

ABSTRACT

THE RELATIONSHIP BETWEEN PET OWNERSHIP, STRESS, AND EPISODIC MEMORY

Previous research on pets has focused on both the psychological benefits through attachment and physiological benefits through stress reduction and health improvement. Research has shown that the mere presence of a companion animal can reduce stress in humans (Allen, Blascovich, Tomaka, & Kelsey, 1991). Stress has been shown to cause decreases in executive functioning and deficits in overall cognitive processing, while having a particularly unique impact on episodic memory. Because of the decrease in stress that pets can provide, and the known relationship between stress and episodic memory, the current study investigated the relationship between having a pet and episodic memory. The four measures of pet attachment (CENSHARE PAS), State-Trait Anxiety Inventory (STAI), Duke-UNC Functional Social Support Questionnaire, and Picture Sequence Memory Test were used in this study. It was predicted that pet ownership would be related to lower levels of trait stress and higher levels of episodic memory functioning. Results did not show any relationships between pet ownership, attachment, stress, or episodic memory. However, pet owners who were highly attached to their pets reported higher levels of social support.

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THE RELATIONSHIP BETWEEN PET OWNERSHIP, STRESS,
AND EPISODIC MEMORY

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CHAPTER 1: INTRODUCTION

For many people, pets are an important part of their family. Just as with any family member, a person's relationship with a pet can vary in its nature and attachment. Many different factors contribute to these differences in relationships that people have with their pet. These factors include current life situation, stressors, who one lives with, bonds with friends and family, health, pet behavior, and the overall attachment one has with their pet (Duvall Antonacopoulos & Pychyl, 2010) (Serpell, 1996). People who have strong bonds with their pets can experience deep levels of companionship (Garrity, Stallones, Marx, & Johnson, 1989). A unique type of emotional support can arise from living with a pet as well. There are additional psychological benefits that may be related to living with or interacting with a companion animal.

Companion animals, or pets, can also aid humans in other ways. Pets help improve people's social interactions with others and facilitate more social interactions (McNicholas & Collis, 2000). It has also been found that viewing baby domestic animals can have influences on humans' fine motor skills (Nittono, Fukushima, Yano, & Moriya, 2012). Pets and animals that people have no history with can also positively influence psychological well-being through therapy and stress reduction (Barba, 1995). Pets also provide health benefits in humans by lowering blood pressure and reducing stress, but it is unknown exactly what variables account for these improvements (Beck & Katcher, 2003).

Companion animals have also been found to reduce the psychological and physiological effects of stress on humans (Allen, 2003). There are many negative psychological impacts of stress on humans including increasing the risk for varying pathologies and the risk of developing depression and anxiety (Marin et

al., 2011). Stress also has a profound impact on cognitive development as well as cognitive functioning in general (Pechtel & Pizzagalli, 2011). Specifically, stress has negative effects on memory function, primary episodic memory function, and even accelerates the effects that aging can have on memory (VonDras, Powless, Olson, Wheeler, & Snudden, 2005).

Pets may indirectly improve cognitive functioning by reducing the amount of prolonged stress in a human companion's life. Based on the previous research that has focused on the impacts domestic animals may have on humans, the goal of the current study is to expand upon the relationships animals may have with human behavior and cognitive functioning. Companion animals have been shown to reduce stress in humans. Stress has been empirically shown to decrease cognitive abilities, specifically episodic memory functioning. The focus of the current research is to explore the relationship between companion animals, stress, and episodic memory. There are four main questions the current research investigates. Is episodic memory function higher for pet owners than to non-pet owners? Does higher pet attachment predict higher levels of episodic memory function? Is higher pet attachment related to lower levels of trait stress? Is there a relationship between lower levels of trait stress and higher episodic memory function?

CHAPTER 2: LITERATURE REVIEW

The field of research on pet ownership and attachment has evolved and changed since its start over 50 years ago. The focus now seems to be on better understanding the nature of pet attachment and the possible benefits pets may have for humans (Blackshaw, 1996). To better understand pet attachment and pet benefits, the social benefits of pets have been investigated (Castelli, Hart, & Zasloff, 2001). This research has found that pets can boost and enhance social interactions and relationships for humans. In addition to social improvements, pets can also influence behavioral change. Pets have also been found to have a strong relationship with human health improvements for various populations.

These health improvements may be caused by several factors, but one that has stood out is pets' relation to stress. It has been widely found that pets aid in the reduction of stress in humans. Prolonged stress can have many negative impacts on health. The focus of stress research has been on the negative physical health issues related to stress such as hypertension (Beck & Katcher, 2003). Stress has been known to be related to physical health, but is also related to cognitive health and cognitive function. Extended and acute exposure to stress can cause problems in normal cognitive functioning. Prolonged exposure to stress has been linked to the development of memory deficits and accelerated cognitive aging. One area of these cognitive declines is episodic memory function. Episodic memory function can decrease with normal aging, but the decline is enhanced with prolonged exposure to stress (VonDras et al., 2005).

The Background of Pet Research

Research on pet attachment and the benefits of companion pets started in the late 1960's (Blackshaw, 1996). Blackshaw (1996) reviewed the history of pet-

human relationship research. The first research in this area focused on how animals could aid in clinical therapy. Case studies where pets were used as methods for therapy were examined. Few conclusions could be drawn from this research because it mainly consisted of case studies with no control groups used for comparison and lacked structured experimental research design. The focus of research later shifted to humans' bond with companion animals. The questions of this early research focused on the companionship that animals provided, therapy uses of animals, animals' influence on human stress, and the grief of losing a companion pet (Blackshaw, 1996). One of the few older studies that did use quasi-experimental designs found that pet owners had lower risk factors for cardiovascular disease when compared to non-pet owners (Blackshaw, 1996).

The focus of companion animal research has remained fairly similar since the shift to the companion animal bond. Much of the current research focuses on companion animal bonds and how those bonds are related to human health and well being, and now focuses even more on the nature of attachments humans have with cats and dogs. Blackshaw (1996) also reviewed the existing research in the area of human-animal relationships. Blackshaw (1996) found that because a majority of previous research in the field of companion animals and their relationship with humans has been correlational or case studies with mixed results, it was suggested that a quantitative direction of future research would be best to explain these relationships. More structured experimental designs would benefit this area of research, and help explain the correlations and relationships between pets and other factors that have been found but have yet to be empirically proven.

Generally, it is thought that the human bond with dogs can be superior and more significant than the bonds humans can have with cats (Zasloff, 1996). Zasloff (1996) examined the possible reasons for dogs rating higher than cats or

other companion animals on attachment scales. Dog owners scored higher on the Companion Animals Scale, which is said to measure human attachment to their pet, when administered normally to cat and dog owners. When two dog specific items were removed from the Companion Animal Scale, the cats and other companion animal groups scored the same as dog groups. The results indicated that people can have similar attachment to both cats and dogs. The nature of these relationships and attachments differ between different types of companion animals. Species-specific evaluations of animal attachment need to be taken into account when differences between these attachments come into question (Zasloff, 1996). When evaluating pet attachment for more than one species of pet, the measure of attachment needs to be reliable for all of the types of animals being evaluated.

The attachment a human has with their pet is also based on behavioral interactions. Serpell (1996) explored the possibility that the actual behavior of the animal versus the owner's expectations of the animal's behavior might play a role in attachment. Serpell distributed surveys that evaluated owner's attachment to their pet, satisfaction with the pet, as well as expectations owners had of the pet to both dog and cat owners a year after they had adopted a new cat or dog from a shelter. Results showed that for dog owners, the description of an "ideal" dog did not differ according to the levels of attachment humans had with their pet. The levels of attachment were positively correlated with the owner's satisfaction with the dog's behavior. The direction of this relationship is not clear because the dog's better behavior may cause higher levels of attachment or it may be that the more attached the owner is to the dog, the more lenient and accepting they are of the dog's behavior. There were no significant differences between levels of attachment and behavior satisfaction when it came to cats (Serpell, 1996). This

research helps to explain how differences in satisfaction may account for the differences in levels of pet attachment.

Psychosocial Benefits of Pets

There is a vast history of research examining the various psychosocial benefits of pet ownership and attachment. One such study looked at a group of adults who lived alone and how pet ownership in this particular group could be related to pet attachment and social interaction. It was expected that living with a pet would predict lower levels of depression and loneliness (Duvall Antonacopoulos & Pychyl, 2010). Participants in this study were 132 Canadians. The data were collected through on-line surveys. Results showed that pet ownership and pet attachment alone failed to predict loneliness and depression. However, the study found that dog owners who lived alone but had higher levels of human social support in their lives had lower levels of loneliness when compared to people living without pets. Pet owners who lived alone and had low levels of human social support paired with higher levels of pet attachment reported higher levels of depression and loneliness than people living with pets with high levels of human social support (Duvall Antonacopoulos & Pychyl, 2010). The results show that there is an interaction of pet attachment and ownership with social support. Without social support, pet attachment predicted higher levels of loneliness; with social support, dog ownership predicted lower levels of loneliness than non-pet owners.

A similar study focused on women who lived alone (Zasloff & Kidd, 1994). Results from the study showed that women who lived completely alone without pets or other people were much lonelier than those living with just pets, just people, or both. Women who lived with just their dog and not other people

reported being more attached to their dog than women who lived with both their dog and other people. There was no relationship found between pet attachment and levels of loneliness. Both cats and dogs were found to provide emotional help and companionship for their owners. There was no difference found in pet attachment or loneliness between cat owners and dog owners (Zasloff & Kidd, 1994). Together, these studies found that pet attachment alone and social support alone failed to predict loneliness, while pets paired with more social support can predict lower levels of loneliness.

Eddy, Hart, and Boltz (1988) explored social interactions with strangers when dogs were present. This experimental research examined the interactions of people in wheelchairs with strangers in public places when the person in a wheelchair either had a service dog present or no service dog. Results showed that able-bodied strangers smiled more and had more conversations with a person in a wheelchair when a service dog was present. These results show the additional benefits that service dogs can provide for those in a wheelchair. These results also exhibit how dogs can work as a catalyst for social interaction, even in situations that may be uncomfortable for some people (Eddy et al., 1988). Similar results were found by Geries-Johnson and Kennedy (1995) where a woman in a picture with a dog was rated as more likeable when compared to pictures of the same woman with cats or birds or no animal.

McNicholas and Collis (2000) investigated whether the presence of a dog may change the nature of interactions a person has with strangers in everyday situations. There were two experiments conducted within this study. In the first experiment the researchers either had a dog with them during their daily routine or no dog at all during their daily routine. Both of these experiments were conducted at places other than dog parks or walking routes where dog walking might be

expected (e.g., public places at the center of the city, public transportation, at their workplace, etc.). Results of the first experiment showed that when a dog was present, strangers engaged the researcher more than when a dog was not present. The second experiment was the same except experimenter would dress differently in the various conditions and instead of going through their daily routine, the experimenter pretended to be waiting in a public place. The researchers found that when a dog was present there were no differences in the number or types of interactions when they were dressed nicely or not. This research shows that dogs provide increased social interactions with strangers, even when the types of appearance or situations may vary. The presence of a dog acts as a catalyst for social interactions, even with strangers (McNicholas & Collis, 2000). Dogs function as catalyst potentially by reducing the social stress or anxiety that may normally be caused by interacting with a stranger.

Few studies have focused specifically on the nature of cat-human relationships. Stammbach and Turner (1999) mailed out questionnaires to gather data about pet attachment, human relationships, and social support. Stammbach and Turner (1999) found that cats actually replaced human-to-human relationships instead of boosting existing social support. People who reported higher levels of attachment to their cat had fewer significant others in their life, less social support from people, and lived with fewer people in their household. It can be argued from these results that there is a relationship between people who have smaller social networks and their pet attachment (Stammbach & Turner, 1999). One possible explanation for this is that people may successfully fill the void of human social support with their companion cat (Stammbach & Turner, 1999). Whereas dogs may boost existing social support, cats may be able to replace it. These different

results may explain some of the differences in pet bonds and relationships between varying pet owners.

Pets can also provide aid in therapy for their owners. Castelli et al. (2001) used a convenience sample of male pet owners that had been diagnosed with AIDS. The participants completed a questionnaire that asked about physical health, loneliness, a companion animal scale, lifestyle, and other basic demographic information. Results showed that the comfort participants received from their pets was associated with owning cats uniquely. This association was not found with other types of pet owners. The explanation for this finding was that AIDS patients could not participate in physical activities that normally form the bonds and attachments with dogs. Cats, however, are much less physically demanding and do not require physical activity to form the same bonds and levels of attachment. The comfort from their companion cats was also related to their closeness with their friends and being dissatisfied with their practical support groups (e.g., family). A negative relationship was found between loneliness and having a practical support group, living alone, and scoring as healthy on the questionnaire. Cats seem to boost the support and comfort gained from support groups like friends and family (Castelli et al., 2001).

Pets may provide other types of social improvements for humans, even when the pet is not present. Hyde, Kurdek, and Larson (1983) surveyed college aged men and women about their pet ownership and different aspects of interpersonal relationships. The results showed that pet owners tended to report having higher levels of empathy when compared to non-pet owners. It was also found that pet owners had higher levels of interpersonal trust with other humans. This research shows that pet ownership and companionship may change the ways

in which people interact with other humans by affecting how much a person trusts or empathizes with others (Hyde et al., 1983).

All of this research shows that cats and dogs both can provide social benefits for humans. These social benefits are unique and can vary between cats and dogs. Pets in general are significant to the well-being of humans overall.

Behavioral Influences of Domestic Animals

There has been much support for the psychosocial influences of pets, but there are also many behavioral influences animals can have on humans. Domestic animals tend to be anthropomorphized by people, but not much is known about the effects of this anthropomorphism on human behavior. Chartrand, Fitzsimons, and Fitzsimons (2008) evaluated whether people's behaviors changed when primed by anthropomorphized animals such as cats and dogs. The participants were primed with either the concept of cats or dogs. The participants were asked to list traits of either cats or dogs and then were given a list of traits and had to indicate if the traits were ones associated with either cats or dogs. It was found that when participants were unconsciously dog primed, they scored higher on a loyalty scale than participants that were cat primed. The loyalty scale presented participants with made up scenarios and asked them how much they agreed with the actions in the scenario in regards to a friend of theirs. The unconscious priming of anthropomorphized concepts humans attribute to dogs caused the participants to unconsciously increase behaviors of these attributes, such as loyalty. This is thought to occur because human traits such as loyalty are so intensely attributed to pets like dogs, that when primed with dog concepts people are simultaneously primed with these anthropomorphized concepts (Chartrand et al., 2008).

Animal priming can also affect other human behaviors. Sherman, Haidt, and Coan (2009) examined levels of carefulness in women after viewing either photos of puppies and kittens, adult cats and dogs, or neutral stimuli like famous buildings. Carefulness and fine motor abilities were measured by having participants play the children's game Operation, and then counting the number of errors participants had. The participants were unaware of the actual reason for viewing the photos prior to the measure of fine motor abilities, and were rather told that they were simply rating the photos for another study. The researchers found that when participants viewed cute pictures of kittens and puppies, their fine motor movements were more careful and they perform fewer errors on the motor task. These results were not found after viewing moderately cute pictures of adult dogs and cats or with neutral stimuli (Sherman et al., 2009).

These results were replicated by Nittono et al. (2012) in a study in Japan. The study found that fine motor control increased after viewing images of puppies and kittens but not after viewing adult cats and dogs or neutral stimuli. These results occurred for both men and women. The same study also found that behavioral carefulness, or fine motor precision, also increased after viewing images of puppies and kittens, and these results were not found in trials where adult animals or neutral stimuli was shown. The explanations for these results are thought to be due to human's need to be careful and precise when handling human infants. This may occur when viewing pictures of puppies and kittens because people may experience maternal instincts for companion animals similar to that with humans (Nittono et al., 2012).

Health Benefits of Pets

Following much of the previously mentioned research on pet ownership, attachment, psychosocial benefits and behavioral influences, much investigation on the health benefits of pets has been examined. Because there is indeed a relationship between pet ownership and human health, many studies have investigated factors that cause these benefits in order to enhance and promote the beneficial effects of pets. A large nationwide survey was conducted across Australia to examine the health differences between pet owners and non-pet owners (Headey, 1999). Results from the 1011 people surveyed showed that both cat and dog owners required fewer annual doctor visits than non-pet owners. Non-pet owners were found to make 80.4% of the annual doctor visits of those surveyed. It was also found that cat and dog owners were less likely to be on medication for heart or sleep issues. The study estimated that pet ownership could potentially save the country hundreds of millions of dollars in a year for health expenditures (Headey, 1999). The findings of this survey are similar to the American study that found decreased doctor visits in the elderly when they lived with a companion animal (Siegel, 1990). It is important to remember that these studies have been primarily correlational. This means that many other variables could account for this relationship. This again shows the need for more controlled experiments in the area of pet ownership and its possible benefits.

Much of the research done in the animal attachment field has focused on animals and their benefits to the elderly, with a main focus being on the health of the elderly. One study examined the stress levels, pet ownership, attachment, and doctor interactions of elderly pet owners over a year (Siegel, 1990). Participants completed a baseline health interview at the start of the yearlong study. After that, interviews were conducted every two months and asked about health and doctor

interactions. Every six months, psychological distress information was gathered during the interviews. The results of the study showed that even when the baseline for stressful life events was controlled for, pet owners had fewer doctor interactions within the year for stress related issues when compared to participants without pets. This reduction in stress related doctor visits was reportedly due to pets providing a buffer for stress, and aided in social support and stress reduction. Dog owners were reportedly more attached to their pets than other pet owners and spent much more time with their dogs than other pet owners. It was also found that the stress levels for pet owners were significantly less for dog owners compared to owners of other types of pets. This was because the dogs acted as a buffer between using doctor assistance for stressful life events, providing companionship, company, feelings of love, and security (Siegel, 1990).

Another topic commonly explored in regards to pet ownership and the elderly has been the relationship of pet ownership and depression (Garrity et al., 1989). Garrity et al. (1989) gathered information from participants over the age of 65 over the phone about their life stress, depression, and pet attachment. The results of the study showed that pet attachment was a predictor for decreased depression and illness. Pet ownership alone failed to predict depression and illness. For bereaved participants, higher levels of pet attachment and lower levels of depression were reported compared to bereaved participants without pets (Garrity et al., 1989). This study and the others discussed have found a relationship between the health of the elderly and pet attachment. Overall, the elderly population has enhanced benefits from pet ownership and pet attachment when compared to younger populations.

Much research has found living with a companion animal to be correlated with better health in all humans. Health and pet ownership has generally been

investigated using only surveys and correlational research. Similar to the research of Siegel (1990) with the elderly, Serpell (1991) also used a longitudinal design to look at human health and pet ownership. Participants that were about to acquire a pet were compared to control subjects who did not have pets and were not acquiring a new pet (Serpell, 1991). The study looked at both new cat and dog owners over a ten-month period. Data were collected using health questionnaires administered at different periods during the study as well as assessments of minor health problems such as headaches, colds, mild aches, stomach aches, etc. Both cat and dog owners showed improvements in health within the first month when compared to the control group. At the end of the ten-month period, new dog owners experienced the most health improvements compared to the new cat owners and the control group. Additionally, the new dog owners also engaged in more physical activity after acquiring the new pet compared to the other groups (Serpell, 1991).

Having a pet may be related to lower medical expenditures. Pets may also play a role in reducing the impacts of life stress, particularly in the elderly. Improvements in human health are possible for humans, even within the first year of acquiring a new pet. All of these studies further explain the variety of benefits pets and pet attachment can have for humans. The mediating factors for these health benefits were unknown for many of these studies, but one possible suggestion for these benefits may be a general reduction in stress from pet ownership and attachment.

A review of existing research was completed on the relationship of pet ownership and the owners' physiological and psychological health (Beck & Katcher, 2003). One important finding has been that both cats and dogs can reduce a human's response to stressors as well as being able to lower blood pressure for

people with mild hypertension. Despite all of the support for these findings, there are many discrepancies about what are the exact mediating factors for stress reduction and hypertension reduction. It is known that pets are related to these benefits, but how pets specifically cause these benefits is still unknown. The most common theoretical explanation for these benefits is the social support theory, which suggests that increased social support in general causes health benefits, and that pets can provide the same type of social support. The conclusions drawn from this analysis were mainly that more research should be conducted in general on the pet-owner bond and the variables that mediate the benefits of pets (Beck & Katcher, 2003).

Effects of Pets on Human Stress

A primary mediator for pets' relationship with human health improvements has been their ability to reduce stress in humans. Pets can aid in stress reduction and also enhance the benefits of medications. Allen, Shykoff, and Izzo (2001) investigated the benefits pets can have for patients with high blood pressure when paired with blood pressure medication. Patients with hypertension were assigned to either the control group that only received medication or the pet group that would receive the same medication but were also asked to acquire a pet. A baseline for stress and hypertension was gathered before medication was given and before pets were acquired, and was relatively equal across all groups. Both groups completed the mental stress tasks and hypertension measures in their homes both at the time of the baseline measure and six months later. Results showed that pets provided a unique type of social support that is non-evaluative, meaning that pets will not change their opinions of you or pass judgments about your successes or failures. Hypertension symptoms decreased for both groups, but

the pet group showed lower reactivity to the mental stress tasks. This type of social support, when paired with hypertension medication, caused lower responses to mental stress than just the medication alone (Allen et al., 2001).

One explanation for this decrease in stress caused by companion animals is that these animals provide a positive distraction from stressors (Barba, 1995). Animal-Assisted Therapy (AAT) has been used in nursing homes, clinics, hospitals, and rehabilitation centers. This therapy involves companion animals such as cats and dogs coming and having extended visits with patients that desired to participate. When paired with regular treatment, AAT has been shown to boost the benefits of various traditional treatments. Because of this, AAT has been widely successful for patients suffering from anxiety and pain. This type of therapy has also been found to aid in stress reduction via lowering symptoms of hyperactivity and elevated blood pressure (Barba, 1995). The effects of being able to focus on a companion animal instead of other stressful stimuli has been found to show benefits for people suffering from attention deficits by increasing attention spans through increased focus on these animals (Barba, 1995).

Allen et al. (1991) supported the evidence that the non-evaluative social support of companion animals is related to reductions in reactions to stressors. When female participants were presented with a stressful arithmetic task, there was a friend present, a dog present, or no one else present. Results showed that when a friend was present, there was higher reactivity to stress and worse performance on the presented stressful arithmetic tasks as compared to the control and when a dog was present. The reactivity to stress was lowest in the condition in which a dog was present. These results are thought to be due to the difference in evaluative and non-evaluative social support. The idea of being evaluated or judged by a friend can potentially increase reactivity to stressors. Animals provide

a non-evaluative social support that is different from that of friends and other humans (Allen et al., 1991).

There is another explanation for why pets have an influence on responses to stress for both people who have normal and high blood pressure. Allen (2003) found the same results as Allen et al. (1991) that participants performed better and more efficiently on a stressful arithmetic task when their pet was present than when their spouse was present. Instead of companion animals simply being a distraction from the stressor, it is suggested that this effect pets have on stress may be due to the relaxing effect pets can have on their owners through a type of social facilitation effect (Allen, 2003). Another explanation for this effect may be that companion animals provide the ideal type of social support a person needs in a given situation. This means that during a stressful task, the type of support a pet can provide is a positive one regardless of the person's performance of the task. Pets provide an important type of non-evaluative social support that is uniquely different from the social support people receive from friends, spouses, or other people in general (Allen, 2003).

Friendly domestic animals that are unknown to a person can also provide benefits to humans. Demello (1999) conducted an experiment in which participants were brought into a room and were hooked up to machines that constantly monitored the heart rate and blood pressure. There were three different conditions that each participant completed, with a rest period after each condition. The first condition had the participant complete cognitively stressful tasks with no animal present. The stressful tasks included arithmetic, coding, and a cancellation task. The second condition had the participant complete the same tasks but with either a friendly dog or goat visible in the same room. The third condition had the participant again complete the same stressful tasks with the animal in the room,

but in this condition the participants were allowed to touch or pet the animal if they chose to. Results showed that the participants who were exposed to an unknown, friendly domestic animal during the rest periods after cognitively stressful tasks had reduced heart rates and blood pressure if the animal was visible. When the participant chose to touch the animal after the cognitive tasks, there was a reduction in heart rate but there was not a significant decrease in blood pressure (Demello, 1999). These results were consistent across both domestic goat and dog trials. The results of this study show how the mere presence of a domestic animal can aid in the reduction of heart rate after cognitive stress is induced. This shows a direct link between pets, stress reduction, and cognitive functioning in an experimental setting. The stress reduction benefits of animals are so profound that the animal simply needs to be friendly and in the same room to exhibit measurable physiological and cognitive benefits for humans.

Stress and Episodic Memory

It has been widely found that acute stress, or state stress, can aid in the memory storing process due to the need for us to remember stressful situations for survival (Schwabe, Joëls, Roozendaal, Wolf, & Oitzl, 2012). This effect of stress on memory, however, has negative effects on cognitive functioning that is not directly related to dealing with the stimuli causing the stress (Schwabe et al., 2012). Prolonged stress, or trait stress can in turn harm memory storage because of the extended exposure the hippocampus has to adrenal steroids released during times of stress. This also causes neural damage, decreases in brain plasticity, and even cell death, especially in aging brains according to studies conducted with both animals and humans (McEwen & Sapolsky, 1995).

Contrary to the previously mentioned studies, Payne et al. (2006) showed that people who were exposed to state stress, which is short term stress that occurs based on a specific situation, had difficulties recalling both central and peripheral information after a delay when compared to a control group. Participants in the stress group completed a stress test that is believed to increase state stress levels and were also told that they would be giving a speech in front of several experimenters. Memory was measured by having participants watch a slide show and later answer questions about the slide show. This same study found that memory was better for emotional information in the slide show when compared to neutral information of the stress group. These findings show that both state and trait stress has negative impacts on encoding with long term episodic memory (Payne et al., 2006).

It has been suggested that stress could cause different negative effects on the brain depending on the stage of life in which the high levels of stress occur (Lupien, McEwen, Gunnar, & Heim, 2009). Stress can have long lasting effects on adolescents and young adults because of the brain and cognitive development that occurs during this stage of life. During adolescence, stress hormones in the brain are already higher than that of children or adults due to normal hormonal changes that occur. But because of this, additional life stress can have detrimental impacts on the brain (Lupien et al., 2009). Because stress hormones are already at a high due to development, an increase in stress hormones can lead to damage that is correlated with an increase in the development of depression and anxiety disorders (Lupien et al., 2009). Lupien et al. also suggested that the effects of such high levels of stress hormones can have many other negative effects on the brain and overall functioning, but all the possibilities have not yet been explored.

Episodic memory is one of two types of declarative memory: semantic and episodic. Semantic memory is factual memory that is specialized for or knowledge about the world. This type of memory has been found to stay fairly resilient as people age. Episodic memory stores memories of specific life events, time, and places of events. These types of memories decay over time and episodic memory itself tends to decline with normal aging (Dikmen et al., 2014).

The negative effects stress can have on episodic memory increase with age, similar to the effects stress can have on other cognitive aspects. VonDras et al. (2005) found that high levels of daily stress can have a negative impact on cognitive functioning. This effect particularly impacts the episodic memory functioning of older adults. Episodic memory for this study was assessed by using The Logical Memory scale, which uses verbally presented passages and evaluated both immediate and delayed recall. Those who had higher levels of life stress, as indicated on the Perceived Stress Scale, or that had encountered more stressful events in their lives actually showed accelerated cognitive decline as indicated by their scores on the cognitive evaluations. This was found to be different than the declines of normal aging. This implies that increased life and trait stress speeds up the decline of memory abilities that normally happen with age (VonDras et al., 2005).

Trait stress overall has been linked to declines in memory abilities. This is due to the brain cell damage that occurs after prolonged exposures to stress hormones (McEwen & Sapolsky, 1995). Increased trait stress throughout a person's life can also cause declines in memory function, specifically episodic memory function. Episodic memory function normally declines with age. But due to the sped up cognitive aging effects of trait stress, episodic memory function decreases at a faster rate than normal aging for those that experience it. Therefore,

trait stress is directly linked to abnormal declines in episodic memory function (VonDras et al., 2005).

The Relationship of Pet Ownership and Episodic Memory

Based on the large variety of benefits companion animals can have on people, it is predicted that there may be additional benefits pets may have on their owners. Stress can be mediated and even reduced by the mere presence of an animal (Demello, 1999). The stress reduction that occurs is even detectable through physiological measures of heart rate and blood pressure.

Stress itself has many negative effects on humans, but the effect stress has on cognitive functioning is commonly overshadowed by the effects it has on physical health (VonDras et al., 2005). The specific facet of cognitive functioning that the current study focuses on is that of episodic memory. Because of the stress reducing abilities companion animals have, in addition to the negative effect stress has on episodic memory, people that have companion animals in their lives may have better episodic memory functioning than people living without pets. This may be due to a wide array of factors. One primary factor may be the non-evaluative social support that pets uniquely provide. This type of social support has been found to be the best type of social support for stress reduction in humans. There are many different reasons that pets are thought to reduce stress in humans. The stress reduction caused by pets in humans is predicted also be linked to higher levels of episodic memory abilities for pet owners when compared to non-pet owners. Because of the established relationship between pet ownership and stress reduction, and the impacts stress is known to have on episodic memory, the current research investigates the relationship of pet ownership and episodic memory as mediated through stress. The logical model of the development of

these concepts and their progression and relation to each other throughout the literature can be seen in Figure 1.

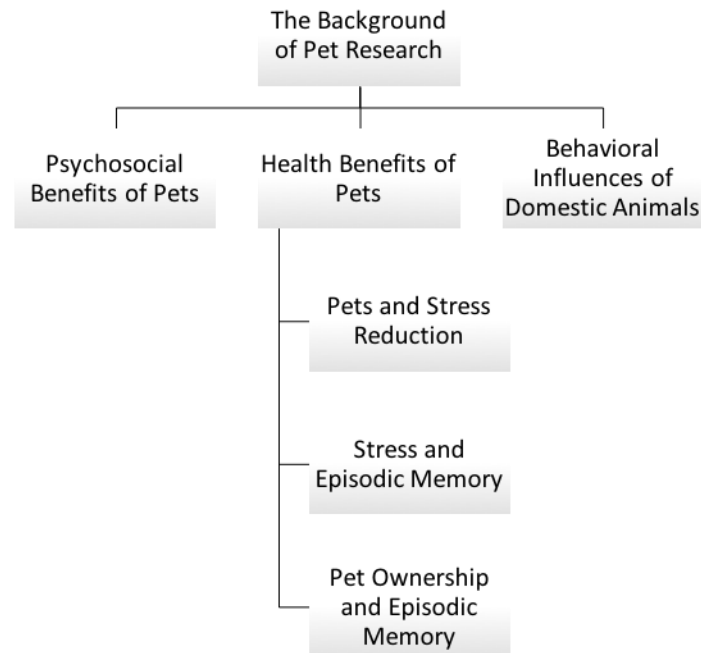


Figure 1. Literature review logic flowchart

Research Questions

1. Is episodic memory function higher for pet owners than non-pet owners?
2. Does higher pet attachment predict higher levels of episodic memory function?
3. Is higher pet attachment related to lower levels of trait stress?
4. Is there a relationship between lower levels of trait stress and higher episodic memory function?

CHAPTER 3: METHODOLOGY

Participants

The participants for this study were 49 undergraduate students at California State University, Fresno who were enrolled in the Psychology 10 course. The participants consisted of 14 men and 35 women. The participants' ages ranged from 18-49, with a mean age of 19.88. The participants were obtained using an online system. Students were allowed to participate in this study once, and after participation in the study the students received credit towards their introductory psychology course.

Although many of the studies that have looked at pet attachment have not used a college population, there are several reasons to think this population would be appropriate. First, Zasloff and Kidd (1994) examined pet attachment successfully while using an undergraduate population. Second, Barba (1995) showed that pets can aid in stress reduction for therapy patients of any age. Third, VonDras et al. (2005) used a wide age range of participants, starting as young as 19, to measure the effects of chronic stress on episodic memory. Therefore, previous research in the fields of pet attachment, pets and stress, and stress and episodic memory justify the use of an undergraduate population.

Design

This study used a quasi-experimental design, where the quasi-independent variable was whether or not the participant owns a pet as determined by their answer to the first question in the pet ownership determination portion of the survey (Appendix A). There were three dependent variables: episodic memory scores, state anxiety scores, and trait anxiety scores. Additional analyses were conducted on the correlations between pet attachment and episodic memory

scores, trait stress and episodic memory scores, and pet attachment and trait stress scores.

Measures

Episodic Memory

To measure episodic memory, the NIH Toolbox Picture Sequence Memory Test (PSMT) was used. The PSMT was developed to be able to test episodic memory abilities of a wide range of ages. Most measures of episodic memory use verbal tasks, but the PSMT was designed to use visual tasks instead to better measure episodic memory (Dikmen et al., 2014). It has been designed to measure episodic memory for participants from the ages 3 to 85. After much rigorous testing, this measure was found to have strong test-retest reliability over 2 weeks at 0.84, which is considered extremely high for a measure of episodic memory. This measure also has strong construct validity (0.64-0.72) when correlated with other widely used measures of episodic memory. As most executive functioning measures usually show, the scores decline with age which exhibits how it can test for brain aging factors of episodic memory (Dikmen et al., 2014). This test was obtained by gaining special clearance and access to the online assessment center that is used to distribute the measure.

This test was administered on a computer screen while the experimenter read instructions aloud and controlled the test from another screen (Appendix B, Figure B1). The participants went through a short practice sequence and then started the actual test. The participants were told “this is how you go camping” followed by an illustration of someone putting up a tent with the audio “set up the tent” was played. This occurred with several illustrations (Appendix B, Figure B2). The participants were asked to place the images in the order they were

presented after all the images had been shown (Appendix B, Figure B3). The images were not in a particular order that could be guessed by chronology alone. The first story and picture sequence consisted of 15 pictures to be placed in a particular order (Appendix B, Figure B4). After the first sequence was completed, participants were asked to complete a second sequence of 18 pictures (Appendix B, Figure B5). For the second sequence, the story and order was the same as the first sequence, but with three additional pictures integrated into the story. Participants were scored on how accurate the picture order they indicated matched the story presented. Partial points were given for pictures placed in the correct adjacent order, even if the placement was not exact. Possible scores ranged from 200 to 700. The participants were not made aware of how well they performed on the task and scores were later downloaded from the assessment website. This test lasted about 15 min.

Stress

In order to measure stress levels of participants, the State-Trait Anxiety Inventory (STAI) was selected for this study. The version used was the STAI-AD, which is the version that was designed to measure stress levels of adults (Spielberger & Gorsuch, 1983). The STAI-AD has been widely used to measure both state anxiety and trait anxiety and has been tested many times for validity and reliability (Julian, 2011). Test-retest reliability evaluations have shown that the trait anxiety portion of this measure is more reliable than the state anxiety portion, ranging from 0.31 to 0.86 (Julian, 2011). The current study focused on trait anxiety, or trait stress, so this finding was beneficial for justifying the use of this measure. Internal consistency was also very high with an alpha coefficient ranging from 0.86 to 0.95. This measure scores high on content validity, but also correlates

highly with measures of depression, but this is normal for the construct of anxiety (Julian, 2011).

The STAI is a 40-item questionnaire that asks participants to rate how certain statements relate to themselves (Appendix C). For this a 4-point rating scale was used that ranged from 1 *Not At All* to 4 *Very Much So*. Some examples of statements were “I am presently worrying over possibly misfortunes” and “I worry too much over something that really doesn’t matter.” This measure was scored by adding up the total score of responses, while also using reverse scoring for 19 items. Possible scores ranged from 20 to 80 for the first 20 questions measuring state anxiety and 20 to 80 for the second 20 questions that measured trait anxiety.

Social Support

A measure of human social support was included. This measure was included to potentially rule out the third variable of human social support. Because of one possible reason for pets causing a reduction in stress is due to their ability to provide social support, human social support may also aid in stress reduction.

To measure social support, the Duke-UNC Functional Social Support Questionnaire was used (Broadhead, Gehlbach, De Gruy, & Kaplan, 1988) (Appendix D). The measure consisted of eight questions that participants answered using a five-point rating scale that ranged from “As much as I would like” to “Much less than I would like.” Some examples of questions are “I have people that care what happens to me” and “I get useful advice about important things in life.”

Pet Attachment

To measure pet attachment, the Pet Attachment Survey of the Center for the Study of Human–Animal Relationships and Environments (CENSHARE PAS) was used. This measure has been found to be suitable for measuring attachment levels of both cat and dog owners (Holcomb, Williams, & Richards, 1985). This survey measures these attachments in two different dimensions: relationship maintenance and intimacy. Tests that evaluated this measure found that it has high internal consistency with a reliability Cronbach's Alpha = .83 for relationship maintenance and a Cronbach's Alpha = .74 for intimacy (Holcomb et al., 1985). The CENSHARE PAS also has high content validity for the two pet attachment dimensions it is said to measure (Holcomb et al., 1985). This measure is one of the most commonly used in pet attachment research and other areas of general companion animal research.

The CENSHARE PAS contains 27 statements for which participants are asked to rate how much they identify with each statement (Appendix E). For these ratings a four-point rating scale is used that ranges from 1 *Almost Always* to 4 *Almost Never*. Examples of the statements in this survey include “You show photos of your pet to your friends” and “when you feel bad, you seek your pet for comfort.” The measure is scored by adding up the total score of responses, while also using reverse scoring for four items. Possible scores on this measure range from 27 to 108, with lower scores representing higher levels of attachment.

Procedure

Overall the tasks lasted about 30 min. Once participants arrived to the experiment they were given an informed consent form (Appendix F) for them to read and sign, copies of the informed consent form were available for the participants who wish to have a copy. Each participant completed the tasks in the

same order: Picture Sequence Memory Test, STAI-AD, Duke-UNC Functional Social Support Questionnaire, and CENSHARE PAS. This ordering was chosen for minimal carryover effects. Because the Picture Sequence Memory Test was the primary measure of the study that was placed first to avoid carryover from any of the other measures. Although there may be increased state stress after completing the Picture Sequence Memory Test, it is believed to be minimal and the study focuses on trait stress more so than state stress.

Participants were taken into a small cubicle with a computer and two chairs. Participants were then given and asked to sign the informed consent. After that, the participants sat at a computer and were told that they would be answering some demographic questions (Appendix G) and completing a simple test. The experimenter sat next to the participant with their own computer screen that the participants could not see. The experimenter then began the practice portion of the Picture Sequence Memory Test. After the practice portion, the test starts, with the experimenter reading the instructions aloud and making sure that the participants stay focused on the task.

Once the episodic memory task was completed, the experimenter would bring up a webpage on the participant's computer that contained the STAI-AD, Duke-UNC Functional Social Support Questionnaire, and the CENSHARE PAS. Participants were instructed to fill out all the questions that were presented on the screen until they were instructed that the experiment was over. After that, the experimenter informed the participants that their responses were confidential and that the experimenter will not be present while this portion is completed. Each participant completed all portions of the surveys. Participants started by completing the STAI-AD and then completed the Social Support Questionnaire. Following those two measures were several questions pertaining to the

participant's pet ownership (Appendix A). After completing all of the pet ownership questions, participants started the CENSHARE PAS. Following this are three free response questions where participants were asked to describe their current and previous pet ownership (Appendix H). After completing all necessary portions, participants went through a short debriefing where they were informed that the study sought to examine the relationship between pet attachment, stress, and episodic memory ability.

CHAPTER 4: RESULTS

Data Scoring

After data collection was completed, the results for all participants were downloaded from the assessment center website and Qualtrics. Before an analysis was completed, the scores for each measure were calculated. The online server that was used to collect the data computed the episodic memory scores. The STAI-S and STAI-T scores were calculated by hand starting with reverse scoring items 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20 for the STAI-S and items 21, 23, 26, 27, 30, 33, 34, 36, and 39 for the STAI-T, and then calculating the total score. Summing the total score and then dividing that by the total number of questions calculated the social support scores. The pet attachment measure was scored by reverse scoring items 2, 13, 19, and 20, and then getting the participant's total score. The scores for pet attachment were inverse; meaning lower scores meant higher pet attachment.

After all the data were scored, an outlier analysis was conducted. This was done by calculating the standard deviation for each measure, and then checking for any participant that had a score that was more than 2.5 standard deviations away from the mean. From this analysis, only one score was found to be an outlier from the social support scores. After further investigation of that participant's score on all the measures, it was decided to still include the participant in the final analysis because no other measure scores were outlying and because the social support measure was not necessary to answer the primary research question. There were 30 participants in the pet owner group and 19 participants in the non-pet owner group.

Primary Analyses

Two-tailed tests using an alpha of .05 were used for all analyses. The first research question was investigated to see if there were any differences in episodic memory across the quasi-independent variable of pet owners and non-pet owners. To test the differences between pet owners and non-pet owners in the areas of episodic memory, an independent samples *t*-test was used with an alpha level of .05. Episodic memory for pet owners ($M = 592.42$, $SD = 81.60$) was not statistically different from episodic memory for non-pet owners ($M = 587.57$, $SD = 72.70$), $t(47) < 1$, $p = .83$, $d = .06$. There were no differences in episodic memory across pet owners.

The second research question investigated whether levels of pet attachment predicted episodic memory function for pet owners. To address this question, a Pearson's *r* correlation coefficient was calculated between pet attachment and episodic memory for pet owners only. There was no statistically significant relationship between pet attachment and episodic memory, $r(28) = .01$, $p > .05$.

The third research question investigated whether there was a relationship between pet attachment and trait stress. First, to analyze this question, an independent samples *t* test was used to see if there were any differences in trait stress between pet owners and non-pet owners. Pet owners did not have statistically higher trait stress scores ($M = 44.17$, $SD = 11.55$) than non-pet owners ($M = 43.63$, $SD = 11.00$), $t(47) < 1$, $p = .54$, $d = .05$. Next, a correlation was computed using pet owners only to see if pet attachment levels predicted trait stress levels. There was not a statistically significant relationship between pet attachment ($M = 55.80$, $SD = 13.06$) and trait stress ($M = 44.17$, $SD = 10.82$), $r(28) = .04$, $p > .05$.

The fourth research question examined whether there was a relationship between trait stress level and episodic memory function across all participants. Here, there was not a statistically significant relationship between trait stress and episodic memory, $r(47) = -.04$, $p > .05$.

Secondary Analysis

Scores for state stress were also examined to see if there were any differences between pet owners and non-pet owners. An independent samples t test revealed that pet owners did not have statistically higher state stress ($M = 37.93$, $SD = 10.82$) than non-pet owners ($M = 36.53$, $SD = 9.92$), $t(47) < 1$ $p = .649$, $d = .13$. An independent samples t -test also revealed no significant differences in social support between pet owners ($M = 2.12$, $SD = 1.05$) and non-pet owners ($M = 2.24$, $SD = 1.03$), $t(47) < 1$ $p = .690$, $d = .12$.

Overall analyses were conducted on the correlations between episodic memory, state stress, trait stress, and social support for all participants. There were statistically significant correlations between state stress and trait stress, social support and state stress, and social support and trait stress (see Table 1).

Table 1

Correlations of Episodic Memory, State Stress, Trait Stress and Social Support for All Participants

Measures	1 r	2 r	3 r	4 r
1. Episodic Memory	-			
2. State Stress	-.07	-		
3. Trait Stress	-.04	.66**	-	
4. Social Support	.17	.30*	.47**	-

** . Correlation is significant at the 0.01 level (2-tailed)

* . Correlation is significant at the 0.05 level (2-tailed)

The correlations were analyzed for pet owners only to investigate if there were any significant relationships between variables specifically for this group. There were statistically significant relationships between state stress and trait stress, and also a significant relationship between social support and trait stress (see Table 2).

Table 2

Correlations of Episodic Memory, State Stress, Trait Stress, Social Support, and Pet Attachment for Pet Owners

Measures	1	2	3	4	5
	<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>
1. Episodic Memory	-				
2. State Stress	-.07	-			
3. Trait Stress	-.10	.67**	-		
4. Social Support	.30	.32	.48**	-	
5. Pet Attachment	.01	-.02	.04	.05	-

** . Correlation is significant at the 0.01 level (2-tailed)

* . Correlation is significant at the 0.05 level (2-tailed)

Correlations were also analyzed for only non-pet owners. This was also done to see if there were any relationships between the variables specifically for this group alone to further examine the differences that there may be between pet owners and non-pet owners. There were statistically significant correlations between state stress and trait stress, and also between social support and trait stress. This pattern is similar to that of pet owners (see Table 3).

Table 3

Correlations of Episodic Memory, State Stress, Trait Stress and Social Support for Non-Pet Owners.

Measures	1	2	3	4
	<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>
1. Episodic Memory	-			
2. State Stress	-.07	-		
3. Trait Stress	.07	.63**	-	
4. Social Support	-.07	.28	.48*	-

** . Correlation is significant at the 0.01 level (2-tailed)

* . Correlation is significant at the 0.05 level (2-tailed)

To investigate and expand the analysis of pet ownership, we separated participants into three pet ownership categories: living with a pet ($n=24$), having no pet ($n=16$), and having a pet but not living with it ($n=9$). We acknowledge the lack of power in this analysis. A one-way between-subjects analysis of variance (ANOVA) revealed no statistical differences on episodic memory when participants lived with a pet ($M = 606.46$, $SD = 75.58$), did not live with their pet ($M = 560.88$, $SD = 80.02$), or had no pet at all ($M = 583.36$, $SD = 77.92$), $F(2, 46) = 1.25$, $p = .297$, partial $\eta^2 = .05$. There were no other main effects of pet living situation (see Table 4).

To further expand the analysis of pet ownership and attachment, pet owners were classified into two categories of either highly attached or not highly attached. Pet owners that scored less than 63 on the attachment scale as measured by the CENSHARE PAS were counted as highly attached. This analysis was done to investigate if there were unique relationships for pet owners that were more attached to their pet, since attachment is a primary predictor in this study. Lower scores on this scale meant higher levels of attachment. Twenty pet owners were included in this analysis. Correlations for this subgroup of highly attached pet owners showed the same trends as pet owners of all attachment levels (see Table 5).

Table 4

Measures of Episodic Memory, State Stress, Trait Stress, and Social Support for Differing Pet Living Arrangements

Measures	Live with a Pet	Do not Live with Pet	No Pets	F	p
Episodic Memory				1.25	.297
M	606.46	560.88	583.36		
SD	75.58	80.02	77.92		
State Stress				0.23	0.795
M	38.33	35.67	36.94		
SD	11.50	6.58	2.70		
Trait Stress				0.93	0.402
M	45.92	40.11	43.19		
SD	12.64	5.01	11.37		
Social Support				0.10	0.906
M	2.23	2.17	2.08		
SD	1.18	.75	.98		

*p<.05

Table 5

Correlations of Episodic Memory, State Stress, Trait Stress, Social Support, and Pet Attachment for Highly Attached Pet Owners

Measures	1	2	3	4	5
	r	r	r	r	r
1. Episodic Memory	-				
2. State Stress	-.08	-			
3. Trait Stress	-.22	.60**	-		
4. Social Support	.22	.38	.61**	-	
5. Pet Attachment	-.02	-.16	-.26	-.44+	-

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

+ Correlation is significant at the 0.053 level (2-tailed)

For this group of highly attached pet owners, there was a statistically significant negative correlation between pet attachment and social support $r(18) = -.44, p = .053$ (see Figure 2). Because lower pet attachment scores indicated higher levels of attachment, this relationship means pet attachment increased with general social support for highly attached pet owners.

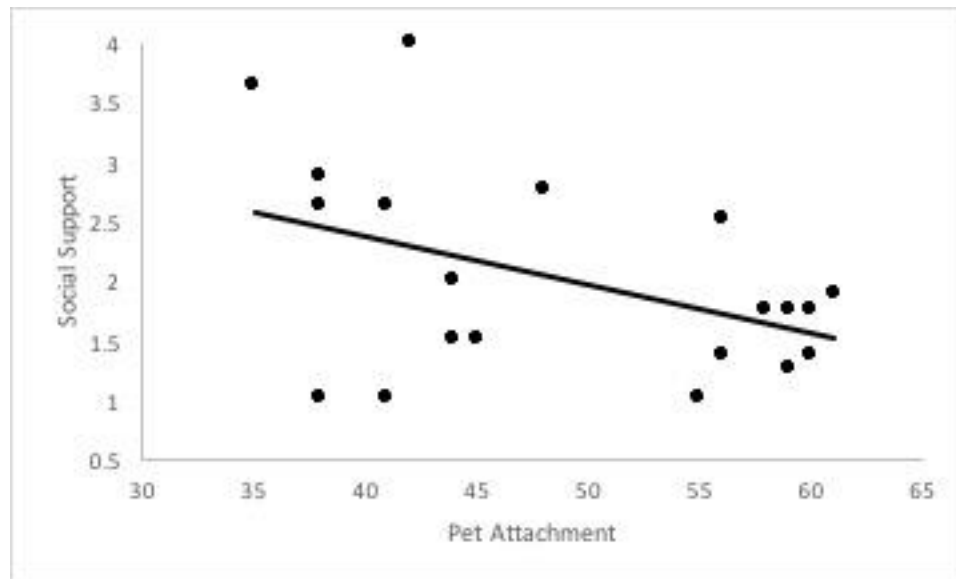


Figure 2. Correlation of pet attachment and social support for highly attached pet owners

CHAPTER 5: DISCUSSION

The current research investigated four main questions about pet ownership, pet attachment, stress, and episodic memory. The first question asked if episodic memory function was higher for pet owners than non-pet owners. The second question asked whether there was a positive relationship between pet attachment and episodic memory function for pet owners. The third research question asked whether higher levels of pet attachment were related to lower levels of trait stress for pet owners. The final research question asked whether there was a relationship between lower levels of trait stress and higher levels of episodic memory functioning.

All four of the research questions were necessary to be able to investigate the overall relationships that were predicted between pet ownership and episodic memory. These questions were formulated on the basis that pet ownership has consistently been found to reduce stress in humans (Allen, 2003; Allen et al., 1991, 2001; Barba, 1995). Stress has been proven to cause cognitive deficits over time, and trait stress is specifically harmful to episodic memory functioning. Therefore, it was predicted that pet ownership would be related to episodic memory functioning as mediated by trait stress.

The current study did not support this hypothesis. There were no significant differences in episodic memory function between pet owners and non-pet owners. There were also no relationships found between pet attachment levels and episodic memory and trait stress as predicted. Both state and trait stress failed to predict differences in episodic memory. Additionally, pet ownership and attachment levels had no relationship with either state or trait stress. Both state and trait stress

were related to higher levels of social support for both pet owners and non-pet owners.

It was hypothesized that the differences in episodic memory function were mediated through stress reduction related to pet ownership. Previous research has found that lower levels of both trait and state stress were related to higher cognitive functioning (Payne et al., 2006). Previous research also found that pets are related to human stress reduction (Allen, 2003; Allen et al., 1991, 2001; Barba, 1995). Therefore, the possible link between pet ownership, stress, and episodic memory seemed to be well supported from the culmination of previous research. Pet owners were not found to have lower levels of trait stress and pet owners did not have higher levels of episodic memory. Pet owner's attachment levels also had no significant relationship with their levels of episodic memory function. Additionally, the link between trait or state stress and episodic memory was not replicated in the current study.

One of the main explanations for why this occurred may be due to the general age of the participants. VonDras et al. (2005) explained that the decrease in episodic memory function due to stress is something that occurs over extended exposure to trait stress. With the mean age of the participants being just below 20, it is possible that there has not been enough exposure to trait stress to cause measurable differences in episodic memory function decline. This, however, is different than merely comparing average trait stress scores for age. The level or score of trait stress is not necessarily the same as the duration of stress over a person's lifetime. The age of the participants in this study is also in line with the expected peak in episodic memory function, which may also explain these results. Dikmen et al. (2014) found the normal decline in episodic memory to occur around age 30 when using this measure with participants who did not have any

forms of accelerated cognitive aging. The average age adjusted percentile of participants' scores from the current study was 63, which would suggest that the episodic memory scores of the current study were not abnormal.

As for the lack of replication of pet owners having lower levels of trait stress found in previous research, there are also some possible reasons for this finding. Although pet attachment was measured and also not found to predict stress levels, overall participant exposure to a pet was not investigated. Living with a pet or not did not show any link to stress differences, but it may be because of the amount of time spent with the pet. The population used consisted of undergraduate college students. This population may include pet owners, but the time they can spend with the pet can vary greatly. Therapeutic studies of pets and stress reduction have focused on the effects pets can have when much time is spent with a pet, and being able to focus on the pet (Barba, 1995). This may be much different from simply owning a pet or how attached one is to their pet. This population was used because pet ownership was found to have an impact on college students on levels of empathy (Hyde et al., 1983). Zasloff and Kidd (1994) also found differences between pet owners and non-pet owners on levels of loneliness using a college population. Although pets may be able to still impact empathy and loneliness, the exposure a college student has to their own pet may not be enough to cause the stress reduction benefits that have been previously found.

The second research question investigated if higher levels of pet attachment would predict higher levels of episodic memory function. This hypothesis was not supported in the current study. Pet owner's attachment levels had no significant relationship with their levels of episodic memory function. Much of the explanation for these findings is similar to that of pet owners not differing on

episodic memory function from non-pet owners as previously discussed. It is possible that the question is not about pet attachment but rather pet exposure. College students may own a pet, but could possibly spend much less time with that pet, regardless of their levels of attachment to the pet.

Additionally, this may also have to do with stress exposure. Participants may have not experienced trait stress for a long enough time to show measurable differences in episodic memory function. It was predicted that higher levels of trait stress would predict lower levels of episodic memory function. Stress has been found to speed up cognitive aging, with episodic memory being one factor that decreases with aging (VonDras et al., 2005). The effects of stress on cognitive aging of the participants may have not manifested on a measureable level yet.

As a possible explanation for differences in stress and episodic memory, general social support was also measured. There were no significant differences in social support between pet owners and non-pet owners. However, there was a significant relationship found for all participants between social support and both state and trait stress. Interestingly, the relationship found was a positive correlation. This means that as someone's social support increased, their levels of both state and trait stress increased. One possible explanation for this result is the concept of evaluative social support. The idea behind evaluative social support is that friends or family may be able to provide social support, but that support is not beneficial in the aspect of stress (Allen et al., 2001). People who you are close to may judge or evaluate you in areas of success or ability. This is thought to be the unique difference between having animals instead of people for support because pets are able to provide non-evaluative support. Pets do not evaluate people on successes or failures; therefore, getting support from a pet does not cause the stress from evaluation or judgment that human social support can cause.

A secondary analysis examined the relationships of pet attachment, stress, social support, and episodic memory for pet owners that were highly attached to their pets. The results of this analysis found a relationship between pet attachment and social support. For this group, as pet attachment increased, levels of perceived general social support also increased. These findings replicate the findings previous research, which has found that pets and pet attachment are related to general social support (Castelli et al., 2001; Duvall Antonacopoulos & Pychyl, 2010; Zasloff & Kidd, 1994). For previous research, the explanation for this finding has been that pets have the ability to improve and boost existing social support. Although there are no definite explanations for why this occurs, it is thought that there is something unique about a person's relationship with a pet that enhances their relationships with other people. Some suggestions have been that pets act as social catalysts, providing topics or less stressful situations that may elicit social interactions. This correlation between pets and social support has been repeatedly found, but there has not been any in depth exploration into the factors that mediate this relationship specifically.

Limitations and Future Research

One of the main limitations of this research was the use of a cross-sectional design instead of a longitudinal research design. Longitudinal research in past studies have been the most successful in being able to examine the differences pet ownership can make (Serpell, 1991; Siegel, 1990). These types of studies were able to track changes in physical and psychological health for pet owners and were able to compare that to those of non-pet owners. This type of research may be the most beneficial because of the changing and varying nature of stress, but also may be the most difficult to conduct. Additionally, longitudinal studies in the future

could also use this similar methodology to track changes in episodic memory function over time for pet owners and non-pet owners.

Future research could also explore the differences in participants' exposure to their pet. A replication of this study with the same population, but with gathering information on the time people spend with their pet could help explain the results of the current study. There may also be vast differences in pet attachment. Replicating this study with varying pet attachment scales may give more insight in to why significant differences were not found in the current study. A person's attachment to their pet differs greatly and is quite subjective. The nature of a person's relationship with their pet may better account for stress and memory benefits than measuring attachment and ownership alone. Potentially being able to measure something like pet bond may also answer these questions, but at the current state of the research, there is not yet a definitive way to reliably measure the exact nature of pet bond.

Another area of future research could investigate not only the differences in the nature of pet attachment and pet relationships, but could also examine the differences in social support relationships. As there are great variations in the nature of relationships with pets, the nature of social support relationships may also vary. These variations may better explain the evaluative social support theories and expand the existing explanations. This would help explain the findings of the current study of trait stress increasing as perceived social support increases.

It would also be extremely beneficial for future research to look at the duration and exposure to trait and life stress. The use of a more invasive and detailed trait stress measure that evaluates how long someone has experienced stress could help explain the findings of the current study. The STAI-AD used in

the current study is valid and reliable for providing a snapshot of a person's state and trait stress, but does not investigate things like duration of stress. This would be important, especially when studying episodic memory, because these cognitive declines occur after extended exposure to stress.

Finally, future research could investigate the same questions as the current study, but with a different population. A middle aged population may be able to show the long term impacts trait stress can have on episodic memory, and be able to better show those differences in memory function. This suggested population may also provide researchers with a better measure of trait stress due to potential extended exposure to this type of stress.

General Conclusions

Although none of the predictions were supported in the current study, the results of this study are still able to provide a lot of important information. There was not a relationship between pet ownership and episodic memory as mediated through stress. There also was no replication of the previous research for the relationship of stress and episodic memory. However, the relationships that were found in the current study open up future research to not only investigate the original research questions using different methods and populations, but to also investigate the relationship social support may have with other factors that may be influenced by both state and trait stress. Social support may increase stress, but it is also possible that increased stress may cause people to seek more social support. High levels of pet attachment also predicted higher levels of social support. With this replication, it is important to investigate different aspects of both pet attachment and social support. Pets may increase our ability to form bonds and receive support from others, while it is also possible that pets may change other

factors of a person that may boost this social support. Although the significant and non-significant findings of the current study seem to be definitive, many more questions remain to be answered and the continuation of quantitative research in the field of pet ownership and attachment is vital for the advancement of this field of research.

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APPENDICES

APPENDIX A: PET OWNERSHIP DETERMINATION QUESTIONS

Do you have a cat or a dog of your own?

Yes

No

>>

Do you have a cat or a dog of your own?

Yes

No

Do you live with this pet?

Yes

No

I do not have a pet

I live with a pet but it is not mine

Do you have a cat or a dog?

Cat

Dog

Both

Neither

Which pet do you feel most attached to?

Cat

Dog

I do not have any pets

How many of each pet do you have?

	0	1	2	3	4
Cats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dogs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX B: THE NIH TOOLBOX PICTURE SEQUENCE
MEMORY TEST



Figure B1. Experimenter screen (first testing sequence).

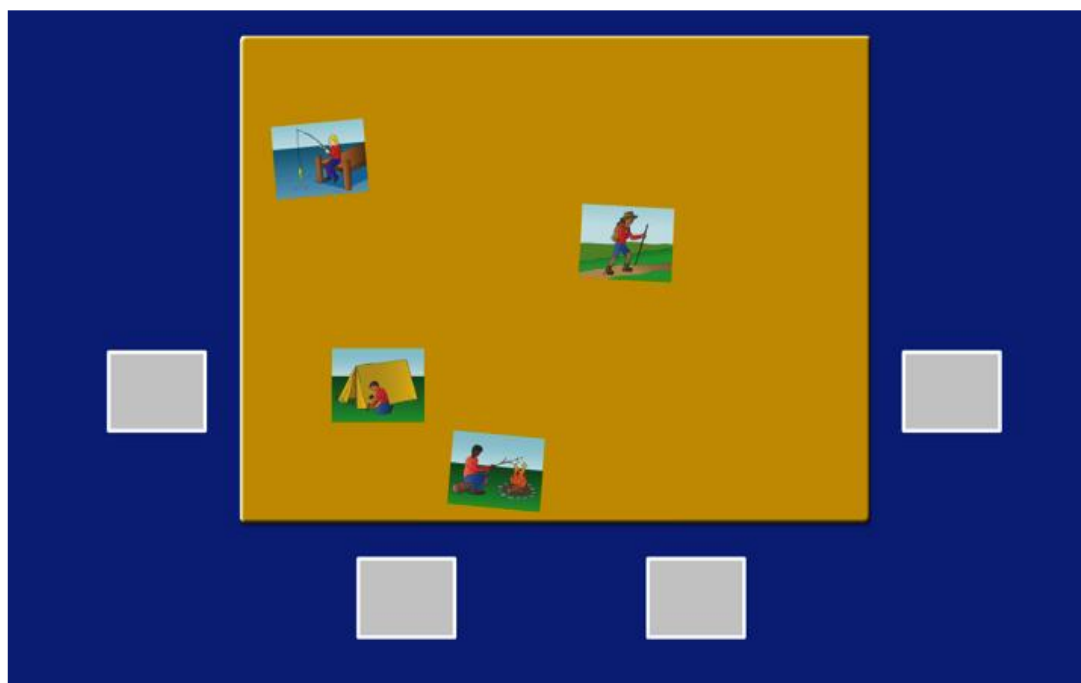


Figure B2. Items to be placed in story order (practice).

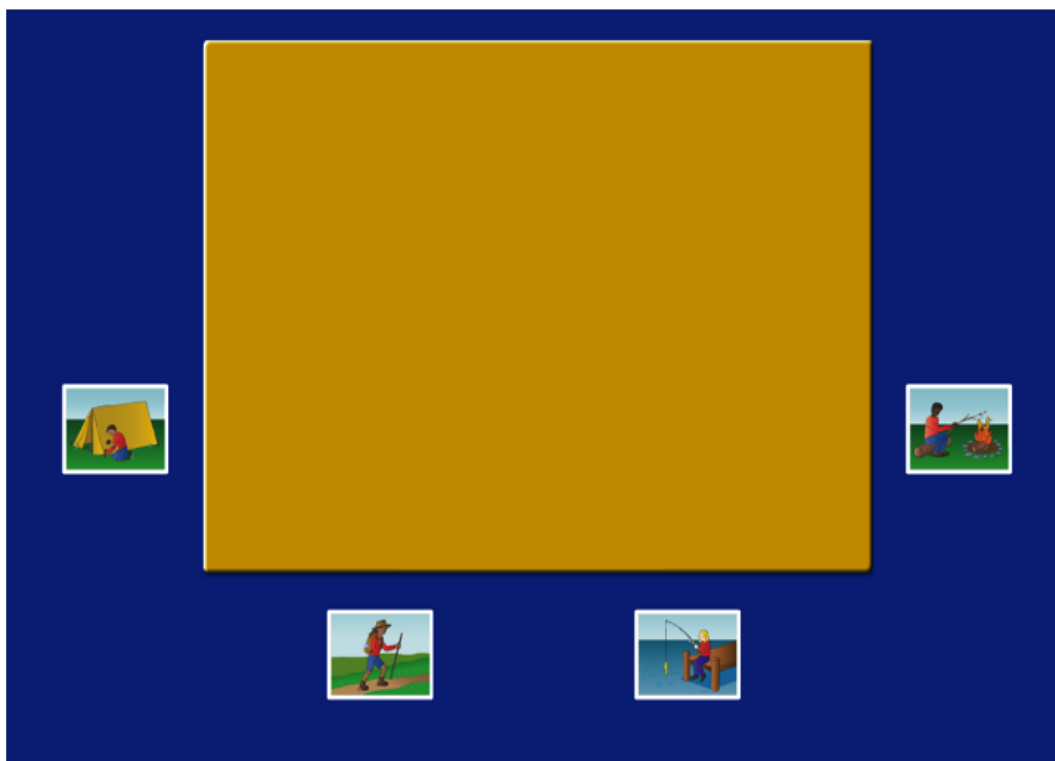


Figure B3. Items placed in story order (practice).

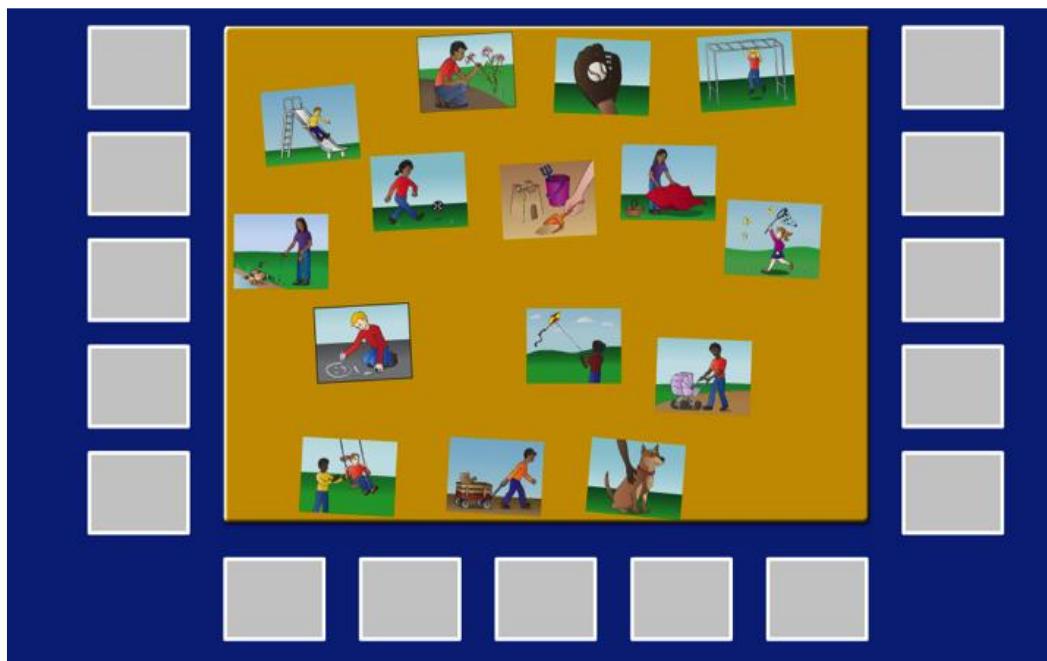


Figure B4. Participant screen (first testing sequence).



Figure B5. Participant screen (second testing sequence).

APPENDIX C: THE STATE-TRAIT ANXIETY INVENTORY

A number of statements which people have used to describe themselves are given below. Read each statement and then select the appropriate bubble to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I feel secure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I am tense	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I feel strained	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I feel at ease	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I feel upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I am presently worrying over possible misfortunes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I feel satisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I feel frightened	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I feel comfortable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I feel self-confident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I feel nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I am jittery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. I feel indecisive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. I am relaxed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. I feel content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. I am worried	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. I feel confused	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. I feel steady	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. I feel pleasant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A number of statements which people have used to describe themselves are given below. Read each statement and then select the appropriate bubble to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. I feel nervous and restless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. I feel satisfied with myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. I wish I could be as happy as others seem to be	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. I feel like a failure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. I feel rested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. I am "calm, cool, and collected"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28. I feel that difficulties are piling up so that I cannot overcome them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29. I worry too much over something that really doesn't matter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30. I am happy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31. I have disturbing thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32. I lack self-confidence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
33. I feel secure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
34. I make decisions easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
35. I feel inadequate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
36. I feel content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
37. Some unimportant thought runs through my mind and bothers me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
38. I take disappointments so keenly that I can't put them out of my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
39. I am a steady person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX D: DUKE-UNC FUNCTIONAL SOCIAL SUPPORT
QUESTIONNAIRE

Here is a list of some things that other people do for us or give us that may be helpful or supportive. Please read each statement carefully and click a bubble in the column that is closest to your situation. Give only 1 answer per row.

	As much as I would like	Almost as much as I would like	Some, but would like more	Less than I would like	Much less than I would like
1. I have people who care what happens to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I get love and affection.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I get chances to talk to someone about problems at work or with my housework (or school).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I get chances to talk to someone I trust about my personal or family problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I get chances to talk about money matters.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I get invitations to go out and do things with other people.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I get useful advice about important things in life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I get help when I am sick in bed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX E: PET ATTACHMENT SURVEY OF THE CENTER
FOR THE STUDY OF HUMAN-ANIMAL RELATIONSHIPS
AND ENVIRONMENTS

Please respond to the following statements in regards to the pet you are the most attached to.

	Almost Always	Often	Sometimes	Almost Never
1. Within your family, your pet likes you best.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. You are too busy to spend time with your pet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. You spend time each day playing with or exercising your pet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Your pet come to greet you when you arrive.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. You talk to your pet as a friend.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Your pet is aware of your different moods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Your pet pays attention and obeys you quickly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. You confide in your pet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. You play with your pet when he/she approaches.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. You spend time each day training your pet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. You show photos of your pet to your friends.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. You spend time each day grooming your pet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. You ignore your pet when he/she approaches.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. When you come home, your pet is the first one to greet you.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Your pet tries to stay near by following you.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. You buy presents for your pet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. When you feel bad, you seek your pet for comfort.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. You prefer to be with your pet more than with most people you know.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. When your pet misbehaves, you hit him/her.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. Your pet is a nuisance and a bother to you.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. You consider your pet to be a family member.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. You like to touch and stroke your pet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. You feel sad when you are separated from your pet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. You like to have your pet sleep near your bed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. You like to have your pet sleep on your bed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. You have your pet near you when you study, read, or watch TV.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. You don't like your pet to get too close to you.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX F: INFORMED CONSENT

INFORMED CONSENT FORM

You are invited to participate in a study conducted by Dr. Karl Oswald and Carla Caffrey-Casiano of the Department of Psychology at California State University, Fresno. We hope to learn about what may change student's levels of cognitive processing. You were selected as a possible participant in this study because you were a member of the psychology undergraduate participant pool.

If you decide to participate, you will complete a short memory task, fill out two short surveys that will ask about your personal life. All of your responses will remain confidential. The experiment will last about 30 minutes.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. If you give us your permission by signing this document, we plan to disclose the results only in the form of grouped data and statistics in a research article format. Your data will not be individually identifiable and your data will be kept in a locked room that only members of our research team will have access to.

For your participation in this study you will receive one credit towards your Psychology 10 research participation requirement.

Your decision whether or not to participate will not prejudice your future relations with California State University, Fresno and the Department of Psychology. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. The Committee on the Protection of Human Subjects at California State University, Fresno has reviewed and approved the present research. If you have any questions, please ask us.

If you have any additional questions later, Dr. Karl Oswald (559-278-4215) will be happy to answer them. Questions regarding the rights of research subjects may be directed to Constance Jones, Chair, CSUF Committee on the Protection of Human Subjects, (559) 278-4468.

You will be given a copy of this form to keep.

YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE. YOUR SIGNATURE INDICATES THAT YOU HAVE DECIDED TO PARTICIPATE, HAVING READ THE INFORMATION PROVIDED ABOVE.

Date

Signature

Relationship to Subject

(This line should not appear on forms that will be given to subjects consenting for themselves)

Signature of Witness (if any)

Signature of Investigator

APPENDIX G: DEMOGRAPHIC QUESTIONS

Please complete all applicable registration information below.
All information will be kept confidential.

Age

Ethnicity

- ☐ Hispanic or Latino
☐ Not Hispanic or Latino
☐ Not Provided

Gender

- ☐ Male ☐ Female

Race

- ☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or Other Pacific Islanders
☐ Not Provided
☐ Other
☐ White

[Continue](#)

Please complete all applicable registration information below.
All information will be kept confidential.

Year in College

Socioeconomic Status

Please Select 

Continue

**APPENDIX H: PREVIOUS AND CURRENT PET OWNERSHIP
QUESTIONS**

Please explain your current pet ownership

Please explain your pet ownership within the last year

Please explain your history of pet ownership

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