the same effect in reducing physical symptoms of stress as a known dog. Human–animal bond theory, Human pressor test. Data were analyzed using repeated measures, analyses of variance, and *t* tests. Results indicated that interaction with a strange dog lowered heart rate and blood pressure significantly faster in the experimental group than in the control group. The positive social change implications of this research include policy and procedural accommodations for the use of canines as comfort animals for individuals in stressful conditions.

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Dedication

This dissertation is dedicated to my family for all of the support and understanding. My children have been my rock and inspiration. Brandi, Dane, Shelbi, and Katie, your love, wisdom, and “ears to vent” go beyond what I can express in words. I did this for you. I am so grateful for all the hard work of researchers who inspired me, educated me, and gave me the drive to continue where they left off. Last but not least, I am grateful for the animal souls in the world. My hope is that we will someday fully understand the importance of our relationships with all creatures from insects to whales and everything in between!

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To Mamacita, my beloved rescued dachshund. Although you were the strange dog in the research, your loving disposition was contagious, and you made an impact on those you comforted.

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Chapter 1: Introduction to the Study

Many households are home to animals. The bond shared between humans and animals seems to be positive with many health benefits (Walsh, 2009). There is evidence indicating owning a pet can decrease anxieties, increase positive mood, and decrease the effects of stress on bodies (T. Adams et al., 2017; Allen, Shykoff, & Izzo, 2001). Most often researchers have focused on the influence of therapy canines on physical, mental, and emotional health-related issues. Research has also indicated the benefits a pet dog can have on improving humans' quality of life (Allen et al., 2001; Irvine & Cilia, 2017). Dogs have comforted humans and have been accepted into family systems for decades (Payne, Bennett, & McGreevy, 2015). Humans have been found to show physiological changes in the presence of dogs (Allen, 2003; Allen et al., 2001; DeNoon, 2015; Hosey & Melfi, 2014). Having a pet has been found to affect people in positive ways related to improved social skills, improved reported health, and a more positive emotional condition (T. Adams et al., 2017; Allen et al., 2001; Allen, Blascovich, & Mendes, 2002; Hosey & Melfi, 2014).

Previous research has focused on the influence of therapy canines or pets on physical, mental, and emotional health-related issues. Although canine therapy animals have been around for decades, there is relatively little empirical data to support the beneficial use of a non-pet canine. Research showed that the use of dogs as therapeutic animals provides benefits that are mainly for those suffering from some degree of malfunction, including having a mental, physical, or emotional disability (Pruchno, Heid, & Wilson-Genderson, 2018; VonBergen, 2015). Pet therapy research is not restricted to

use of canines. In one recent study, elderly individuals were assigned to care for a canary or plant, with care instructions provided (Cherniack, & Cherniack, 2014). After a 3-month intervention, those who cared for a canary had significantly better scores on subscales of psychological symptoms in the Brief Symptom Inventory and LEIPAD-II-Short Version (Cherniack, & Cherniack, 2014). Pets provide security and connectivity in the lives of owners, especially for those with long-term diagnosed mental illness (Brooks, Rushton, Walker, Lovell, & Rogers, 2016). Pets of choice vary from individual to individual and include cats, dogs, hamsters, guinea pigs, birds, and fish (Brooks et al., 2016).

The benefit of the human-animal bond experienced with dogs, is more expansive and not limited to the arena of trained canines (Belk, 1996; Krause-Parello 2018; VonBergen, 2015). Understanding the importance of a dog, whether it be a loyal pet or a valued creature, goes beyond the boundary of therapeutic use. Belk (1996) found that pets are owned for four reasons: the human-pet relationship is just as important for day-to-day existence as for therapeutic or service reasons. Pets give pleasure, pets may be an extension of a person, pets are family members, and pets are toys. Current research substantiated these earlier findings (Payne et al., 2015). Animals can be good for humans' well-being, and dogs can be beneficial for humans aiding in healthy physiological functioning (Allen, 2003; Allen et al., 2001; DeNoon, 2015; Pruchno et al., 2018).

I analyzed secondary data from an unpublished study at Northeastern State University addressing the lack of information available on the use of non-therapy, non-service, and non-pet canines for human stress reduction, both perceived and physiological

(Kirk & Bowin, 2019)The current study has implications for social change by increasing understanding of the benefit a canine has on an individual's ability to cope during stressful life situations. This chapter includes the background, problem statement, purpose of the study, research questions and hypotheses, definitions of terms, assumptions, scope and delimitations, limitations, nature of the study, significance, and a summary.

Background

The idea for this study came from anecdotal and testimonial reports that being around a canine made a person feel better. Researchers from several social science disciplines along with biology and zoology have found that the presence of a therapy or pet canine reduces stress and decreases anxiety by lessening the nervous system arousal and decreasing the amount of cortisol released within the body (Hart-Cohen, 2009). A therapy or pet canine has been shown to be beneficial in lowering blood pressure, lowering heart rate, increasing speech and memory function, and increasing mental functioning (Hart-Cohen, 2005; Kim, Pellman, & Kim, 2015; Kuhlmann, Piel, & Wolf, 2005). Therapy and service dogs have generally been accepted as the only ones of therapeutic value. Pets, in general, are instrumental in daily life for many in society (Beck, 2014)

Pets offer emotional support, security, and unconditional love. As the purpose of animals evolved from usefulness to pleasure, so did the attachment and bond humans experience with animals (Serpell, 2000). According to Bowlby's (1959) attachment theory, individuals' developmental working models of themselves and others depend on

dimensions of need fulfillment from parents or caregivers. Classified as secure and nonsecure, these styles were later found to be developed by the individual's arrangement based on anxiety and avoidance associated with the parents or caregivers (Blazina, Boyraz, & Shen-Miller, 2013). This attachment can be used to measure human companion animal relationships as well (Crawford, Worsham, & Swinehart, 2006; Hosey & Melfi, 2014; Meehan, Massavelli, & Pachana, 2017). Researchers have portrayed the significance of therapy, service, or pets and the positive benefits to individuals (VonBergen, 2015). There have been assumptions about the human-animal bond being similar to human relationships (Meehan et al., 2017). Studies have shown that pets and people can be significant attachment figures for one another (Meehan et al. 2017). Research on the benefits of pets and the human-animal bond is not a novel. Nebbe (2001) found the human-pet relationship is simple and safe resulting in far less risk than human relationships. A pet can satisfy a person's basic need to be loved and accepted, thereby positively developing his or her self-worth (Nebbe, 2001). More recent research indicated that the use of a horse improved well-being and psychological healing in volatile substance abuse recovery through the journey of First Nations female youth (C. Adams et al., 2015). Horses were found to be highly instinctive animals, adding to the rich cultural enhancement and holistic healing approach (C. Adams et al., 2015).

The role of pets as resources for mental health management has been shown to enhance physical and mental well-being (Brooks et al., 2016). Using pet therapy also supports the environmental, behavioral, and psychological principles of the holistic lifestyle approach to the management of mental health problems, care, and prevention

(Brooks et al., 2016). Researchers have examined the significance of therapy, service, or pets and the positive benefits to individuals (Walsh, 2009). I analyzed secondary data from an original study completed at Northeastern State University by Kirk, J. & Bowin, B., (2019) [A study of the effects of canines on physiological and perceived stress]. Unpublished raw data. I addressed the gap in research regarding the benefits of non-therapy, non-service, and non-pet canines, or a strange dog. The current study examined empirical data on the physiological, emotional, and mental impact canines can have on humans' well-being. Findings contributed to the existing research on the benefits of animals as therapeutic tools and the importance of the human-animal bond.

Problem Statement

Researchers examined the use of service, therapy, and pet dogs and studied the impact on the human stress response (Brooks et al., 2016; Pruchno et al., 2018). Many studies confirmed the use of service, therapy, and pet dogs to alleviate symptoms of stress, benefiting those suffering from severe dysfunctional behaviors or conditions related to daily life stressors; however, much of the data were self-reported or anecdotal (Brooks et al., 2016; Pruchno et al., 2018). I analyzed secondary data from an earlier study to examine the influence a strange dog has on stress reduction for healthy adults without limiting the benefits to those with previous diagnosed conditions or behaviors. The term *stress* refers to “the non-specific response of the body to any demand made upon it” (Seyle, 1976, p. 12). Stress is an obvious part of daily functioning. Many things can trigger a body's stress response (O'Brien, Mathieson, Leafman, & Rice-Spearman, 2012). Some stress may be acute and short-term in duration; other stress may be chronic,

extreme, and long lasting (O'Brien et al., 2012). A type of stress response, such as exposure to violence, can lead to agonizing stress reactions (Hart-Cohen, 2009). Research has indicated that pets can have a beneficial and positive impact on blood pressure (BP) and heart rate (HR) responsiveness (Allen et al., 2001). Researchers focused on therapy dogs or service dogs but did not examine the influence of non-pet, non-therapy, or non-service dogs.

Stress can become problematic for individuals on a day-to-day basis. Research indicated that normal stress responses can lead to an increase in arousal, which can result in changes in overt behavior as well as cognitive functioning (Aggarwal et al., 2014; Argyle, 2009; Ginty, Kraynak, Fisher, & Gianaros, 2017). Starcke and Brandt (2012) noted that difficult decisions are also accompanied by stress reactions. Mechanisms in psychophysiology, psychoendocrinology, and psychoimmunology have been found to mediate these changes (Morey, Boggero, Scott, & Segerstrom, 2015; Urisn & Eriksen, 2002). Sliwinski, Smyth, Hofer, and Stawski (2006) reported that stress-related cognitive interference competes for attentional resources. Under stress, many daily life skills can become difficult.

Pet-owning patients with high blood pressure have been reported to keep their blood pressure lower during times of mental stress than patients without pets (Allen, 2003). Pet owners also have increased odds of surviving for at least a year after having a heart attack (DeNoon, 2013). Research also indicated that using pet canines for companionship has some benefits for managing behavioral and psychological symptoms of dementia in people with dementia of various stages (Perkins, Bartlett, Travers, &

Rand, 2008). Studies have shown that reduced stress can benefit physical health and use of pets, including canines, can have positive effects (Irvine & Cilia, 2017; Oyama & Serpell, 2013).

Although studies addressed pet ownership and stress reduction, there was a gap concerning short-term non-pet canine use (as in pet therapy) and the effects this has on lowering the physiological markers of blood pressure and heart rate and ultimately lowering perceived stress. Research on human-dog interactions has been valuable in indicating a connection between talking to and petting a dog and lowering blood pressure (McDonald, McDonald, & Roberts, 2017; Ward-Griffin et al., 2017). Several researchers acknowledged the use of therapy dogs to relieve stress and confirmed that individuals feel better when a dog is present (Allen et al., 2001; DeNoon, 2015; Goddard & Gilmaer, 2015; Pruchno et al., 2018). However, little is known about physical effects with strange dogs (McDonald et al., 2017). I examined the influence of non-service, non-therapy, non-pet dogs on the human stress response by using the physiological markers of blood pressure and heart rate.

Purpose of the Study

I analyzed the data from (Kirk & Bowen, 2019) quantitative study conducted at Northeastern State University. The purpose of the current study was to explore the influence a non-pet canine has on lowering blood pressure and heart rate and the effect related to perceived stress. In (Kirk & Bowen (2019) participants completed the Pet Attitude Scale-Modified to indicate attitudes towards pets, and the Positive and Negative Affect Schedule-Short Form (PANAS-SF) pre and post trial, to indicate positive and

negative emotions of perceived stress. Stress was induced by using a cold pressor test Kirk & Bowin (2019) [A study of the effects of canines on physiological and perceived stress]. Unpublished raw data. A cold pressor test was performed by immersion of one hand in ice water (2 +/- 0.5 degrees C) for 1 minute (Kirk & Bowin, 2019). Readings of the dependent variables of BP and HR were then measured and recorded, after stress induction and reduction, with a LotFancy BP 103H Automatic Digital Blood Pressure Monitor device, with and without use of the independent variable, the canine (Kirk & Bowin. 2019).

Stress causes behavioral, psychological, and physiological changes in the body, which are met with a physical hyperarousal response (O'Brien, et al., 2012). Stress results in a number of normal bodily reactions to retain self-preservation (O'Brien et al., 2012). There is a lack of experimental physiological evidence comparing anecdotal accounts of canines making a person feel less stressed and physiological stress reduction using BP and HR recordings. This gap was addressed in the current study.

Research Questions and Hypotheses

RQ1:: Can induced stress, as measured by increases in blood pressure and heart rate, be affected by the presence of a non-pet canine?

H₀1: Induced stress, as measured by increases in blood pressure and heart rate, is not significantly affected by the presence of a non-pet canine or strange dog.

H_a1: Induced stress, as measured by increases in blood pressure and heart rate, is significantly affected by the presence of a non-pet canine or strange dog

RQ2: Will decreased stress result in self-appraisal of a more positive emotional state as measured by the PANAS-SF?

H₀2: Decreased stress does not result in self-appraisal of a more positive emotional state as measured by the PANAS-SF.

H_a2: Decreased stress results in self-appraisal of a more positive emotional state as measured by the PANAS-SF.

Theoretical and/Conceptual Framework

Human-Animal Bond Theory

The primary conceptual framework for this study was the human-animal bond theory, which focuses on the benefits of companion animals (Walsh, 2009). This theory provided evidence that correlates pet ownership with positive physiological measures, such as lowered blood pressures, serum triglycerides, and cholesterol levels (Walsh, 2009). Walsh (2009) reported pets can provide healing in a range of relational benefits including stress reduction, loyalty, companionship, comfort, security, and unconditional love. Individuals in contact with animals experience a decrease in blood pressure, a reduction in reported feelings of anxiety, and a general feeling of well-being. Research also indicated the possible role oxytocin plays when children observe the behavior of animals: More nurturing behavior is learned that perhaps enables children to become better parents to their own children (Beetz, Uvnäs-Moberg, Henri, & Kotrschal, 2012). The therapeutic value of animals for socially isolated individuals in nursing homes, hospitals, hospices, and prisons has been documented (Barker, Knisely, McCain, Schubert, & Pandurangi, 2010; Beck, 2014; Robinson, MacDonald, & Broadbent, 2015;

VonBergen, 2015). People in the presence of animals are often perceived to be happier and healthier than those without animals (Saunders, Paraast, Babey, & Miles, 2017). The human-animal bond theory supported the hypothesis in the current study that the physical markers of blood pressure and heart rate will be reduced at a faster rate when a dog is available to ease the stress.

Affiliation in Human-Animal Interaction

The affiliation in human-animal interaction theory was developed from evidence that supported the evolutionary journey of animals from workers and means of transportation to companions with various benefits (Beetz & Bales, 2016; Payne et al., 2015). These benefits include social companionship and therapeutic health benefits (Beetz & Bales, 2016; Payne et al., 2015). The health benefits include, but are not limited to, lowering the effects of stress and anxiety (Beetz & Bales, 2016; Saunders, Parast, Babey, & Miles, 2017). The benefits arise from interactions through emotional attachments and by the calming nature of animals. In the current study, the affiliation in human-animal interaction theory demonstrated the importance of animals for human well-being through quantification of the effects a strange dog has on humans' perceived stress response.

Attachment Theory

The model of attachment style, first pioneered by Bowlby in 1959, is based on the perceptions formed of the important people or caregivers throughout life (Ainsworth & Bowlby, 1991; Bowlby, 1959). Attachment styles were identified as insecure or secure and were associated with the type of care, amount of care, and consistency of care given

(Ainsworth & Bowlby, 1991; Bowlby, 1959). Attachment theory maintains that caretakers who are available and responsive to a baby's needs create feelings of security (Ainsworth & Bowlby, 1991; Bowlby, 1959). The infant develops an understanding that a caretaker can be counted on, leading to a warm and safe foundation in which the world can be explored (Ainsworth & Bowlby, 1991; Bowlby, 1959). Adults rely on friends, family, and pets to obtain reassurance and support (Zilcha-Mano, Mikulincer, & Shaver, 2011). This feeling of support and acceptance may cause pet owners to turn to their companion animal for comfort and reassurance, especially during trying times (Zilcha-Mano et al., 2011). The present study included assessment scales based on human attachment to explain and quantify the importance of pets in a person's life. Attachment to pets, like a dog, can be beneficial in explaining how the presence of a dog can ease physiological and perceived stress. I explored this attachment by examining whether a strange dog offered the same benefits of lowering stress and aiding in comfort and support as a pet dog, service dog or therapy dog.

Nature of Study

The nature of this study was quantitative using secondary data that were not previously analyzed for the study purpose. The data from a study at Northeastern State University (Kirk & Bowin, 2019) were analyzed using a repeated measures ANOVA to predict and explain the main effects of the independent variable: induced stress (see Gravetter & Wallnau, 2009). The data consisted of results of blood pressure and heart rate (as measured by the LotFancy BP 103H Automatic Digital Blood Pressure Monitor device) and perceived pre and post stress (as measured by the PANAS-SF).

In the original study, the measures of baseline blood pressure and heart rate, the measures following the cold pressor test, and measures after stress reduction with and without holding a canine were compared. A Pet Attitude Scale- Modified (PAS) was administered to collect data from participants regarding their inner feelings toward pets. A pre and post Positive and Negative Affect Schedule (PANAS-SF) was administered to measure mood and the degree of positive and negative affect. Interval data were analyzed from the findings of this inventory and were used to provide rich information regarding the thoughts and feelings of individuals following a stressful situation and the importance the use of a canine on physiological stress. The participants were 80 adults over the age of 18 with no known blood pressure or heart problems. Participants were women and men from Northeastern State University and the surrounding town of Tahlequah, Oklahoma. In the current study, the secondary data were analyzed through repeated measures ANOVAs to examine heart rate and blood pressure before and during the stress tests for the two groups (with and without a canine present). An independent *t* test was used to examine self-appraisal of emotional state (using the PANSA-SF) after the stress tests for the two groups (with and without a canine present).

Definitions of Terms

Blood pressure: The pressure of the blood in the circulatory system, often measured for diagnosis because it is closely related to the force and rate of the heartbeat and the diameter and elasticity of the arterial walls (Johnson, Kamilaris, Chrousos, & Gold, 1992; Kuhlmann et al., 2005; O'Brien et al., 2012; Urskin & Eriksen, 2002).

Cold pressor test: A cardiovascular test performed by immersing the hand into an ice water container, usually for 1 minute, and measuring changes in blood pressure and heart rate (Silverthorn & Michael, 2013).

Companion animal: Domesticated or domestic-bred animals whose physical, emotional, behavioral, and social needs can be readily met as companions in the home or in close daily relationship with humans (American Society for the Prevention of Cruelty to Animals, n.d.).

Cortisol: A hormone involved in the regulation of metabolism in the cells that helps individuals regulate stress within the body (Johnson et al., 1992; Kuhlmann et al., 2005; O'Brien et al., 2012; Urskin & Eriksen, 2002).

Decision-making: The thought process of selecting a logical choice from the available options (Kuhlmann et al., 2005; Sliwinski et al, 2006).

Effects of stress: A body's hardwired response to a stressor (Johnson et al., 1992; Kuhlmann et al., 2005; O'Brien et al., 2012; Urskin & Eriksen, 2002).

Heart rate: The number of heartbeats per unit of time, usually per minute. The heart rate is based on the number of contractions of the lower chambers of the heart (Johnson et al., 1992; Kuhlmann et al., 2005; O'Brien et al., 2012; Urskin & Eriksen, 2002).

Human-animal bond: The human-animal bond is a mutually beneficial and dynamic relationship between people and animals that is influenced by behaviors that are essential to the health and well-being of both. This includes, but is not limited to, emotional, psychological, and physical interactions of people, animals, and the

environment (American Veterinary Medical Association, 2018; Beetz & Bales, 2016; Walsh, 2009).

Memory: The faculty of the mind by which information is encoded, stored, and retrieved. Memory is vital to experiences and related to limbic systems; it is the retention of information over time for the purpose of influencing future action (Kuhlmann et al., 2005).

Non-pet: An animal not kept for enjoyment or companionship. The word implies the animal has no owner (Beck, 2014).

Pet: An animal kept for enjoyment or companionship. The word implies the animal has an owner (Beck, 2014).

Pet ownership: The situation in which an animal is kept for enjoyment or companionship. The word implies the animal has an owner (American Veterinary Medical Association, 2018; Beetz & Bales, 2016; Walsh, 2009).

Pet therapy: Also called animal assisted therapy; a type of therapy that involves animals as a form of treatment to improve a patient's social, emotional, or cognitive functioning (Fine, 2000).

Physiological markers of stress: Cortisol, blood pressure, and heart rate (Johnson et al., 1992; Kuhlmann et al., 2005; O'Brien et al., 2012; Urskin & Eriksen, 2002).

Strange dog: A canine not known, seen, or experienced before (Reverso dictionary, 2017).

Stress: A physical, mental, or emotional factor that causes bodily or mental tension. Stress can be external (from the environment, psychological, or social situations)

or internal (illness, or from a medical procedure). Stress can initiate the fight or flight response, a complex reaction of neurologic and endocrinologic systems (Johnson et al., 1992; Kuhlmann et al., 2005; O'Brien et al., 2012; Urskin & Eriksen, 2002).

Stress reduction: Various strategies that produce a sense of relaxation and tranquility (Johnson et al., 1992; Kim et al., 2015; Kuhlmann et al., 2005; O'Brien et al., 2012; Urskin & Eriksen, 2002).

Assumptions of the Study

An assumption of the study, Kirk & Bowin, (2019), was the participants' ability to understand what was required of the study and the expectations of the cold pressor test. The attitudes toward placing a hand in cold water could not be controlled in the original study. In addition, I assumed that the subjects understood the questions asked on the survey and answered as honestly as possible. Certain uncontrolled variables in the original study were the participants' tolerance toward cold temperatures and attitudes toward the cold pressor test and the particular canine used. Other uncontrollable variables were the participants' accuracy and honesty in pre and post assessments. The use of the cold pressor test was necessary to induce stress; pain tolerance was not assessed or controlled for in the study.

Scope and Delimitations

The original study at Northeastern State University (Kirk & Bowin, 2019) addressed adults under a simulated stressful situation to explore the influence of a non-service, non-therapy, non-pet canine in lowering the biological markers of blood pressure and heart rate. Kirk and Bowin (2019) also examined the participants' perceived stress

before and after stress induction, and the effect a non-pet canine may have had on that emotional functioning. The population in the original study were adults over the age of 18 years who had access to Northeastern State University to take part in this study. The significant findings from the current study may be generalized to individuals who experience stress due to extenuating life circumstances as an alternative or in conjunction with physical, mental, and emotional health care. Health care professionals, policymakers, and administrators may also find these research findings useful.

Limitations

One of the limitations of the original study was participants were limited to adults over the age of 18 years. Many of the factors of the study, such as elevation of blood pressure and heart rate during stressful situations, may not apply to children and young adults. Self-report bias may have existed in the original study. Although honesty and understanding of the assessment questions were the criteria in the original study, a respondent may have been incapable of providing an accurate response to a question.

Researcher bias in reading the results of the LotFancy BP 103H Automatic Digital Blood Pressure Monitor device could have presented itself in the original study. The interaction between participant and experimenter, the exclusion of participation with the dog, or the effect of laboratory experimentation (the Hawthorne effect) could have impacted the findings in the original study. Because the original study (Kirk & Bowin, 2019) was completed, I was unable to mitigate the limitations.

Significance

The results of the current study may provide insight into stress reduction of vascular responses, using a non-service, non-therapy, non-pet dog, as well as insight into the perception of stress and the relationship with a strange dog. Insights from this study may assist researchers, teachers, social workers, and practitioners in identifying and developing effective and efficient resources for managing stress by use of a canine.

This study provided an original contribution to the limited quantitative research involving the use of non-pet, non-therapy, and non-service canines in reducing humans' stress. The analysis of existing research data was intended to fill a gap in the literature by comparing anecdotal data and empirical data focusing on the use of a canine to decrease stress. I used secondary data analysis to address the use of non-pet dogs in stress reduction, making this study unique among the existing research. Alleviating the symptoms of stress, such as higher blood pressure and increased heart rate, is beneficial in reducing the innermost feelings of perceived stress (K., Allen et al., 2001). This research is significant because it adds to the body knowledge on the predictive influence of stress variables and types of services that would be beneficial for remediation of stress, which can have a detrimental effect only on individuals (see Baker et al., 2010; Betz et al., 2012; Mubanga et al., 2017; Ward-Griffin et al., 2017).

Social change results from various causes and sources, invention being one. The use of invention can include implementing new ideas to create new social patterns. The objective was to show how dogs are purposeful and capable agents and to explore how they interact with humans. The original study and analysis of data adds important

implications to promote the use of canines in social service agencies, for providers for victims of crime, for therapists, for school personnel, and for hospitals and health providers (Hart-Cohen, 2009; VonBergen, 2015). Schools insist on learning outcomes and optimal performances of students, yet test anxiety and performance anxiety are real for many students (Steinmayrl, Credel, McElvany, & Wirthwein, 2016). A patterned use of canines in schools may decrease this anxiety. The problem of secondary victimization in court rooms and by social or medical service providers causes unnecessary stress (Hart-Cohen, 2009). A patterned use of canines in these agencies may decrease the effects of secondary stress due to victimization. Social change promotes attitudinal change and increases civic participation and policy change that corrects injustice, which may allow canines to become purposeful and capable social agents. Analysis of the original study may be useful in emphasizing the importance of the human-animal bond, especially with a dog. Understanding of this bond may lead to acceptance of a dog's presence to promote optimal human functioning, especially in areas of stress-provoking challenges (see Crossman & Kazdin, 2015; Polheber & Matchock, 2013).

Summary

The bond between dogs and humans has a rich history with a well-established evolutionary path (Irvine & Cilia, 2017; Oyama & Serpell, 2013; Payne et al., 2015; Serpell, 2006; Topail, Kis, & Olah, 2014). Research findings indicated the human-animal interaction can positively influence health emotionally, physically, and mentally (Allen, 2003; Barker et al., 2010; Beetz & Bales, 2016; Hart-Cohen, 2009; Saunders et al., 2015). Pet owners can attest to the fact that there are many benefits to having a companion

animal (Allen et al., 1991; Beetz & Bales, 2016; Payne et al., 2015; Saunders et al., 2015).

Studies have shown lowered physiological markers of stress can have many positive advantages for health. Research also indicated that lowered stress results in better cognitive functioning (Crossman & Kazdin, 2015; Kim et al., 2015; Perkins et al., 2008; Polheber & Matchock, 2013).

The current study addressed the influence of nontherapeutic canines or non-pet canines in lowering humans' blood pressure and heart rate. This study also addressed humans' perceived stress while in the presence of a canine. Findings may be used to advocate for the use of canines in areas where exposure to stress is profuse. In Chapter 2, I review the literature related to the current study.

Chapter 2: Literature Review

In many homes and in various cultures, pets, particularly dogs, are part of the family. Having a family dog has been shown to have positive and beneficial health effects (Payne et al., 2015; Rijken & Beek, 2011). A dog has been regarded as a human's best friend, but according to findings a dog could also be the heart's best friend (DeNoon, 2013; Irvine & Cilia, 2016). Studies on pet ownership have indicated that people who own dogs tend to outlive cat owners (DeNoon, 2013; Saunders et al., 2015; Schreiner, 2016). Although studies have addressed pet ownership and stress reduction (McDonald et al., 2017), there was a gap concerning the influence of short-term non-pet canine use (e.g., as in pet therapy) on lowering humans' physiological markers of blood pressure and heart rate, which was the subject of the original quantitative research (Kirk & Bowin, unpublished), which was analyzed in the current study. In Chapter 2, I examine the theoretical and empirical factors related to stress, including maladaptive aspects. Informal daily complications from stress have been associated with various physical and emotional functioning causing burden and decreased quality of life (Ginty et al., 2017). Various types of formal support services are available to individuals suffering from stress; however, these support services are not always available for many of the life daily stressors that a person may experience.

The American Heart Association suggested that owning a dog increases the likelihood that a person will be more physically active (DeNoon, 2013; Mubanga et al., 2017; Saunders et al., 2017; Schreiner, 2016). Those who walked their dogs were less likely to suffer from obesity, had lower bad cholesterol, had lower negative physical effects

of stress, and were more likely to be survivors of a heart attack than individuals without dogs (DeNoon, 2013; Mubanga et al., 2017; Ogechi et al., 2016; Saunders et al., 2017). Positive benefits of owning a dog may be related to getting more exercise (Hicks & Weisman, 2017). Evidence showed that high blood pressure due to high-stress jobs can also be lowered by adopting a dog (DeNoon, 2013). Physical activity from dog ownership is not the sole reason for health improvements (Pruchno et al., 2018; Schreiner, 2016). Studies indicated that the emotional connection with a dog improves health and extends lives (Allen et al., 2002; Beetz et al., 2012; DeNoon, 2013; Ogechi et al., 2016; Payne et al., 2015).

Wilson (1987) examined the blood pressure and heart rate of college students while reading silently and aloud, and while petting a dog. Results indicated that close contact with a dog under baseline conditions decreased the students' autonomic arousal (Wilson, 1987). Recent research supported the finding that contact with therapy dogs on a college campus or in other stressful environments decreases the stress response (VonBergen, 2015; Ward-Griffin et al., 2017). Allen, Blascovich, Tomaka, and Kelsey (1991) hypothesized that friends and pet dogs would have the same calming effects on women undergoing tasks of mental arithmetic. Allen et al. discovered that friends greatly increased blood pressure readings compared to pet dogs. Friends were viewed as more judgmental resulting in compounded effects of stress (Allen et al., 1991). Interpretation of findings indicated the presence of pet dogs provides nonthreatening, nonevaluative, social support during stressful tasks and events (Allen et al., 1991).

Pet-owning patients with high blood pressure have been reported to keep their blood pressure lower during times of mental stress than patients without pets (Allen, 2003; Mubanga et al., 2017; Schreiner, 2016). Pet owners may also have increased odds of surviving for at least a year after having a heart attack (DeNoon, 2013; Mubanga et al., 2017; Ogechi et al., 2016). Research also indicated that using canines for companionship has some benefits for managing behavioral and psychological symptoms of dementia in people with dementia of various stages (Kim et al., 2018; Perkins et al., 2008; Pruchno et al., 2018). Studies have shown that reduced stress can directly benefit physical health, and use of pets, including canines, can have positive effects (Hosey & Melfi, 2014). Research on human-dog interactions have been valuable in making an impact on children hospitalized on a pediatric oncology unit, and have indicated increased independence, increased appetite, and decreased fear of treatments and procedures when a dog was present (Goddard & Gilmer, 2015).

Human-animal interaction and stress reduction can be further demonstrated by use of a canine in the courtroom during victim testimony. Victims reported feelings of high stress and high emotional arousal, and sometimes were unconfident in what they reported due to their stress level (Argyl, 2009; Brown, n.d.; Pruchno et al., 2018). Victims reported that memory of a crime is an ongoing process to the victim, and confidence of testimony implies better memory recall of events (Hart-Cohen, 2009). Heereman and Walla (2011) found that decision confidence is manipulated by means of stress as induced by excessive cognitive demands indicated that decisions (based on high and low, but not intermediate levels of uncertainty) made under stress (confirmed by skin

conductance measures are associated with increased confidence when outcome probabilities are incompletely increased confidence when outcome probabilities are incompletely known and a different pattern emerged when outcome probabilities were completely known. Stress led to decreased decision confidence, and evidence indicated ambiguity assessment being impaired under stress conditions (see Kim et al., 2015; Kuhlmann, et al., 2005). Although studies have addressed pet ownership and stress reduction, there was a gap concerning the influence of short-term non-pet canine use (e.g., as in pet therapy) on lowering the physiological markers of blood pressure and heart rate, which was the subject of the current study. Several researchers acknowledged the use of therapy dogs to relieve stress and confirmed that individuals feel better when a dog is present (Allen et al., 2001; Saunders et al., 2017). However, little was known about the physical effects on humans from strange dogs (such as pet therapy animals). Focusing on the use of non-pet or therapy dogs may facilitate future use of canines in stressful life situations through improved understanding of people's physical responses.

There were several theoretical models available to explore the significance of the beneficial relationship of animals to humans' well-being, including the human-animal bond theory (Walsh, 2009), which focuses on the benefits of companion animals. Complete health comprises psychological, physical, social, spiritual, and environmental dimensions, and the human-animal bond theory focuses on the benefits of pet ownership and pet companionship as a potential to optimal health achievement (Oyama & Serpell, 2013). The affiliation in human-animal interaction (Beetz & Bales, 2016) is a complimentary theory that focuses on the positive effects of interactions with animals.

These positive effects include reduction of stress reactions, reduction of depressive mood, reduced anxieties, reduced aggressive drives, and effective pain management (Beetz & Bales, 2016). Interactions with animals, as seen in therapeutic settings, result in enhanced personal performance, promotion of trust, achieved calmness, enhanced motivation, and concentration (see Beetz et al, 2012; Brooks, et al., 2016; & Crawford, et al., 2006).

The attachment theory (Ainsworth & Bowlby, 1991; Bowlby, 1959) is a theoretical model that focuses on pets used as sources of social support and attachment. Companion animals are increasingly recognized as beneficial to optimal human functioning and are becoming more widely accepted as authentic members of the family. Relationships with pets and companion animals are emotionally as close, and in some instances closer, than human relationships (Irvine & Cilia, 2017). These theories address how a bond with a pet can strengthen human resilience through times of crisis, persistent adversity, disruptive transitions, and traumatic events. The present study extended previous research through examination of the physiological effects of being with a strange dog (i.e., as with pet therapy animals).

A discussion of the importance of stress reduction was indicated by the literature review as an important aspect of well-being and optimal human health and functioning. Because of this, I provide a brief overview of stress and the ill effects of the stress response on the physiological systems. Close attention is given to the cardiovascular system, the immune system, the memory system, and the effects of chronic and acute stress. In conjunction with the ill effects of stress, the beneficial effects of animals on the stress response are examined in the literature review. The review inspired the current

study because research findings indicated that relationships with animals are highly beneficial in lowering the ill effects of stress.

Studies have been done on the human-animal bond and human-animal interaction. The research indicated that animals are important for the health and well-being of humans at any age (see Bustad, 1980; Cherniak & Cherniak, 2014; Crossman & Kazdin, 2015; Goddard & Gilmer, 2015). Based on the literature review, I examined the attachment formed with strange canines. This attachment originates from the acceptance, support, and companionship pets offer and parallels the attachment developed with human caregivers in early life. The existing literature on the human stress response is addressed in this chapter and provides the foundation for the effects pets have on this response. The literature review includes the historical background of pet therapy and provides valuable information on the relationship between humans and animals. This chapter also contains the research strategies used to locate articles of importance pertaining to this study.

Literature Review Strategy

The search terms and the combination of search terms used in this research were *stress, service-animals, pets, therapy-animals, human-animal bond, chronic stress, memory, heart rate, blood pressure, companion animals, cortisol, and therapies*. The literature search included a comprehensive and systematic search of the literature on use of canines to lower stress and chronic stress related illness from 1959 to 2018. The literature searches also involved several literary data sources that included PsychArticles, PsyINFO, EBSO, Springer, Medline, dissertation abstracts, ERIC, Google Scholar, and

Academic Search Complete, were among the various online data bases from Walden University and Northeastern State.

Theoretical Framework

The theoretical framework for this study was the Human-Animal Bond Theory (Walsh, 2009), which emphasizes the benefits of companion animals. Also of interest was the Affiliation in Human-Animal Interaction theory (Beetz, & Bales, 2016). This theoretical evidence supports that animals are used as therapeutic tools for a variety of health related conditions. An underlying condition which both of these theories share is attachment. The attachment perspective explains that people react differently to the instrumental people in their lives and research has shown that developed attachment style is seen in the aspects of pet ownership (Walsh, 2009).

Human-Animal Bond Theory

The Human-Animal Bond Theory focuses on the benefits of companion animals on physical and psychological well-being (Walsh, 2009). As the historical journey of this bond unfolds, the path throughout human's ancestral past and in varying cultural contexts people have united with animals to aid in survival, health, and healing rituals (Walsh, 2009). This interconnection of animal spirits and the natural world have been traditions honored by many (Serpell, 2006). Animals as guides and companions are prevalent in shamanic practices. In Native American cultures and in Asian cultures, ancient symbolic drawings depict the importance of the relationships between animals and humans (Serpell, 2006). Buddha was said to have assembled 12 animals under a Bodhi tree. Here he taught them about their strengths and weaknesses enabling them to go out in the world

to become guides for humans in their personal and relational growth (Walsh, 2009). The Chinese also believe that each human is born with characteristics and forces of the animal associated with the month and year of birth (Walsh, 2009). Beneficial relationships between human and animal were influenced by behaviors seen as crucial to the health and well-being. The present Human-Animal Bond theory focuses on the mutually beneficial relationship experienced between animals and humans based on this past evolution (Walsh, 2009). This includes, but is not limited to, emotional, psychological, and physical interactions of people, animals, and the environment.

The biological process of domestication developed from the selection of desired traits of animals and thus controlled by the breeding process (Beck, 2014). Archaeological evidence reveals that domesticated wolves lived with humans as far back as 14,000 years ago and the characteristics of intelligence, keen senses, and loyalty were refined (Serpell, 2008). The early ancestral dogs were valued guides, guardians and protectors, and partners in hunting and fishing (Walsh, 2014). Dogs became invaluable to the farming and livestock communities as working class companions. Dogs progressed from mere work animals to companions, valued for emotional support by allowing humans feel safe (see Payne et al., 2015; Walsh, 2009).

In early Egypt, dogs were so beloved that they were seen as guardians in the afterlife and would oftentimes accompany their owners in death. Research shows, in early Egypt the loss is great, to the extent that when a pet dog died the owners shaved off their eyebrows, smeared mud in their hair, and mourned aloud for days. Even commoners scraped together enough money to embalm and mummify their dogs and buried them in

one of Egypt's many animal necropolises (Walsh, 2009, p. 463). Early Greek and Roman societies shifted dogs' purposes. Dogs were commonly kept as hunters, herders, and guardians, but also as loyal beloved companions. The proper treatment of animals was highly regarded by both Judaism and Islam traditions. The Christian faith practiced an annual rite of the "Blessing of the Animals" on church steps which is still practiced today in the Catholic faith (Dresser, 2000). With the onset of the Middle Ages purebred dogs, and cats, became the valued possessions of rulers and nobility. Pets were infused with human like characteristics and provided entertainment and stress relief for family members. The companionship of pets was found to relieve the feelings of despair from the loss of a family member, far too common during the Middle Ages (Walsh, 2009).

The beneficial roles of pets as friends or family members have evolved throughout history within several cultural contexts (Hosey & Melfi, 2014). Approximately sixty-two percent of American individuals live with a pet (Saunders et al, 2017). The term "pet" refers to the status of an animal and simply put means that that animal will be favored (Irvine & Cilia, 2016). After being identified as a pet, the animals receive names, are given special treatment, and individual personalities and attributes are likely to be claimed for them (Irvine & Cilia, 2016). Earlier research by Wells and Perrine (2001) found 95% of pet owners' value their pets as friends, and/or 87% value their pets as members of the family. Findings also indicated that dogs are the most common pets, with cats, horses, and birds closely following (Wells & Perrine, 2001). American dogs and cats are pampered pets. Eighty-seven percent of pet owners in America give their pets a holiday present; 65% sing or dance for their pets; 52% prepare

a special food for their pets and 53% of pet owners will take off from work to care for a sick pet. Studies show 44% of the American workforce takes their pets to work claiming it boosts morale and productivity (Wells & Perrine, 2001). The human-animal bond is defined as:

A mutually beneficial and dynamic relationship between people and animals that is influenced by behaviors that are essential to the health and well-being of both. This includes, but is not limited to, emotional, psychological, and physical interactions of people, animals, and the environment (American Veterinary Medical Association, 2017)

Research reports pets can provide healing in a range of relational benefits from stress reduction, loyalty, reducing feelings of loneliness for those living alone, companionship, comfort, security, and unconditional love (see Hosey & Melfi, 2014; Saunders et al., 2015; Sharkin & Knox, 2003; Siegel, 1993; Wrobel & Dye, 2003; Walsh, 2009). As reported by Walsh, “One of the strongest areas of research evidence correlates pet ownership with positive physiological measures, such as lower blood pressure, serum triglycerides, and cholesterol levels” (2009, p.5). Pets were found to counteract the negative cardiovascular effects of stress better than a spouse or friend (Walsh, 2009). The American Veterinarian Medical Association (AVMA) officially recognizes:

(1) the existence of the human-animal bond and its importance to client and community health, (2) that the human-animal bond has existed for thousands of years, and (3) that the human-animal bond has major significance for

veterinary medicine, because, as veterinary medicine serves society, it fulfills both human and animal needs (AVMA, 2018.)

Affiliation in human-animal interaction. There is a great deal of information relating to pets and how they facilitate well-being, help reduce stress, and enrich quality of life. In fact, animals have come so far as to aid patients in formal therapeutic settings such as hospitals, clinics and physical therapy and/or rehab units, and in the courtroom (see Cole & Gawlinski, 2000; Hart-Cohen, 2009; Walsh, 2009). In Western societies, many pet owners regard their furry companions as family members with whom they have developed a strong emotional attachment (see Beetz & Bales, 2016; Irvine & Cilia, 2016). Throughout humans' evolutionary journey, animals have been in close contact. For the benefit of our survival, paying attention to the animals in their environment was a necessary way of life (Beetz & Bales, 2016). Animal behavior may have been our first alert system to environmental dangers while a relaxed, resting animal communicated relaxation and aided in stress reduction (Beetz & Bales, 2016). The calming and secure effect on human psychological and physiological functioning has been coined the *biophilia effect* (Julius, Beetz, Kotrschal, Turner, & Uvnäs-Moberg, 2013).

There have been many positive effects of human-animal interaction (HAI). With a friendly dog as a companion, humans receive more attention from others. This attention is generally positive in nature (Julius et al., 2013). The presence of an animal also increases verbal communication between people. Animals also promote perceived trustworthiness toward the accompanied person (Julius et al., 2013). Interacting with a

dog decreases depression, reduces anxiety, facilitates a positive mood, and promotes calmness (Julius et al., 2013).

Animals and the human stress response. A great deal of research has been devoted to the effects of Human-Animal Interaction on human stress response (Barker et al., 2013; Julius et al., 2013; Ward-Griffin et al., 2016). Several studies have concluded interaction with a dog decreases cortisol levels as well as epinephrine and norepinephrine (Julius et al., 2013; Schreiner, 2016). Everly and Lating (2013) report stress puts a significant demand on the cardiovascular and the cardiorespiratory systems. Research has shown that during the stress response, most importantly the emotional stress response, the hormone epinephrine is released causing risk to the heart muscles, potentially inducing arrhythmia (Everly & Lating, 2013; Remue et al., 2015). There has been an increasing amount of research on the relationship between cortisol levels and psychological stress (Morey et al., 2015). Recent studies have generated the effect cortisol has on the inhibition of cell-mediated immunity (Marks et al., 2011, p. 276). Evans et al. (2011), reports that asthma and other allergic conditions are associated with high levels of circulating cortisol. Further research indicated that children who suffer from asthma attacks do so under acute and chronic stress conditions (Murray, et al., 2011, p. 276).

Studies of the Human-Animal Interaction reports findings indicative to the positive effects of the emotional bond between humans and animals (Virués-Ortega, Gualberto, 2006). Spanning several ages and incorporating both physical and mental functioning including mood, stress-related effects of cortisol, heart rate, and blood pressure, and in self-reported fear and anxiety, findings indicate that the interaction

with animals reduce the ill effects (Beetz et al., 2013). There are also other biological mechanisms involved in the human-animal interaction. Betz and Bales (2016) investigated the effects that oxytocin (OT) release contributes to the explanation of many of the effects of Human Animal Interaction documented in various studies. A neuropeptide released in the hypothalamus, OT is involved in social behaviors such as recognition, pair-bonding, and partner preference (Bales & Carter, 2003). Children and adults alike have shown to have positive cardiovascular benefits and lowered blood pressure when interacting with a dog in place of reading or person contact (see Julius et al., 2013; Ward-Griffin et al., 2017). Higher oxytocin levels have been associated with lowered blood pressure when preparing for a difficult task, or while recovering from a difficult task (Light, Grewen, Amico, 2004). Ownership of a pet has been associated with positive general health benefits (see Julius et al., 2013; Ogechi et al., 2016; Mubanga et al., 2017; Pruchno et al., 2018; Schreiner, 2016).

Attachment Theory

The attachment perspective explains that people react differently to the instrumental people in their lives. Adulthood relationships are based on earlier relationships with caregivers (Ainsworth & Bowlby, 1991; Bowlby, 1959). Attachment style forms in infancy around what is referred to as *an internal working model*. This model is based on perceptions of people (Ainsworth & Bowlby; 1991 Bowlby, 1959). If these models were formed with anxiety because important people were not available in times of need, then relationships will be formed to try to remain as close as possible. If these models were formed with mistrust and avoidance anxiety, formed relationships will

become distrusting and distance and become as self-reliant as possible (Ainsworth & Bowlby, 1991; Bowlby, 1959). These attachment styles were classified as nonsecure and were later found to be developed on a continuum of styles configured by the individual's arrangement based on anxiety and avoidance associated with caregivers (Blazina, Boyraz, & Shen-Miller, 2013). The best possible style, one which Bowlby described as a secure attachment, is characterized by responses that are in sync between caregiver and child, allowing for the development of self-worth and trust (Ainsworth & Bowlby, 1991; Blazina et al., 2013).

Using psychological assessment scales based on human attachment theory, the concept of attachment to pets is the most widely used explanation of this relationship between humans and pets (Beck, 2014). Bowlby's (1969/1982, 1980) attachment theory has also been used to describe and explain the importance pets are in people's lives. The relationships between humans and animals are fascinating and complex and pets can fulfill the role of an attachment figure, or in the least meet many of the attachment figure criteria (Beck, 2014). Humans can form close social companionship, good working partnerships, and abusive or neglectful relationships (Blazina et al., 2013, p.206; Bowlby, 1959). Individuals may form various bonds with others throughout the lifespan with both people and pets (Meehan, Massavelli, & Pachana, 2017). Researchers Zilcha-Mano, Mikulincer, and Shaver (2011) studied pet owners in Israel with a scale they called the "Pet Attachment Questionnaire" to discover if the same attachment formation carries over to pet ownership. The relationships between two attachment dimensions and the Five Factor personality traits were assessed. Findings suggested people high in

attachment anxiety also displayed higher traits of neuroticism and reported less attachment to their pets, while those high in extroversion were more likely to have secure attachments to their pets (Zilcha-Mano et al., 2011). Interesting findings suggest people who were insecurely attached to their pets, regardless of their attachment to humans, had poorer mental health (Meehan et al., 2017).

Pet attachment seems to play an important role in overall mental health (Cromer & Barlow, 2013; Meehan et al., 2017; Zilcha-Mano et al., 2011). Studies have found that humans do indeed develop attachment bonds with their animals (Blazina et al., 2013; Meehan et al., 2017). Meeting attachment status, Kurdek (2008) surmises that pets must satisfy criteria defined by Ainsworth (1991) in her work with human attachment. These criteria include; (1) the attachment figure is a sense of comfort; (2) the attachment figure is approached in the case of emotional stress in proximity and as a safe haven; (3) positive emotions are associated with physical proximity to the attachment figure; and (4) separation from the attachment figure results in an association of negative emotions (see Julius et al., 2013). Dogs do function as attachment figures for their owners (Kurdek, 2008). Evidence from studies of human-animal interactions, report that dogs are also capable of forming attachment bonds with their owners (Jalongo, 2015, p.401). The present study provided evidence to support Attachment Theory in that the dog satisfies many of the criteria established by Ainsworth (1991). Findings supported a dog provided a sense of comfort alleviating the negative effects of stress.

Pet ownership and attachment to pets has been shown to minimize emotional trauma and fears, alleviate loneliness, lessen anxiety during times of stress, provide

unconditional acceptance and love, and promote positive mental and physical health (see Beck & Katcher, 1983; Bryant, 1990; Levinson, 1982; Meehan et al., 2017). In the current study, this theory was evident as indicated by the presence of a dog in lowered blood pressure and heart rate, which was induced by the cold pressor stress test. It was presumed that lowered blood pressure and heart rate readings after acute stress, manifests due to the attachment for the dog; thus, dogs will have increased humans' coping abilities.

Literature Review Related to Key Variables and/or Concepts

The Stress Response

A very common definition of stress involves describing a condition where one perceives the undeniable feelings of inadequate personal and social resources to deal with the demands of circumstantial life events or catastrophes (Ginty, Kraynak, Fisher, & Gianaros, 2017). The stress response, in intent, is to allow the organism to adapt and rise to the demands of the environment. Johnson, Kamiliaris, Chrousos, and Gold, describe the stress system, as “consisting of the corticotrophin-releasing hormone (CRH) and locus coeruleus (LC)-norepinephrine (NE)/autonomic systems, as well as their peripheral effectors, the pituitary-adrenal axis and the autonomic system, which function to coordinate the stress response” (1992, p. 1). As indicated in research, stress results in the activation of the hypothalamic-pituitary-adrenal (HPA) axis resulting in elevated cortisol levels (see Kuhlmann, Piel, & Wolf, 2005; O'Brien, Mathieson, Leafman, & Rice-Spearman, 2013; Usrkin & Eriksen, 2002).

The stress response does not always function in the best interest of the individual. Researchers have found a common pathological state associated with stress involves increases in blood pressure (Kuhlmann et al., 2005; O'Brien et al., 2013; Usrkin & Eriksen, 2002).

Stress results in a number of normal bodily reactions to retain self-preservation (O'Brien et al., 2013). Usrkin and Eriksen (2002) found normal stress responses lead to increased arousal in several parts of the body. Researchers have found this arousal effects cognitive functioning as well as emotional responses resulting in various overt behaviors that influence health and disease (Argyle, 2009). Current research on perceived stress and cognitive functioning in older adults found that higher levels of perceived stress were related to lower cognitive function as well as accelerated cognitive decline (Aggarwal et al., 2014). In research conducted by Sliwinski, Smyth, Hofer, and Stawski (2006), it was determined young and old adults are both negatively affected by stress with older adults showing stress affects magnified.

Sliwinski et al. (2005) also reported that stress, regardless of age, affected performance by impairing reaction time and suggested that stress affects an individual's ability to control attention. Kuhlmann et al., (2005) have reported the impairing effects of stress on memory retrieval in noteworthy research. Modulation of memory in animals and humans are in response to glucocorticoids (GCs). Findings indicated memory retrieval, or free recall, was impaired after an induced stress condition (Kuhlmann et al., 2005). Elevated cortisol levels, as seen in response to psychosocial stress, combined with an activation of the autonomic nervous system, has the potential to block or impair the

ability for a person to retrieve relevant information from memory (see Kuhlmann et al., 2005; Marsland, Walsh, Lockwood, John-Henderson, 2017). This could be devastating for scenarios such as testimony, exams, matters of business, or in everyday life functioning such as medicine schedules. Research conducted by Barker, Kinsely, McCain, Schubert, and Pandurangi (2010) indicated owning a pet is correlated with a reduction in effects of this type of stress.

Although not simple in its workings, the human immune system must be considered in the stress response. Research on the effects stress and the immune system is divided into short term acute stress and longer term chronic stress (Marks et al., 2011; Morey et al., 2015). Taking exams, not getting enough sleep, exposure to fears, and attempting to solve difficult problems have been research techniques for studying acute stress. Bereavement, marital problems, suffering from illness, and unemployment has been means for studying chronic stress (Marks, et al., 2011; Morey et al., 2015). Chronic stress has been shown to reduce the functioning of the immune system, with changes in the reduction of natural killer (NK) cells, total number of T cells, and the ratio of T helper to T suppressor cells (Marks, et al., 2011; Morey et al., 2015). Stress management techniques have become the subject of much research. Pet ownership, as a stress management technique, has been shown to reduce stress (Barker et al., 2010). Reducing stress results in less compromised immune system functioning. This present study examined blood pressure and heart rate readings when acute stress was simulated by use of the cold pressor technique. The stress management technique used was that of a non-pet dog, while monitoring the recovering impact on blood pressure and heart rate.

The role of stress in the inflammation response has been documented in various studies. Chronic stress can lead to chronic inflammation (Morey et al., 2015; Pickering, 2007). Based on findings, that over a period of time when cortisol and catecholamine levels are elevated the pattern of cytokine released from the immune system is altered (see Morey et al., 2015; Polheber & Matchock, 2013; Pickering, 2007). The constant elevated levels of stress hormones shift the production of pro-inflammatory cytokines and lower the release of anti-inflammatory cytokines resulting in chronic inflammation. Chronic inflammations cause the body's resources to be high alert in a continuous state. A chronic high alert body state can cause irreversible heart damage, brain damage, and damage to other organs. When inflammatory cells are in excess in the blood vessels, a dangerous accumulation of plaque can occur. As plaque builds the arteries can thicken. This condition increases the likelihood of a heart attack or stroke much more likely (Pickering, 2007).

A number of studies have tested whether greater cardiovascular responses to acute mental stress predict future cardiovascular disease, with varying results (see K. Allen, 2003; K. Allen et al., 2001; K. Allen et al., 1991; DeNoon, 2012; Kim et al., 2018). In a review by Chida and Steptoe (2010) the association between cardiovascular responses to laboratory mental stress and subsequent cardiovascular risk status was evaluated. Because of the lack of current meta-analytic techniques to quantify the extent to which cardiovascular response predicts cardiovascular status, Chida and Steptoe (2010) carried out a review of material which included combined psychological challenges with physical stressors, such as the cold pressor, hand-grip, and treadmill exercises. Findings

determined that greater responsiveness to acute mental stress does indeed have an adverse effect on future cardiovascular risk status (Chida & Steptoe, 2010).

To assess the effects of physiological stress on blood pressure and heart rate the present study implemented the cold pressure test. The cold pressor test is the immersion of one hand in ice water for one to two minutes (Silverthorn & Michael, 2013). Changes from baseline to recovery was monitored. Sudden cold stress causes activation of the sympathetic system releasing norepinephrine (Chida & Steptoe, 2010; Silverthorn & Michael, 2013). These changes result in arteriole constriction, increased heart rate and increased contractions of the heart. These combined forces increase blood pressure also known as the pressor response (Chida & Steptoe, 2010; Silverthorn & Michael, 2013). These studies indicated the ill effects of stress on the human body. Prior research suggests it is imperative to find means to lower the physiological responses to stress in daily life. A technique to lower the ill effects of stress, growing in popularity, is the use of animals for stress relief. This study compared the physiological markers of blood pressure and heart rate as stress responses. Acute stress was induced by a cold pressure test. Also studied was the blood pressure and heart rate responses when a non-pet dog was used as an anti-stress technique.

Historical Background of Pet Therapy

The history of animal and therapeutic human relationships dates to 1792 in England at the York Retreat (Bustad, 1980). The York Retreat was a humane home for the insane where rabbits and chickens were used therapeutically with patient care (Bustad, 1980). Another historical establishment was Bethel in 1867. Bethel was a home

in Germany for epileptic care (Bustad, 1980). Patients could interact with several animals including cats, dogs, horses, and birds (Bustad, 1980).

In the United States, starting in the 1940s, therapeutic agencies encouraged recovering veterans to work with the animals at Pawling Air Force Convalescent Hospital, at the hospital's farm, in Pawling, New York (Arkow, 1982). Arkow reports that in 1942, the center had plans for a therapeutic program involving dogs and recovering veterans and became place to the first documented use of Animal Assisted Therapy in the United States. By chance Levinson (1972) stumbled on the therapeutic value of using a dog in therapy. While his own dog, Jingles was with him during a session with a nonverbal child disturbed child, he noticed interaction between the child and the dog. Recognizing the possible benefit of using a dog as a communication tool, he planned well-designed research projects and recommended training for animals to be used in therapy (Levison, 1972). Levison coined the terms "pet-therapy" or "human/companion animal therapy" and also "pet-oriented child psychotherapy" (Beck & Katcher, 1996). His conclusions were based on case studies and observations of the interactions between pets and people in therapeutic settings (Beck & Katcher, 1996). Levison concluded that an animal could be a communicator between the patient and the therapist (1984).

As animal-facilitated therapy gained popularity and growth during the 1960s, a pivotal date came in 1970 when the American Humane Education Society employed survey revealing 48% of responding institutions reported using animals in therapy in some capacity (Arkow, 1982). As the interest in the therapeutic benefits of animals has

become popular and the research increasing productive, pet therapy has gained respect in group, individual and family therapy settings. The Delta Society reported about 2000 animal assisted psychotherapy and physical therapy programs, with the use of a dog as the most common support animal (Beck & Katcher, 1996).

As the interest and use of animals in therapy become more popular, so do the assessments of animal-assisted therapy programs. Studies to evaluate the use of pets in nursing homes, to the studied effects of service-dog ownership for people with ambulatory disabilities have been reported in existing literature (Allen & Blasovich, 1996). Findings suggested use of pets in nursing homes resulted in less depression, anger and confusion. Positive psychological well-being and social interaction were reported with the use of a dog for ambulatory participants. Emotional health studies have concluded that the presence of a dog during the interaction of strangers, facilitated interactions (Sanders & Robins, 1996). General health studies on well-being concluded that pet ownership resulted in increased levels of reported positive well-being (Serpell, 2000). Other studies concluded that dogs, ownership or contact with, results in lowered blood pressure and better cardio health (see Baker et al., 2016; Chida & Steptoe, 2010; DeNoon, 2012; Mubanga et al., 2017; Schreiner, 2016).

Throughout the human evolutionary span, human beings have entered into a special relationship with animals, especially dogs. Domestication of the dog evolved from mere ownership benefits to a special bond resulting in emotional, psychological, and physiological well-being by touching or talking to a dog (Belk, 1996).

Stress Reduction and Health Benefits of Dogs as Pets

Researchers have tried to develop a better understanding as to whether pets can help humans live healthier lives and if so why (see Cromer, & Barlow, 2013; Goddard & Gilmer, 2015; Mills & Hall, 2014; Ogechi et al., 2016; Mubanga et al., 2017; Saunders et al., 2017). In an attempt to understand the benefits of a therapy or service dog, research has studied the short-term effects which can be measured almost immediately, unlike long term effects that may take days or months or have accumulating consequences.

The majority of studies are conducted using pet dogs or service dogs (Chandler, 2001; Goddard & Gimer, 2015; Ward-Griffin et al., 2017). This is done for the convenience of having the dog available and therapy, service and pet dogs are also generally easier to manage (Chandler, 2001). Animal Assisted Therapy (AAT) is based on the premise that using an animal for promotion of a positive human-animal interaction, to aid in recovery (Chandler, 2001). The therapist is trained in the techniques necessary to aid in the animal's contributions to the recovery approach. There are several reasons to involve dogs in therapy, many factoring in on the short term effects: (1) a person may be more willing to go to therapy because of the interaction possibility with a dog; (2) gain more benefits from a therapy session; (3) nurturing and healing through physical contact with dog; (4) soothing comfort from petting or holding a dog; (5) Experience unconditional acceptance; (6) enjoyment and entertainment from interaction with a dog; (7) form more trusting relationship with therapist; (7) perform activities or achieve goals that may not be physically possible without a therapy or service dog

(Chandler, 2001). With each of these reasons, the short term effect of reduced stress is a major contributing factor.

While petting a dog, blood pressure decreases. This decrease in blood pressure is lower than carrying on a conversation with another person or reading out loud (Nagengast, Baun, Megel, & Leibowitz, 1997; Ward-Griffin et al., 2017; Walsh, 2009). Lowered blood pressures, reported lower stress, and anxieties occurred in children when researchers were accompanied by a dog (Goddard & Gilmer, 2015). In other studies, petting a companion dog decreased blood pressure in healthy people and people suffering from hypertension alike (Ward-Griffin et al., 2017).

Rethinking the role of dogs into therapeutic and service duties has enabled them to buffer humans from many of the detrimental effects of stress (Beetz et al. 2012; Schreiner, 2016). Dogs have been shown to reduce cardiovascular risk factors and to improve the lives of people suffering from cardiovascular disease (Levine et al., 2013; Mubanga et al., 2017; Schreiner, 2016). Studies have suggested that people who have strong social support systems live longer (Meehan et al., 2017; Pruchno et al., 2018; Rodriguez-Laso et al., 2007). Social support systems can also be equivalent to non-human companion, their dogs (Meehan et al., 2017; Pruchno et al., 2018). The literature also suggests that having a pet dog can greatly diminish the sense of loneliness (Irvine & Cilia, 2016; Pruchno et al., 2018; Ward-Griffin et al., 2017; Zasloff & Kidd, 1994).

Research by Allen, Blascovich, and Mendes (2002), found more significance in having a pet present compared to a sibling or close friend, in reducing the cardiovascular effects of stress. Studies indicate that companion animals decrease cholesterol, lower

blood pressure and relieve the overactive response of the immune system (Mubanga et al., 2017; Robinson, MacDonald, & Broadbent, 2015; Schreiner, 2016; Ogechi et al., 2016; Walsh, 2009).

Although stress is an inevitable part of life, research suggests pet ownership may reduce the physiological effects of stress resulting in lowered threat of cardiovascular disease and better memory recall (see Allen et al., 1991; Allen et al., 2000; Baker et al., 2016; Chida & Steptoe, 2010; DeNoon, 2012; Kim et al., 2018). For people who enjoy the company of animals and for people who may have limited social contacts, research has shown that pets can improve your health (Allen, 2003).

Studies have confirmed people like to spend time with dogs (Julius et al., 2013). In some settings, dogs are part of an individual's work life. Research shows people can communicate with them even to the extent of sharing secrets (Payne et al., 2015; Pruchno et al., 2018; Julius et al., 2013). Dogs exercise with people and they relax with people. Dogs are a part of travel, for security and for comfort. Research indicates they are also good for an individual's health (Julius et al., 2013).

Stress Reduction and Health Benefits of Using Non-Pet Dogs and Animals

There is evidence suggesting that interaction with an animal, not necessarily one's own pet, leads to relaxation and anti-arousing effects. Research has found that a mere 12 minute visit with a dog had positive benefits to heart and lung function by lowering the release of hurtful hormones therefore decreasing anxiety (Cole, Gawlinski, Steers, & Kotlerman, 2007). Early research found that blood pressure was lowered by watching fish swimming in an aquarium more so than by looking at a plant-filled container or merely

staring at a blank wall (Katcher, Friedmann, Beck, & Lynch, 1983). Studies done by concluded that blood pressure in children decreased when they read out loud in the presence of a dog. To combat the allergic or phobic response some may have to animals, more recent research used video tapes of swimming fish, and of birds, and monkeys while reading out loud with results indicating that this venue also lowered physiological stress markers (DeShiver & Riddick, 1990; Wells, 2004). Evidence supports that being with an animal physically or even watching animal videos can be beneficial to our health (Crossman, Kazdin, & Knudson, 2015; Saunders, Parast, Babey, & Miles, 2017).

Animals can also improve feelings of loneliness and isolation. Prisons are beginning to use dogs as therapeutic tools to improve psychological well-being and combat feeling of loneliness and disconnect. One example of a therapeutic prison dog program is Project Pooch in Portland, OR. Prisoners are selected to look after a dog, maintaining everything it needs for its care, and many instances are required to train the dog for a specific reason. Training is most generally done for the purpose of companion assistance animal for the elderly or physically disabled. Studies support the presence of a dog in prisons aids in breaking the cycle of isolation by supporting communication and social interactions among the prisoners (Strimple, 2003).

Studies have shown that dogs can reduce the anxiety associated with major depression. Research by Hoffman et al. (2009) studied patients hospitalized for major depression. Patients were given two 30 minute sessions, one with a dog and interviewer and one with an interviewer alone. Interaction with the dog was discriminatorily controlled by the patient with regards to hugging, petting, and touching. The 30-minute

session with the dog significantly reduced the anxieties reported by the patients compared to the sessions without a dog (Hoffman et al., 2009)

Although not considered a pet, studies have shown a reduction in depressive symptoms, when elderly people obtained a service dog (Pruchno et al., 2018; Robinson et al., 2015). In the present study, non-therapy dogs will be used to lower the physiological markers stress of blood pressure and heart rate readings, assessed by using the cold pressor test.

Summary

The purpose of the present study was to determine if using non-service, non-therapy, non-pet dogs had an impact on lowering the physiological markers of blood pressure and heart rate in acute stress situations. This chapter provided a review of literature including the historical background of pet therapy, the beginning of the use of animals for the therapeutic benefit of humans. Included in this chapter was the definition of stress and the biological mechanisms that account for many normal bodily reactions to stress (see Ginty et al., 2017; Johnson et al., 1992; Kuhlmann et al., 2005; O'Brien et al., 2013; Urskin & Eriksen, 2002). Based the underlying principles of The Human-Animal Bond Theory (Walsh, 2009) and The Human-Animal Interaction Theory (Beck & Katcher, 1996; Beetz & Bales, 2016) an understanding of benefits of dogs to humans' health and well-being, by aiding in stress reduction, gives predictive evidence the use of a non-service, non-therapy, non-pet dog can lessen the ill effects of stress. It is important to bridge the literature and the gap in research giving critical reasoning for the way the relationship with dogs has evolved and why dogs are instrumental as agents of stress

reduction. The gap in the literature indicated that while there is an attachment to animals, dogs in particular, research did not merge the quantitative measurements of the stress readings of blood pressure and heart rate, with the anecdotal and testimonial data of why dogs cause more positive physiological functions in reaction to acute stress. Overall, this research is significant and provided an original contribution to the literature by showing the importance of the supportive effects of animal companionship. Chapter 3 included a detailed description of the methodology used in the present study. The research design, sampling methods, data collections procedures, and data analysis was discussed.

Chapter 3: Research Methodology

Research on the benefits of using non-pet or therapy canines to lower some of the physiological symptoms of acute stress was minimal. What was common in research was the use of therapy dogs and pets as support for physical health outcomes such as weight loss or comfort (Allen, 2003; Barker et al., 2010; Hart-Cohen, 2009; Saunders et al., 2017). Environments seen as the traditional field for canine therapeutic use have been in health care, both mental and physical. An expansion is underway to include educational settings, courtrooms, and the workplace (T. Adams et al., 2017; Cohen-Hart, 2009). Canines, most commonly trained therapy or service dogs and personal pets have monopolized the research studies. Studies have indicated that human-animal interaction can be beneficial in lowering the negative physical effects of stress (Allen, 2003; DeNoon, 2013; Mubanga et al., 2017; Pruchno et al., 2018; Robinson et al., 2015; Schrenier, 2016; Ward-Griffin et al., 2017). Studies have given rise to important questions concerning the use of canines for improved physical health, improved emotional health, and greater satisfaction at work and play. In the current study, I examined whether a non-pet dog influenced the negative physiological markers of stress.

I examined the relationship between stress, stress reduction, and the use of a non-pet, non-service, non-therapy canine in lowering stress, both perceived and physiological, by analyzing secondary data retrieved from research done at (Kirk & Bowin, 2019). Chapter 3 includes a description of the sample group, study variables, instrumentation, and research design used in the study. I also describe the original data collection and current data analysis and address possible threats to validity.

Research Design

The main research question addressed in the original research (Kirk & Bowin, 2019) was whether the use of non-pet dogs, s stress reducers would have an impact on the physiological markers of blood pressure and heart rate following acute stress as measured by the cold pressor test (Silverthorn & Michael, 2013). In the original research, a survey design was used to obtain information from the experimental group participants pertaining to attitudes toward pets (Kirk & Bowin, 2019). Survey research is useful for collecting information about subjective experiences and internal attitudes dealing with information that is not always observable. The questionnaire was the Pet Attitude Scale-Modified, PAS-M (Templer, Salter, Dickey, Baldwin, & Veleber, 1981). The PAS-M consists of 18 items that represent three factorially obtained subscales of love and interaction, pets in the home, and joy of pet ownership (Lago et al., 1988). Kirk and Bowin, 2019) examined the relationship between participants' attitudes toward pets and reduction of the stress response. The PAS-M is one of the few published scales with reliability information available. The Cronbach's alpha was .93, and 2-week test-retest stability was .92 in an undergraduate sample ($N = 92$) used to develop the scale (Lago, et al., 1988).

The purpose of the current study was to analyze data from (Kirk & Bowin, 2019) to determine whether interaction with a non-pet canine had a lowering effect on participants' blood pressure and heart. I used a quantitative design to examine whether vascular responses of blood pressure and heart rate showed a statistically significant predictive relationship to induced stress using a cold pressor test and whether there was a

significant relationship between use of a strange dog in reduction of these responses. A qualitative approach would not have been appropriate for numerical archival data.

The Positive and Negative Affect Schedule-Short Form (PANAS-SF) was used pre and post simulation of stress. The PANAS-SF is composed of two 10-item mood scales, one that measures positive affectivity and the other that measures negative affectivity. Each measure involves 10 words pertaining to the last week that describe different feelings and emotions. Responses on a Likert scale of 1 (very slightly or not at all) to 5 (extremely) indicate how certain emotions are felt at the moment. The PANAS-SF is consistent in reliability and validity to the original form PANAS (Watson, Clark, & Tellegen, 1988). The PANAS reliability and validity was moderately good (Watson et al., 1988). For the Positive Affect Scale, the Cronbach's alpha was 0.86 to 0.90; for the Negative Affect Scale, the Cronbach's alpha was 0.84 to 0.87 (Watson et al., 1988).

Acute stress in the original study was simulated using the cold pressor test (Kirk & Bowin, 2019). The cold pressor test is widely used in quantitative research as an experimental technique for stress induction (Silverthorn & Michael, 2013). Participants in the study performed the cold pressor test by immersing one hand in ice water (typically 0-9°C) for a period of no longer than 1 to 2 minutes (Kirk & Bowin, 2019). Heart rate and blood pressure were measured using a LotFancy BP 103H Automatic Digital Blood Pressure Monitor, an FDA-approved device. Recovering heart rate and blood pressure results were monitored 1 minute following submersion while in contact with a non-pet dog in contrast with recovering results monitored without contact with a non-pet dog. All data were collected and analyzed in the present study. The purpose of the secondary data

analysis was to examine the therapeutic benefit of a non-pet, non-therapy, non-service dog to negate the effects of stress.

Research Questions and Hypotheses

RQ1- Quantitative: Can induced stress, measured by increases in blood pressure and heart rate, be affected by the presence of a non-pet canine, or strange dog?

H_{01} : induced stress, measured by increases in blood pressure and heart rate, is not significantly affected by the presence of a non-pet canine, or strange dog.

H_{A1} : induced stress, measured by increases in blood pressure and heart rate, is significantly affected by the presence of a non-pet canine or strange dog.

RQ2-Quantitative: Will decreased stress result in self-appraisal of a more positive emotional state as measured by the PANAS-SF?

H_{01} : decreased stress will have no difference in self-appraisal of a more positive emotional state.

H_{A1} : decreased stress will result in self-appraisal of a more positive emotional state.

RQ1:: Can induced stress, as measured by increases in blood pressure and heart rate, be affected by the presence of a non-pet canine?

H_{01} : Induced stress, as measured by increases in blood pressure and heart rate, is not significantly affected by the presence of a non-pet canine or strange dog.

H_{a1} : Induced stress, as measured by increases in blood pressure and heart rate, is significantly affected by the presence of a non-pet canine or strange dog

RQ2: Will decreased stress result in self-appraisal of a more positive emotional state as measured by the PANAS-SF?

H₀2: Decreased stress does not result in self-appraisal of a more positive emotional state as measured by the PANAS-SF.

H_a2: Decreased stress results in self-appraisal of a more positive emotional state as measured by the PANAS-SF.

Methodology

Participants

In the original study (Kirk & Bowin, 2019) participants were 50 individuals, male and female, from the campus of Northeastern State University and throughout the community of Tahlequah. Participants were recruited through campus flyers and communication with professors via in-class announcement for voluntary participation. Flyers were also distributed throughout the community via grocery stores and community bulletin boards. A chance to win a 50-dollar visa card was given to participants after completion of study.

Participants were asked to provide information using a demographic survey. Four questions addressed age, ethnicity, gender, and relationship status. Demographics factors were not a determinant to participation in the study. The principle investigator Johnny Kirk allowed access to the necessary data for analysis in the current study as cited in Appendix G .

Sampling Procedures

The original study included participants randomly assigned to one of two groups: control or experimental. The PAS-M survey and the pre-PANAS-SF survey were administered before the experimental procedure. The pre-PANAS-SF survey was completed to determine the perceived negative and positive emotions felt at the moment. The post-PANAS survey was used to evaluate any changes in emotional state after the experiment.

Experimental group. Those in the experimental group ($n = 25$) performed the cold pressor test by immersion of one hand in ice water (typically 0-9°C) for a period of 1 to 2 minutes. Heart rate and blood pressure were measured using a LotFancy BP 103H Automatic Digital Blood Pressure Monitor, an FDA-approved device. Measurements were made before and after 1 to 2 minutes of immersion of the hand in ice water. The initial 60 seconds of the test represented vascular reactivity to the cold stimulus. Recovering heart rate and blood pressure results were monitored immediately following submersion while holding or petting a non-pet dog. After completion of the cold pressor test and the monitoring of the physiological markers of heart rate and blood pressure, a posttest-PANAS survey was administered to determine any perceived emotional change.

Control group. Those in the control group ($n = 25$) performed the cold pressor test by immersion of one hand in ice water (typically 0-9°C) for a period of 1 to 2 minutes. Heart rate and blood pressure were measured using a LotFancy BP 103H Automatic Digital Blood Pressure Monitor, an FDA-approved device. Measurements were made before and after 1 to 2 minutes of submersion of the hand in ice water. The

initial 60 seconds of the test represented vascular reactivity to the cold stimulus.

Recovering heart rate and blood pressure results were monitored 1 minute following submersion without the aid of petting or holding a dog; however, a small hand towel was provided to cover the hand immediately following submersion. A posttest-PANAS survey was administered to determine any perceived emotional change.

Independent variables. The stress induction instrument used in the previous study (Kirk & Bowin, 2019) was the cold pressor test. The vascular responses of blood pressure and heart rate were gathered both pre and post, with and without the aid of a strange dog.

Dependent variables. The vascular responses of blood pressure and heart rate were gathered both pre and post, with and without the aid of a strange dog. The results of the PANAS-SF were gathered both pre and post.

Data Analysis

The data was analyzed using repeated measures ANOVAs. Two repeated measures ANOVAs will examine heart rate and blood pressure pre and post cold pressor test for the two groups (control: no dog and experimental: with a dog present). Scores from the survey was summarized using measures of central tendency and dispersion to provide baseline data on these measures. The data generated was be interval and scale questions, therefore independent t-tests were used to analyze the data. Creswell (2009) suggested that a sample size that is not of sufficient size to meet the desired effect size will alter the results and potentially create a Type I error. A Type I error is when concluding that there is an effect when there is none and therefore incorrectly rejecting

the null hypothesis. Participants equaled 50 individuals, for 2 groups, 3 measurements, 25 per group.

Threats to Validity

As this study analyzed secondary data, it is not possible to influence directly internal or external validity. Threats to the validity of the original study included both internal threats and external threats and are described in detail below.

Threats to Internal Validity

The threats to internal validity in the original study included standardization, instrumentation, and the Hawthorne effect.

Standardization. In the original study (Kirk & Bowin, 2019), instructions were given in the exact manner to each participant; however, each participant may not have fully understood the instructions or become confused in the data collection process. An example of this would be if a participant would reverse the score on the Likert scale assessment midway through competition or not complete all items. To maximize the internal threat of standardization, instructions were made clear, as brief as possible, with emphasis given to the Likert scale values.

Instrumentation. The instrument used during the testing process can change the experiment in itself. The instrument used in the original study to record blood pressure and heart rate was the LotFancy BP 103H Automatic Digital Blood Pressure Monitor. If the LotFancy BP 103H Automatic Digital Blood Pressure Monitor was not fitted properly due to size wrist size, arm size, or position an inaccurate reading may occur. To minimize the internal threat of instrumentation in the original study, the LotFancy BP 103H

Automatic Digital Blood Pressure Monitor was placed precisely in the same manner on the upper arm with each participant.

The Hawthorne Effect. The Hawthorne effect concerns research participation, the consequent awareness of being studied, and possible impact on behavior. In the original study, the surveys were not disguised not giving the possibility for participant bias. In the original study, the blood pressure and heart rate data collection was purely in the form of a laboratory setting. Blood pressure and or heart rate may be impacted. To minimize the internal threat of the Hawthorne effect in the original study, participants were reassured that all data is confidential and the outcomes of the experiment in no way correlates with personality traits or behavioral issues.

Threats to External Validity

The threats to external validity in the original study include reactive or interaction effect of testing and reactive effects of experimental arrangements.

Reactive or interaction effect of testing. A pre-test may sensitize participants and their performance on the post-test may be due to the pre-test, not to the experimental variable. To minimize the external threat of reactive or interaction effect of testing in the original study, instructions were clear and concise establishing the idea the pre and post survey assessments are merely based on subjective interpretations and there are no right or wrong responses.

Reactive effects of arrangements. The experimental environment is so different from the real world that generalization is not possible. In the original study, simulating acute stress using the cold pressor test may not accurately generalize to acute stress

brought on from emotional or psychological factors. To minimize the external threat of reactive effects of arrangements in the original study, the acute stress simulated by the cold pressor test and the PANAS-SF post and pre survey together aid in linking the effects of physical stress with emotional and psychological stress.

Ethical Procedures

Ethical procedures of the current study were submitted to Walden's IRB for approval. Privacy and confidentiality of all secondary data was kept on my computer, which is password protected and accessible only to me. In the original study, the proper IRB was submitted Northeastern State University. Explained informed consents were obtained prior to participation in the original study, upon which this secondary analysis is based. There were no deceptive research practices in the original study and participants were voluntarily able to withdraw participation at any time. The ethical guidelines followed included: (a) the clear and concise explanation of informed consent in order for participation, (b) participants were given an I.D. number instead of proper names in order to protect identity (data will be anonymous in the file to be sent to me), (c) no use of physical, mental, or emotional harm administered during the assessments used in this study.

Summary

In this chapter an overview of a quantitative study using secondary data was presented. Discussed was the secondary research methodology used to establish the relationship between stress, stress reduction, and the use of a non-pet, non-therapy, non-service canine in lowering stress, both perceived and physiological. The independent

variable in the original study included the use of a non-pet canine used as a comfort item. Dependent variables included the reduction in stress as indicated by lowered measures of blood pressure and heart rate. This chapter provided a description of the sample group, study variables, instrumentation, and the research design used in the original study. How the data will be collected and analyzed along with threats to validity, both internal and external was presented. Finally, the ethical considerations of the procedures of the present study and the original studied were reviewed. In Chapter 4 the data, data analysis, and the interpretation of the results of the data analyses was presented. Chapter 4 also discusses the hypotheses testing procedures and included descriptive tables as applicable to the discussion.

Chapter 4: Results

The purpose of this study was to analyze secondary data from a study at Northeastern State University (Kirk & Bowin, 2019) investigated the effects stress had on elevating the physiological markers of blood pressure and heart rate. The cold pressor test was used to induce the stress response, and a dog (non-pet, non-therapy, non-service) was used to aid in the reduction and recovery time of heart rate and blood pressure. In Chapter 4, I describe the demographic characteristics of the sample. I also present the results of the experimental and control conditions on the physiological markers of blood pressure and heart rate along with the results of the PANAS-SF and PAS-M surveys. An examination of additional variables, (pain threshold and pain tolerance) is included. Finally, I review group comparisons of the analyzed data. The institutional review board of Walden University # 09-19-18-0463076 approved the use of the data for this secondary analysis.

Research Questions

The first research question addressed whether a non-pet, non-therapy, non-service strange dog lowers the stress markers of blood pressure and heart rate. The second research question addressed whether interaction with a strange dog resulted in more positive affect relating to perceived acute stress.

Demographic Characteristics

The analysis of preliminary data indicated significance, and a representative sample size of 50 was determined to be adequate for the original study (for two groups, three measurements, and 25 participants in each group). The study consisted of male and

female participants 18 years of age or older who were randomly assigned to the control or experimental group. Age ranged from 18 to 62 years ($M = 29.9$ years). Because age is a continuous numeric variable, it is not summarized in Table 1. Other demographic characteristics such as gender, ethnicity, and relationship status were similar. Sample demographics are presented in Table 1.

Table 1

Participant Demographics

	Frequency	Percentage
Gender		
Male	15	33.3
Female	30	66.7
Marital status		
Single	23	51.1
Married	4	8.9
Partner	15	33.3
Divorced	3	6.7
Ethnicity		
African American	1	2.2
Hispanic	5	11.1
Native American	8	17.8
White	30	66.7
Other	1	2.2

Acute stress was measured using the cold pressor test. The cold pressor test is widely used clinically to evaluate cardiac autonomic functioning, left ventricular assessment, and experimental pain threshold (Silverthorn & Michael, 2013). Sudden and increasingly cold stress causes the sympathetic system to release chemicals necessary to trigger a cascade of cardiovascular responses, such as an increase in heart rate, an increase in blood pressure, arteriolar constriction, and an innate ability for the

constriction of heart muscles (Silverthorn & Michael, 2013). The cold pressor test generally consists of submersion of a hand in a bucket of cold water, with the temperature maintained between 0 and 9° C, for a period of 1 or 2 minutes.

Results

Baseline Measures of Heart Rate, Diastolic and Systolic Blood Pressure

Quantitative data were gathered using a LotFancy BP 103H Automatic Digital Blood Pressure Monitor from those in the control group ($n = 25$) and experimental group ($n = 25$) with baseline measurements of blood pressure (systolic and diastolic) and heart rate. An independent sample t test was used to determine whether the groups were equivalent at baseline on heart rate, systolic blood pressure, and diastolic blood pressure measures. Findings were heart rate baseline ($t = 1.875, p = .067$), systolic blood pressure ($t = 1.315, p = .195$) and diastolic blood pressure ($t = 1.470, p = 1.48$). No significance was found between groups for baseline measurements. An independent sample t test was also used to determine whether the water temperature was equivalent between the groups, and there was no significant difference found ($t = 1.31, p = .197$). Group equivalency tests are summarized in Table 2.

Table 2

Summary of Group equivalency at baseline measures

	<u>T value</u>	<u>Significance</u>	<u>Mean Diff</u>
Heart rate	1.875	.067	4.440
Systolic blood pressure	1.315	.195	5.760
Diastolic blood pressure	1.47	.148	3.760

Heart Rate

Heart rate measurements from baseline to one minute with hand in water, at one minute to recovery with hand taken out of water, and recovery to baseline one minute after one minute to recovery heart rate measure between the experimental group and the control group were examined using a repeated measures ANOVA. For the experimental group, measurements were taken while holding or petting a non-pet or strange dog (the same dog was used for all participants). The control had no contact with the dog.

A repeated measures ANOVA showed a main effect on heart rate between the experimental group ($M = 82.24$, $SE = 1.55$) and the control group ($M = 79.83$, $SE = 1.55$; $F(2, 96) = 9.76$, $p < .001$). There was also an effect of time, baseline to one minute ($M = 76.78$, $SE = 1.18$), one minute to recovery ($M = 86.46$, $SE = 1.24$), and recovery to baseline ($M = 79.86$, $SE = 1.24$; $F(1, 48) = 10.14$, $p = .003$). There was also an interaction effect $F(1, 48) = 12.65$, $p = .001$) in which the experimental group had a higher mean heart rate at one minute to recovery ($M = 89.08$) than the control group ($M = 83.84$); however the experimental group recovered faster ($M = 78.64$) than the control group (M

= 81.08; see Figure 1).

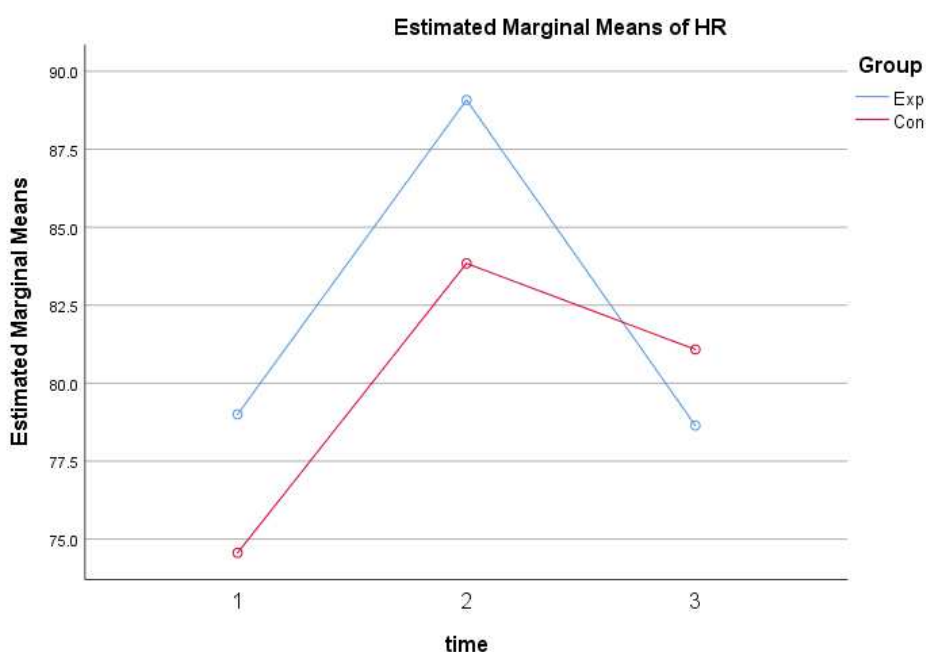


Figure 1. Heart rate comparison between experimental and control group at baseline to one minute, one minute to recovery, and recovery to baseline

Because the repeated measures ANOVA finding was significant, additional post hoc tests were conducted to examine pairwise comparisons. There were three pairwise comparisons for each dependent variable. Cronk (2010) explained that conducting three subsequent *t* tests would inflate the type I error and suggested lowering the significance threshold to .017 to correct. An independent sample *t* test was used to determine whether the groups were equivalent at baseline in heart rate measures. The results indicated the groups were equal at pretest ($t = 1.875, p = 0.67$). Cronk (2010) suggested pairwise comparisons be evaluated using *t* tests. Heart rate baseline to one-minute measure showed significance ($t(49) = 10.544, p < .001$), one-minute heart rate to recovery showed significance ($t(49) = 6.191, p < .001$), and recovery heart rate to baseline measure showed

significance ($t(49)=2.862, p<.01$). The analysis of heart rate baseline to one minute, one minute heart rate to recovery, and recovery heart rate to baseline are shown in Table 3.

Table 3

Heart rate base to one-minute, one-minute heart rate to recovery, recovery heart rate to baseline

	Group	Mean	t	Sig
Heart rate base to one minute	exp	79.00	10.544	.0001
	control	74.56		
One minute heart rate to recovery	exp	89.08	6.191	.0001
	control	83.84		
Recovery heart rate to baseline	exp	78.64	2.862	.006
	control	81.08		

Diastolic Blood Pressure

Diastolic blood pressure measurements from baseline, at one minute, and recovery between the experimental group and the control group were examined using a repeated measures ANOVA. For the experimental group measurements were taken while holding or petting a strange dog (the same dog was used for all participants). The control had no contact with the dog.

A repeated measures ANOVA showed no main effect of group between the experimental group ($M = 86.07, SE = 1.68$) and the control group ($M = 84.47, SE = 1.68$; $F(1, 48) = .48, p = > .05$). There was not an effect of time, baseline to one minute ($M = 81.48, SE = 1.28$), one minute to recovery ($M = 91.10, SE = 1.26$), and recovery to

baseline ($M = 83.14$, $SE = 1.43$; $F(1, 48) = 3.07$, $p = .08$). Finally, there was an interaction effect ($F(1, 48) = 8.35$, $p = .006$), whereby the experimental group had a higher mean Diastolic blood pressure at one-minute to recovery ($M = 92.56$) than the control group ($M = 89.64$) and they recovered faster ($M = 82.28$) than the control group ($M = 84.00$; see Figure 2).

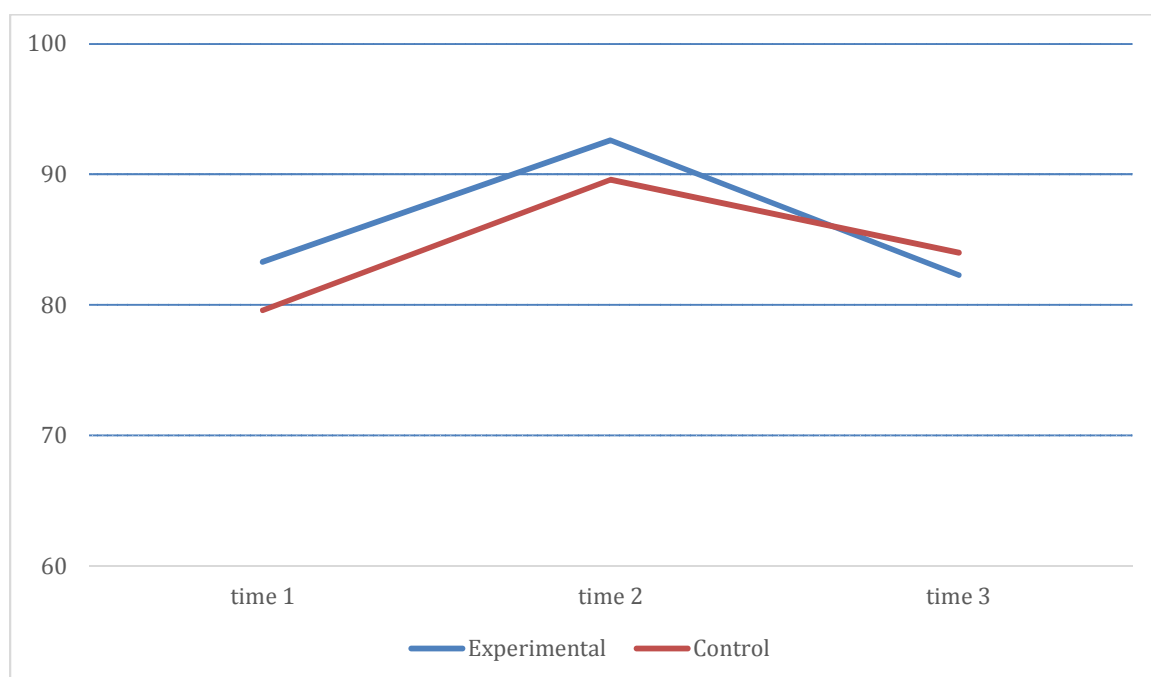


Figure 2. Diastolic blood pressure comparison between experimental and control at baseline to one-minute, one-minute to recovery, and recovery to baseline.

Systolic Blood Pressure

Systolic blood pressure measurements from baseline to one-minute, at one-minute to recovery, and recovery to baseline between the experimental group and the control group was examined using a repeated measures ANOVA. For the experimental group measurements were taken while holding or petting a strange dog (the same dog was used for all participants). The control had no contact with the dog.

A repeated measures ANOVA showed no main effect between the experimental group ($M = 137.347$, $SE = 3.255$) and the control group ($M = 135.173$, $SE = 3.255$; $F(1, 48) = .223$, $p = >.05$). There was not an effect of time, baseline to one-minute ($M = 130.32$, $SE = 2.190$), one minute to recovery ($M = 146.40$, $SE = 2.625$), recovery to baseline ($M = 132.06$, $SE = 2.532$; $F(1, 48) = 1.79$, $p = >.05$). Finally, there was also an interaction effect ($F(1, 48) = 20.54$, $p = .001$), whereby the experimental group had a higher mean Systolic blood pressure at one minute to recovery ($M = 133.2$) than the control group ($M = 127.4$) and they recovered faster ($M = 129$) than the control group ($M = 135$; see Figure 3).

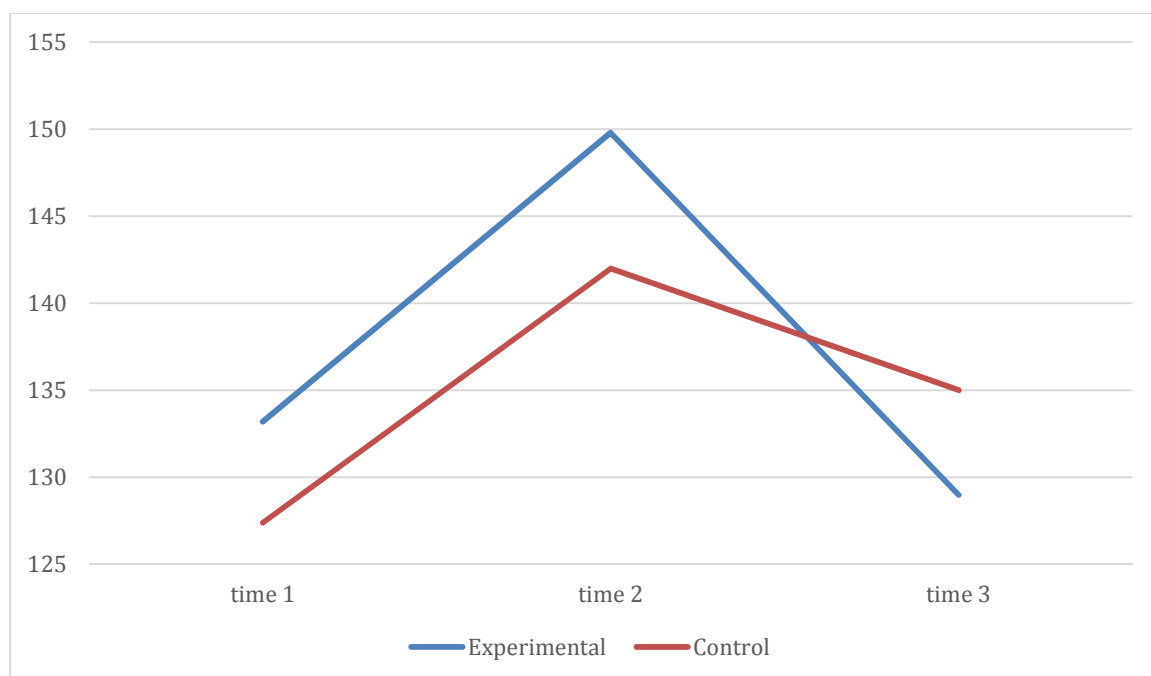


Figure 3. Systolic blood pressure comparison between experimental and control at baseline to one-minute, one-minute to recovery, and recovery to baseline.

Threshold and Tolerance

The effects a canine had on the physiological markers of heart rate and blood pressure, during times of stress, was the focus of the original study. An additional

variable considered was the reported time the participants could keep their arm in the water of the cold pressor apparatus. Participants in both groups were asked to announce when the water became cold (pain tolerance) and then to take their arm out once the water became too uncomfortable (pain threshold). A one-way MANOVA was calculated examining the effect of having a dog present on reported seconds to Pain Threshold and seconds to Pain Tolerance. AVOVAs indicated that the experimental group ($M = 62.6$, $SE = 6.851$) displayed higher levels of pain threshold than the control group ($M = 34.76$, $SE = 6.851$; $F(1,48)=8.26$, $p=006$). The experimental group also had a significantly higher Pain Tolerance $F(1,48)=13.13$, $p=.001$).

Positive and Negative Affect Schedule-Short Form

Positive and Negative Affect Schedule-Short Form (PANAS-SF) was used both pre and post as an assessment instrument. The PANAS-SF is composed of two 10 item mood scales, one which measures positive affectivity and the other which measures negative affectivity (Karim, 2011). The measure involves 10 words pertaining to the last week that describes different feelings and emotions to identify with. Based on a Likert Scale 1(very slightly or not at all) to 5 (extremely) indicates how certain emotions are felt at the moment and can be positive and negative or a mixture (Karim, 2011). For the Positive Affect Scale, the Cronbach alpha coefficient was 0.86 to 0.90; for the Negative Affect scale, 0.84 to 0.87.

The differences between the experimental group and the control group positive and negative affect scores were examined using a repeated measures ANOVA for both pretest and posttest. A 2 (group: experimental x control) x 2 (positive x negative affect) x

time (time: pre x post) repeated measures ANOVA using scores on PANAS (DV) was conducted. The results showed a main effect for time (pre score = 34.18, post = 16.38; $F(1, 48) = 144.11, p = .001$). There was also a group x time interaction $F(1, 48) = 8.4, p = .006$, see Figure 4. There was also an interaction effect of positive and negative affect x time $F(1, 48) = 16.39, p = .001$, see Figure 5. There were no other significant effects.

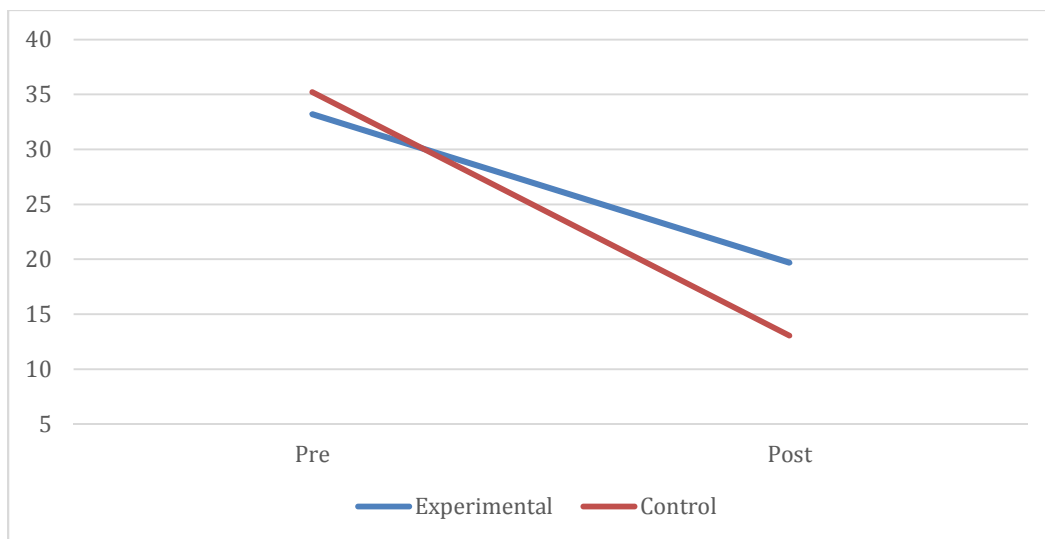


Figure 4. Group x time interaction

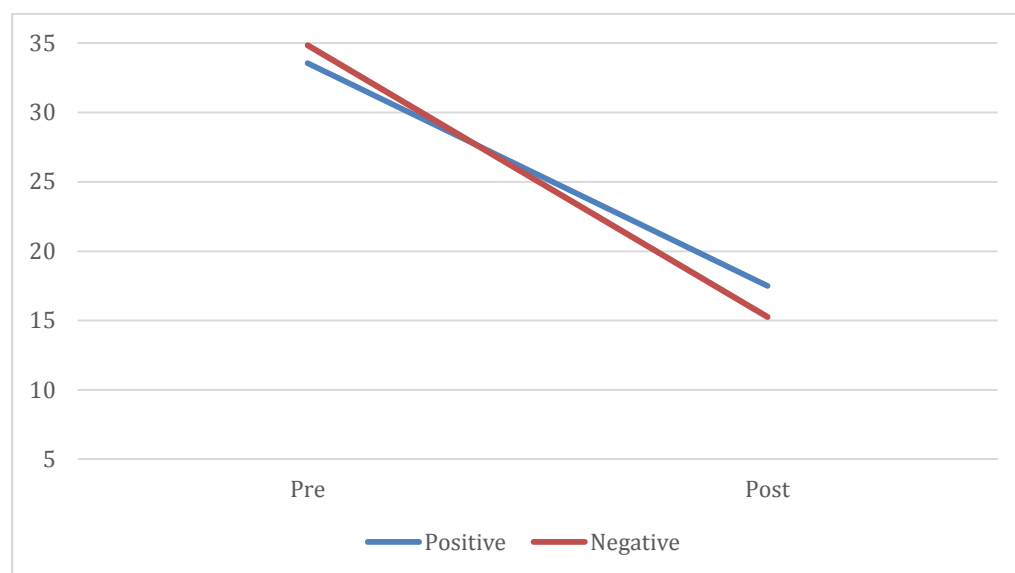


Figure 5. Interaction effect of positive and negative affect x time

At pretest, for the positive items there were no significant differences between the groups ($t=-1.960$, $p=.348$) and negative items at pretest ($t=7.960$, $p=.000$). When examining the negative affect items at posttest there was a significant difference between the groups ($t = 4.802$, $p = .0001$) showing the experimental reported less negative affectivity by the end of the experiment.

Pet Attitude Scale-Modified (PAS-M)

Pet Attitude Scale-Modified, PAS-M (Templer et al., 1981; Munsell et al., 2004). The PAS-M consists of 18 items that represent three factorially obtained subscales consisting of, love and interaction; pets in the home; and joy of pet ownership (Lago et al., 1988). The PAS-M is one of the few published scales with reliability information available. Cronbach alpha of .93, and two-week test-retest stability of .92 in an undergraduate sample $N=92$ used to develop the scale (Lago et al., 1988).

Assessment of attitudes towards pets using the PAS-M was conducted only with the experimental group as a pre-assessment measurement. The design flaw for the use of this assessment could not be used as a reliable and valid assessment for group comparison and the results could not be interpreted as having any correlational value for this study.

Summary

To determine if the use of a strange dog (non-pet, non-therapy, non-service) could aid in the reduction and recovery of the physiological markers of stress, a Cold Pressor apparatus was used to induce the stress response in participants. Baseline measurements of heart rate and diastolic and systolic blood pressures in both conditions were obtained and compared along with one-minute and recovery measurements. No baseline determinants were found. However, the support of a strange dog had a significant effect on the recovery measurements between the two conditions, experimental and control in heart rate, diastolic and systolic blood pressure.

To further understand the benefits of interacting with a dog, a Pet Assessment Scale was administered as a baseline for attitudes towards dogs in general. Additionally, the participants in the study were asked to self-appraise perceived stress, both with a pre and post assessment, a PANAS-SF inventory. An additional variable considered was the effect a dog had on pain threshold and tolerance. Although this was not the focus of the original study, significance was found and findings were reported. The findings, implications, limitations, and future more research will be discussed and detailed in Chapter 5.

Chapter 5

This chapter includes a discussion of the results of the secondary data analysis. Despite the popularity of using canines for therapy, service, and emotional support, few randomized studies have addressed the categories of dogs (non-pet dogs versus pet dogs) on health and well-being. The results of the study provided evidence that dogs in general can decrease heart rate and blood pressure in stressful situations. The methodology of the original data collection and the data analysis of the current study were supported by literature addressing the impact a dog has on human health (Allen et al., 2001; Irvine & Cilia, 2007).

In the original study (Kirk & Bowin, 2019) quantitative data were gathered using a LotFancy BP 103H Automatic Blood Pressure Monitor, and baseline measurements for heart rate and diastolic and systolic blood pressure were recorded and compared between groups with no significance found. Next Kirk and Bowen (2019) used a cold pressure apparatus to induce acute physiological stress by immersing participants' one hand in cold water. In the current study, heart rate and blood pressure, both systolic and diastolic, were compared at intervals of one minute and recovery. The independent variable was interaction with a dog. A significant difference was found between the groups with regard to the recovery heart rate and systolic and diastolic blood pressure.

To further explore the effects of a dog on perceived stress, a self-report quantitative assessment scale, the PANAS-SF was administered both pre and post to both conditions. This assessment is designed to report the combination of positive and

negative emotional affectivity. A small interaction of less negative emotions were reported by the experimental group at posttest.

Theoretical Foundations of the Research for Interpretation

Human-Animal Bond Theory

The human-animal bond theory (Walsh, 2009) and the human-animal interaction theory (Beck & Katcher, 1996; Beetz & Bales, 2016) provided a framework for organizing the data and understanding the benefits of dogs to humans' health and well-being. The American Veterinary Medical Association (2018) determined that this well-being includes emotional, psychological, and physical interactions of people, animals, and the environment. One of the strongest research areas provided evidence that pet ownership is correlated with positive physiological measures, such as lower blood pressure, serum triglycerides, and cholesterol levels (Walsh, 2009).

Human-Animal Interaction

There have been many positive effects of human-animal interaction. Julius et al. (2013) reported that the presence of an animal increases verbal communication between people and promotes trustworthiness toward the accompanied. Interacting with a dog decreases depression, reduces anxiety, facilitates a positive mood, and promotes calmness (Julius et al., 2013).

Attachment Theory

Attachment theory maintains that caretakers who are available and responsive to a baby's needs create feelings of security (Ainsworth & Bowlby, 1991; Bowlby, 1959). The baby develops an understanding that a caretaker can be counted to provide a warm

and safe foundation in which the world can be explored. For adults, friends and family and pets can serve the purpose of reassurance and support (Zilcha-Mano et al., 2011). Applying the idea of attachment to canines, I examined how the presence of a non-pet dog can ease physiological and perceived stress. I examined whether a strange dog offered the same benefits of lowering stress and aiding in comfort and support as a pet dog, service dog, or therapy dog.

Interpretation of Findings

The benefits humans experience while interacting with a dog have been studied most often through testimonial and anecdotal data. The usefulness of the present study was the empirical design and findings that could be added to existing research on the human-animal bond. The focus of the current study was how recovery from induced stress, as measured by increases in blood pressure and heart rate, was affected by the presence of a non-pet dog. Results of this study indicated that interaction with a strange dog can lower the physiological markers of heart rate and systolic and diastolic blood pressure faster during times of stress than having no interaction with a strange dog.

Stress can be defined as a physical, mental, or emotional factor that causes bodily or mental tension (McDonald et al., 2017). Stress can initiate the fight or flight response, a complex reaction of neurologic and endocrinologic systems (Johnson et al., 1992; Kuhlmann et al., 2005; O'Brien et al., 2012; Urskin & Eriksen, 2002). Baseline measurements of heart rate and systolic and diastolic blood pressure indicated no significant differences between group comparisons when data were collected. The cold pressor apparatus was used to simulate the stress response (Kirk & Bowin, 2019).

Comparison of heart rate and diastolic and systolic blood pressure measurement between groups indicated no significant differences at one minute. However, comparison of acute stress recovery heart rate and systolic and diastolic blood pressure indicated a significant difference between groups, with the experimental group recovering faster. Analysis of the secondary data indicated the difference can be attributed to the interaction with the dog during recovery time. Based on the underlying principles of the human-animal bond theory (Walsh, 2009) and the human-animal interaction theory (Beck & Katcher, 1996; Beetz & Bales, 2016), findings provided predictive evidence that the use of a non-service, non-therapy, non-pet dog can lessen the ill effects of stress.

An additional variable considered was the reported time the participants could keep their arm in the water of the cold pressor apparatus. Although this was not indicated in the original study experimental design, the findings were worth consideration. Results indicated that the experimental group displayed higher levels of pain threshold (when the water became uncomfortable) than the control group. The experimental group also had a significantly higher pain tolerance (how long the hand could stay in cold water).

Limitations of Study

Limitations to the original study were participation was limited to adults over the age of 18 years. Many of the factors of the study, such as elevation of blood pressure and heart rate during stressful situations, may not apply to children and adolescents. The original study also included a self-assessment of perceived stress. As with self-reports, bias may have existed in the original study. Honesty and understanding of the assessment

questions were also assumed in the original study; however, a respondent may have been incapable of providing an accurate response to a question.

Researcher bias or inconsistency in reading the results of the LotFancy BP 103H Automatic Digital Blood Pressure Monitor device could have occurred in the original study. The interaction between participant and experimenter, the exclusion of participation with the dog, the effect of laboratory experimentation (the Hawthorne effect), or the dog as a distraction could have impacted the findings in the original study.

The Positive and Negative Affect Schedule-Short Form (PANAS-SF) was the instrument used to assess self-appraisal of perceived stress. This scale is used to show relations between positive and negative affect. The assessment was given both pre and post experiment. The participants were instructed to indicate the extent to which they had felt this way over the past week, with 10 negative emotions and 10 positive emotions on a Likert scale. This type of assessment is used to describe an emotional state independent of the experiment. Also, because the PANAS-SF is a self-report questionnaire, it may have been difficult to assess moods accurately. Finally, the PANAS-SF was used both pre and post experiment, and some participants may have inaccurately understood the instructions and attempted to answer the same on both.

The Pet Assessment Scale-Modified (PAS-M) was used to assess participants' attitudes toward pets. After participants were randomly assignment into conditions, the PAS-M was administered as a pretest assessment to only the experimental group. This assessment tool was used to understand the benefits of interacting with a dog and served as a baseline for comparison between groups on attitudes toward pets in general. No

analysis was conducted due to the experimental design failure of one group administration.

Recommendations

There is a great deal of information relating to pets and how they facilitate well-being, help reduce stress, and enrich quality of life. Animal behavior may have been our first alert system to environmental dangers while a relaxed, resting animal communicated relaxation and aided in stress reduction (Beetz & Bales, 2016). Understanding and acting on this knowledge has led into specialized training resulting in therapy dogs trained to provide psychological or physiological therapy to individuals other than handlers, in service dogs that have been trained to perform tasks and activities easing the disability of handlers, and in emotional support dogs available to provide some benefit to an individual with a mental or emotional need.

The information provided from the analysis of this study suggests that strange dogs, not just service dogs, therapy dogs, or support dogs can be an essential part of therapeutic intervention. While it is not suggested that everyone needs canine intervention and everyone needs canines that are trained for specific interventions, in some situations having just a dog available to pet in times of stress may be the coping strategy needed. This study supported the findings that dogs have a direct influence in lowering our heart rate and systolic and diastolic blood pressure after episodes of acute stress. Many report dogs make people feel better, the analysis of this study reported that dogs do indeed make people feel better physiologically by lowering markers of physiological stress. As the literature review supports, along with the results of this study,

more research needs to be conducted in the importance and necessity of not just dogs, but all types of animals to human's physiological, psychological, and emotional health and well-being.

Implications

The interpretation and analysis of data collected in this study adds to the growing amount of research on the importance of animals to happiness and well-being. This study focused on the ability of a dog, without respect to training or attachment, to be used for coping during times of acute stress. When more information is available on the empirical findings of the importance of all kinds of benefits from animal interactions, then mental health policy, educational policy, medical health policy, and community policy can develop to foster the appropriateness of interactions between animals and humans. Animals have come so far as to aid patients in formal settings such as hospitals, clinics and physical therapy and/or rehab units, and in the courtroom (Cole & Gawlinski, 2000; Hart-Cohen, 2009; Walsh, 2009). Understanding the importance of the Human-Animal bond is important for wider developing areas.

Conclusion

Dogs have been called man's best friend. There is a reason; throughout history humans have used dogs for personal benefit. Dogs as guides and companions are prevalent in many historical cultures in the world. Dogs have served humans as family members, as guardians, as friends, and as therapeutic tools. Trained dogs, those being labeled in a role of service, therapy, and emotional support, or pets have received the most popularity as the most beneficial. But every dog is unique in its ability to catch our

attention and tug at our heart strings. Because of this the ordinary strange dog can make people feel better. In times of stress, an ordinary dog can make human's elevated blood pressure and heart rate become lower. In times of stress, an ordinary dog can calm anxieties. An ordinary dog has the "almost magical" ability to make people happy.

The use of companion animals is increasingly being recognized by society as beneficial to optimal functioning. Companion animals are becoming more widely accepted as authentic members of the family. Relationships with animals are emotionally as close, in some instances closer, than human attachment. The present study extended previous research and examined the physiological effects of being with a strange ordinary dog (i.e., as with pet therapy animals). Future research in this area is needed to extend the understanding of the Human-Animal Bond and the reciprocal benefits of animal companionship.

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Appendix A: Pet Attitude Scale and Animal–Human Continuity Scale

PET ATTITUDE SCALE AND ANIMAL–HUMAN CONTINUITY SCALE
SCORING INSTRUCTIONS

To Whom It May Concern:

You have my permission to use my Pet Attitude Scale and my Animal–Human Continuity Scale. No payment is needed. Enclosed find the scales and relevant articles.

For the Animal–Human Continuity Scale, score the number the participant indicates for items 4, 5, 6, and 8. For example, if the participant indicates 6 on item 5, score 6. For items 1, 2, 3, 7, 9, 10, 11, and 12, reverse the scoring. For example, if a participant indicates 6 on item 3, score 2. Add the scores for each of the 12 items. The higher the score, the higher the participant is in the dichotomous direction.

For the Pet Attitude Scale, score the number circled for items 1, 2, 3, 4, 7, 8, 10, 11, 14, 16, and 18. For example, if a participant circles 7 on item 1, score 7. For items 4, 6, 9, 12, 13, 15, and 17, reverse the scoring. For example, if a participant circles 5, score 3. Total score is the sum of all 18 items.

It is probably not important whether one uses the original format of the Pet Attitude Scale or the revised format with the wording of three items changed. The latter has the advantage of more precise wording but without demonstrated psychometric superiority.

Sincerely,
Donald I. Templer

Appendix B: Cold Pressor Test Instructions

Cold pressor test instructions

The cold pressor test is performed by immersion of one hand in ice water (typically between 0-5 °C) for a period of 1 to 2 minutes.

Appendix C: Permission to Use the PANAS-SF

Permission to use the PANAS-SF

The PANAS can be used for research, with proper acknowledgement to the authors (Watson et al., 1988). <https://ogg.osu.edu/media/documents/MB%20Stream/PANAS.pdf>

Appendix D: Cold Pressor Text Permission

Cold pressor test permission

The cold pressor test is a standard clinical test. Protocol as published in *Advances in Physiology Education*, the only thing needed is to acknowledge the reference in work.

Appendix E: Permission to analyze data

I, Johnny Kirk, Department of Psychology and Counseling, Northeastern State University, Tahlequah, Oklahoma give my permission for Beth Bowin to analyze the data from the research study entitled, A study of the effects of canines on physiological and perceived stress (2019).