Running head: PETS AND STRESS

Stress in Pet Owners and Non-Pet Owners

Jill A. Kraus

Abstract

It has previously been suggested that pet ownership is associated with lower levels of stress. In the current study, this association was tested, while controlling stressful life experiences and social support, and the limits of this association were examined. It was expected that pet ownership would be associated with lower levels of subjective stress only when there were moderate levels of objective stress and perceived social support. Participants were 1,512 males and females between the ages of 14 and 83, primarily residing in the United States. The results suggest that, regardless of objective stress or perceived social support levels, pet ownership is associated with lower levels of subjective stress. Additionally, a negative correlation was found between frequency of interaction with the pet and subjective stress scores, suggesting that those who interact with their pets more frequently enjoy lower levels of subjective stress. Directions for future research are discussed.

Stress in Pet Owners and Non-Pet Owners

Over the years, much research has been dedicated to studying stress and the effects of stress on people's physical and mental health. The negative impacts that daily stressors can have on one's general health and mood have been reported for years. For instance, in a six-month study conducted by DeLongis, Folkman and Lazarus (1988), significant relationships were found between daily stress and the occurrence of flu, sore throat, headaches, backaches, and mood disturbances. This suggests that people tend to have poorer health at times when they experience more stress.

However, people who experience stress do not invariably experience such negative outcomes. For instance, the effects of stress may be buffered by various factors, including social support. Among the 75 married couples who took part in DeLongis, Folkman, and Lazarus's (1988) study, it was found that participants with unsupportive social relationships were more likely than those with supportive social relationships to experience the negative effects of stress. The effects of social support on stress and health have been studied extensively, and many researchers report that strong social support may serve as protection against the adverse effects of stressful life events (Cohen & Wills, 1985). This is generally known as the buffering model of social support.

Although much research has been conducted on the topic of social support, researchers acknowledge that there is no one definition of what social support really is (House, Umberson, & Lanis, 1988). For the purposes of this study, social support is defined as the perceived availability of someone in the individual's life who he or she feels will be there during difficult times. Similar definitions of perceived social support have been used in other studies (see e.g., Zimet, Dahlem, Zimet, & Farley, 1988).

Despite some differences between studies in the exact definition of social support that is used, there is agreement across these studies that social support is usually used to refer to the human element in people's lives. Friends, family, and co-workers can be a part of one's social network. However, it is also possible that pets may fit the definition of social support as described above. Additionally, many studies looking at the effects of pet ownership have found results similar to some studies looking at the effects of social support. For example, companion animals have previously been associated with beneficial outcomes related to physical health and behavior. In a study by Serpell (1991) using the General Health Questionnaire, dog owners reported a highly significant reduction in minor health problems when compared to the group without pets. Animal therapy programs have also been associated with reduced anxiety levels in hospitalized patients (Barker & Dawson, 1998). Furthermore, it has been suggested by Allen, Blascovich and Mendes (2002), that pets lower physical reactivity to stress because they are serving as a non-critical form of social support. Thus, like more traditional forms of social support, pets might serve as a buffer to the effects of stress.

The current study aims to explore the possibility that pets serve as a source of social support, as well as to explore the limits of pet ownership as a means for reducing stress. In light of these goals, the remainder of this introduction is divided into four parts. The first section reviews some of the research on the negative outcomes with respect to both physical and mental health that are associated with stress. The second section explores the role that social support may play in reducing the negative effects of stress. The third section addresses the possible role that pet ownership may play in reducing stress and the possible limits of this role. Lastly, the final section provides an overview of

the current study which was designed to investigate the circumstances in which pet ownership is associated with lower levels of stress.

Stress

Physiological responses to stress. Experiencing stress has been found to be associated with negative physical and psychological outcomes. With respect to physical outcomes, it has previously been shown that there is a general decline in physical health during exposure to stress (DeLongis et.al., 1988). Physiologically, the human body responds to stress by releasing certain hormones. An increase of cortisol in the blood, for example, is directly associated with stress (Kirschbaum & Hellhammer, 1994). Another physiological response to stress is a rise in blood pressure. It has been suggested that chronic exposure to stress may ultimately cause hypertension (consistently elevated blood pressure) due to the repeated increases in blood pressure and release of hormones such as cortisol during stressful times (Kulkarni, O'Farrell, Erasi, & Kochar, 1998). In addition to blood pressure, stress has also been associated with an increase in cholesterol levels. In a study which asked 26 male participants to perform a stressful arithmetic task, cholesterol levels were measured during a baseline, task, and recovery session. Heart rate, blood pressure and cholesterol levels were all significantly higher during the mental stress task (Muldoon, Bachen, Manuck, Waldstein, Bricker & Bennett, 1992).

Health conditions associated with stress. In addition to having a direct effect on the human body, stress has also been shown to increase the likelihood of the occurrence of certain health conditions. Three of the health conditions that have been found to be associated with stress are upper respiratory infections, peptic ulcers, and headaches. Cobb and Steptoe (1996), for example, have demonstrated that those with high levels of

stress are at a greater risk of developing upper respiratory infection. In this study, 107 adults between the ages of 18 and 65 took part in a 15-week analysis which included weekly perceived stress measurements and clinical examinations to confirm upper respiratory infection. Life event stress for the 12 months prior to the study was also measured. Higher risk of illness was not only found for those with high levels of stress during the study period, but also in those with high levels of stress in the 12 months prior to the study. This information suggests that stress may negatively affect one's health for months.

This is also supported by a study which suggested that those who perceive themselves as stressed are at a greater risk of developing peptic ulcers (Anda, Williamson, Escobedo, Remington, Mast, & Madans, 1992). In a survey which looked at the stress levels and incidence of peptic ulcers in 4,511 U.S. adults, it was found that people who perceived themselves as stressed were 1.8 times more likely to develop ulcers than those that did not. A graded relationship also existed between the amount of stress perceived and the incidence of ulcers. The greater the stress, the greater the relative risk for developing an ulcer.

It seems the same may be true for headache sufferers. In a study comparing a group of chronic headache sufferers to a non-headache control group, Martin and Soon (1993) found that headache sufferers had greater perceived stress. Furthermore, the perceived stress levels increased as a function of the amount of headaches experienced. These results suggest that stress has both direct and indirect effects on people's physical health.

Behavioral risk factors associated with stress. In addition to being directly associated with negative physical outcomes, stress is also related to an increase in behaviors which have health risks associated with them. In a study conducted by Heslop, Smith, Carroll, Macleod, Hyland, and Hart (2001), 6,832 employed Scottish men and women completed a questionnaire and attended a physical examination. It was found that perceived stress was associated with infrequent exercise, increased cigarette smoking, and high alcohol consumption. Furthermore, the greater the level of stress, the greater the number of cigarettes smoked and alcoholic drinks consumed. Results were generally similar across both men and women with the exception that stress was only associated with reduced exercise levels in men. In another study of 59 U.S. adults, it was found that individuals who were given a stressful speech task during a pre-sleep period had poorer sleep maintenance and lower levels of deep sleep known as delta activity (Hall, Vasko, Buysse, Ombao, Chen, Cashmere, Kupfer, & Thayer, 2004). These results suggest that high levels of stress are associated with a range of unhealthy behaviors.

Stress and mental health. Along with physical health and behavioral risk factors, stress may also affect one's mental health. Previous research has shown that stress interferes with cognitive functioning. In one study by Waldstein and Katzel (2005), 94 U.S. adults between the ages of 54 and 79 completed physiological and cognitive tests. It was found that greater blood pressure reactivity to stress resulted in decreased performance on immediate and delayed verbal memory recall. These findings are further supported by Sandstrom, Rhodin, Lundberg, Olsson, and Nyberg (2005), who found that among 67 female patients being treated for burnout (chronic stress), significant

reductions existed in nonverbal memory as well as disruptions in auditory and visual attention when compared with healthy control subjects.

A physiological basis for the decreases in cognitive functioning seen in these studies has been suggested in research conducted by Kirschbaum, Wolf, May, Wippich, and Hellhammer (1996). In the first part of their study, thirteen subjects completed the "Trier Social Stress Test" prior to completing a memory task. Cortisol levels of the participants were measured. Results indicated that subjects with high cortisol levels showed poorer memory performance. In the second part of their study, forty healthy subjects received either 10mg of cortisol or a placebo. Subjects who received the cortisol showed impaired performance in declarative memory and spatial thinking tasks when compared to the placebo group. It is suggested by these data that physiological changes associated with stress are related to lower levels of cognitive functioning.

In addition to decreased cognitive functioning, stress has also been found to play a role in depression. In a study by Aneshensel and Stone (1982), a survey of 1,000 adults residing in Los Angeles County found that perceived stress was positively related to depressive symptoms. As with the decreased cognitive functioning, it is suggested that high cortisol levels are responsible for this association. In a study conducted by Carroll, Curtis, Davies, Mendels, and Sugarman (1976), urinary free cortisol (UFC) excretion was measured in 60 depressed patients and 35 patients not diagnosed with depression. Over 40% of the depressed patients had high levels of cortisol while only 6% of the other patients had cortisol levels in the same range. This suggests that stress-induced increases in cortisol levels are associated with depression.

Even though stress is generally associated with the previously mentioned negative outcomes, it is important to keep in mind that there are two types of stress that we are looking at in the current study: objective stress and subjective stress (also called perceived stress). Objective stress refers to a disruptive life event, while subjective stress refers to how the individual perceives this life event (Cohen, Tyrrell, & Smith, 1993). Objective stressors usually cannot be avoided and everybody tends to experience them at some time. Examples include a death in the family, being fired from a job, getting married, and having children. It is important to note here that both positive and negative life events may cause stress. And since no two people respond to an event in the same way, subjective stress becomes an important evaluation of how each individual views his or her stress status. This raises the important question of what allows some individuals to have lower levels of subjective stress in response to equal amounts of objective stress.

Social Support

One factor that might help explain differences in individuals' levels of subjective stress in the face of objective stress is their level of social support. While the basic definition of social support varies from study to study (and is the source of much debate), here we will refer to social support as the number of social relationships an individual maintains which may possibly serve as a source of comfort or help during times of need. Perceived social support, then, refers to the amount of social support individuals believe is available to them. Studies already mentioned by Aneshensel and Stone (1982) and Martin and Soon (1993) have suggested that social support buffers the negative effects of stress related to headaches and depressive symptoms. Here, other research will be discussed which suggests that individuals with greater social support tend to be healthier.

In a research review conducted by Lett, Blumenthal, Babyak, Strauman, Robins & Sherwood (2005), it was found that low levels of social support were associated with coronary heart disease. Furthermore, in a survey of women aged 65 and older, it was found that level of satisfaction with social support given to family and friends is associated with better health and fewer hospitalizations (Ostir, Simonsick, Kasper & Guralnik, 2002). This suggests that even giving social support (having a strong social network) may be beneficial.

Social support also plays a role in anxiety and anxiety-related disorders. In a survey completed by 4,688 adults between the ages of 21 and 54 years (Bertera, 2005), it was found that social negativity from spouses, relatives, and friends had a strong positive correlation with the number of anxiety and mood disorder episodes. Positive support from family, on the other hand, was associated with a lower number of anxiety and mood disorder episodes. Thus, those with more social support tend to be healthier, both physiologically and psychologically.

In addition to being associated with better physical and mental health, the availability of social support has also been more directly associated with lower levels of stress reactivity. In a study conducted by Lepore, Allen and Evans (1993), college students were asked to perform a public speaking task alone, in front of a supportive group, and in front of a non-supportive group. Blood pressure was measured before, during, and after each speech. Subjects had significantly lower blood pressure in the alone and supported conditions when compared to the non-supported condition. A similar study was conducted by Uchino and Garvey (1997). In this study, 28 men and women were asked to perform a speech task in either a social support available or no

social support available situation. The participants in the social support available condition were characterized by lower blood pressure when compared to the no social support available group. Results of this study suggest that even having the potential to access social support is sufficient to buffer the negative effects of stress.

Since social support may in fact buffer the negative effects of stress, it is important to consider how people view their social networks and who they consider to be a part of them. In previously mentioned research, the social networks described consisted of spouses, family, and friends. However, in a study conducted by McNicholas and Collis (2001), twenty-two children between the ages of 7 and 8 were asked to create a list of their "top 10 most special relationships." The children were then given scenarios and asked who in their list they would turn to in each situation. The researchers found that pets were often ranked higher than some kinds of human relationships. They also found that children thought of their pets as a source of comfort and esteem support. Another study conducted by Triebenbacher (1998) found similar results in 174 boys and girls in preschool through fifth grade. More specifically, analyses indicated that children perceive their pets as friends, family members, and providers of affection. Pets have also been shown to affect the development of young children. In a study conducted by Poresky and Hendrix (1990), mothers were asked to rate their child's relationship to the family pet. Children were then assessed by researchers in the areas of social competence and empathy. Significant correlations were found between a strong bond with the pet and high scores on social competency and empathy scales. This evidence suggests that a bond with an animal, perhaps viewing pets as social support, is more beneficial to developing children than simply the presence of a pet in the home.

Studies examining the role of pets as a source of social support in adults are limited. However, in a study conducted by Garrity, Stallones, Marx, and Johnson (1989), strong attachment to a pet was associated with less depression in a sample of 1,232 adults over the age of 65. Similar results were found in a study conducted by Calvert (1989). In this study, 65 nursing home residents completed a revised version of the UCLA loneliness scale in addition to a human-pet interaction level scale. Results showed that subjects who had greater interaction levels experienced less loneliness. This evidence suggests that pets may in fact be considered as part of one's social network and therefore may also buffer the negative effects of stress.

Pet Ownership

If pets may serve as a source of social support, this may mean that pet owners may see many benefits which non-pet owners do not. This has been suggested in past research. Individuals who own pets have been found to be physically healthier than those who do not own pets. Pet owners have lower blood pressure and heart rate (Allen et. al., 2002), as well as fewer visits to healthcare providers than non-pet owners (Siegel, 1990).

Furthermore, evidence suggests that, more specifically, pet owners may be better off than non-pet owners when it comes to stress. In a study conducted by Barker, Knisely, McCain, and Best (2005), both blood and salivary levels of cortisol were measured in 20 healthcare professionals before and after interaction with a dog. Significant decreases of cortisol in both the blood and saliva were noted. This is further evidence that interaction with pets may reduce the body's physiological response to stress. In addition to lower blood pressure and cortisol levels, interaction with pets has previously been associated with increased immune system function (Charnetski, Riggers,

& Brennan, 2004). In this study, 55 college students either interacted with a live dog, a stuffed dog, or sat comfortably on a couch. Salivary levels of immunoglobulin were measured before and after treatment. Significant increases of immunoglobulin levels existed in the live dog interaction group only. These results are consistent with past research which has found that pet owners have fewer visits to healthcare providers than non-pet owners (Siegel, 1990). Another study which compared pet owners and non-pet owners after discharge from a coronary care unit found that pet owners, specifically owners of dogs, had a higher recovery rate after a heart attack (Friedmann, Katcher, Lynch & Thomas, 1980). In sum, pet owners appear to be healthier overall than non-pet owners, and to recover more quickly from bouts with illness.

In addition to being associated with higher levels of overall health, it has also been suggested by Allen et. al. (2002) that pet owners have a faster recovery rate from the physiological symptoms of stress than non-pet owners. In this study, 240 married couples were asked to perform a stressful task (either arithmetic or cold pressor) and cardiovascular reactivity was examined in four conditions: alone, spouse present, pet present, spouse and pet present. The lowest physical reactivity and fastest recovery from this physical reactivity (increased heart rate and blood pressure) was found in the presence of pets only. In other words, when faced with equal amounts of objective stress, participants had lower levels of subjective stress when their pets were in the room.

It is important to note that the benefits that have previously been associated with pet ownership may not be found with just any animal. It has also been found that when people interact with a pet they know, their stress response is lower than when they interact with a pet they do not know (Baun, Bergstrom, Langston, & Thoma 1984). In

this study, blood pressure, heart rate, and respiratory rate were recorded in 24 subjects while they interacted with an unknown dog or with a dog they had a companion bond with. These results are consistent with the findings of the study by Poresky and Hendrix (1990) which suggested that having a bond with an animal is more beneficial than simply having an animal present. In short, it appears that results of many studies examining the association between stress and pets are similar to the results of studies examining the association between stress and social support.

Overview of Current Study

Previous research has already shown that pet ownership is associated with beneficial outcomes. With this study I aim to provide a more stringent test of the benefits of keeping pets: I want to control for objective stress levels to see if pet ownership is associated with lower levels of subjective stress. Additionally, all of these studies suggest that pet ownership should serve as a moderator of the negative effects of objective stress. I would like to directly test the idea that pets serve as a buffer for objective stress by examining the interaction between pet ownership and objective stress. Finally, I would like to address the possible limits of the benefits of pet ownership. There are two instances where such limits may exist. The first is if there is too much objective stress in the individual's life. It is likely that if there are too many stressful events occurring in one's life, having a pet may not be enough to buffer the negative effects of so much stress. The second instance is if the individual already has a strong human social network. Pets may not play a significant role in buffering stress if the individual perceives their human support is already helping them.

Because of these possible limits of pet ownership, it is hypothesized that pet ownership will be associated with lower levels of subjective stress only when there is a moderate level of need. That is to say that, if the objective stress levels are not too high and there is not a very strong human social network, pet ownership will be associated with lower levels of subjective stress.

Method

Participants

Participants were recruited on the Internet by contacting the webmasters of popular web sites (such as www.drsfostersmith.com, a popular pet product company) and requesting that they place a link to the study site on their main page. These links remained active for a period of five months. Links to the study site were also placed on Internet message boards with topics relating to pets or stress. The sample for this study consisted of 1,512 adult males and females between the ages of 14 and 83. The mean age of the participants was 42 years old (SD = 12.8). The majority of the participants (88.1%) were female, and 91.1% lived in the United States. The majority of the remaining participants were from the United Kingdom.

The vast majority (93.8%) of the participants owned pets. Most of the participants owned dogs (79.2%). Bird owners represented 9.2% of the sample, fish owners represented 11.4%, reptile owners represented 4.6%, and rodent owners represented 5.3%. Ten percent of the sample also answered that they owned a pet which did not fall into any of the above categories. Because some participants owned more than one pet, these percentages add up to more than 100%.

Measures

Objective Stress. Objective stress was measured using the Objective Stress Inventory developed by Holmes and Rahe (1967). Participants were presented with a list of both positive and negative events which may disrupt one's life (e.g. death in the family, marriage, birth of a child). The participants were asked to check off which events had occurred in their lives over the past 12 months. To compute scale scores, each item on the list was weighted based on how much disruption it may cause, using weights developed by Holmes and Rahe (1967). For example, the death of a spouse has a weight of 100 while a change in residence has a weight of 19. These weighted scores were then summed. Total scores have a potential range from 0 to 1073 with higher scores relating to higher levels of objective stress.

Subjective Stress. Perceived stress levels were measured using the Perceived Stress Scale developed by Cohen, Kamarck, and Mermelstein (1983). Participants were presented with ten questions designed to evaluate the amount of stress they perceived in their lives over the previous month (e.g., "In the last month, how often have you felt nervous or stressed?"). Responses to each question were on a 7-point scale ranging from "Never" to "Very Often". Total scores have a potential range from 10 to 70 with higher scores relating to higher levels of perceived stress. The internal reliability for this scale was high with a Cronbach's alpha of .92.

Social Support. Perceived social support levels were measured using the Multidimensional Scale of Perceived Social Support by Zimet, Dahlem, Zimet, and Farley (1988). The scale consists of twelve statements concerning how the participants perceive their relationships with those close to them. Statements include "There is a person around when I am in need." Participants rated their agreement with these

statements on a 7-point scale ranging from very strongly disagree to very strongly agree. Total scores have a potential range from 12 to 84 with higher scores relating to higher levels of perceived social support. The internal reliability for this scale was high with a Cronbach's alpha of .94.

Procedures

This study consisted of an anonymous online questionnaire that contained 62 items. Once consent was given on the study main page, the participants were redirected to the first page of the questionnaire where they were then asked to complete the Perceived Stress Scale (PSS) and the Objective Stress Inventory (OSI). Following the PSS and OSI, respondents completed the Multidimensional Scale of Perceived Social Support followed by a series of demographic items including pet ownership status. Participants were prompted to complete unanswered items once to prevent items being left blank unintentionally. Once completed, the data were stored on a web server until analysis was ready to begin.

Results

Preliminary Analyses

A preliminary ANCOVA indicated that, even when controlling for levels of objective stress, pet owners had lower levels of subjective stress (M = 35.89, SD = 13.28) than non-pet owners (M = 41.32, SD = 14.51), F (2,1516) = 17.92, $p < .01$. A second preliminary ANCOVA indicated that these lower levels of subjective stress among pet owners remained when subjective stress was controlled for, F (2, 1516) = 48.51, $p < .01$.

Main Analysis

The main hypothesis stated that pet ownership would be associated with lower levels of subjective stress when there is a moderate level of need. That is, if objective stress levels were not too high and there was moderate perceived social support, pet ownership would be related to lower levels of subjective stress levels. To see if this was the case, a regression analysis was performed. The dependent variable was subjective stress. In the first step of the model, pet ownership, objective stress, and social support were entered. In the second step of the model, the two-way interactions between these variables were entered, and, in the third step, the three-way interaction was entered. It was expected that the three-way interaction would be significant. In contrast to expectations, there was no significant interaction between pet ownership, objective stress, and perceived social support. Results indicate that, regardless of level of objective stress and amount of perceived social support, pet ownership was associated with lower levels of subjective stress. These results remained consistent when analyses were performed on the whole sample as well as with a sub-set consisting of an equal number of pet owners and non-pet owners.

Supplemental Analyses

To examine whether the association between pet ownership and subject stress was consistent across genders, a 2 (gender) X 2 (pet ownership) ANOVA was conducted. When the entire sample was used, gender was found to moderate the association between pet ownership and perceived stress. However, this was probably due to the fact that there were eight times more female participants than male participants. To investigate whether this was the case, this analysis was recalculated using a randomly selected sub-set of

females, in order to examine an equal number of males and females. In this new analysis, there was no interaction between gender and pet ownership in predicting perceived stress.

In order to see if specific aspects of pet ownership were associated with different outcomes, supplemental analyses were conducted. First, to examine whether there was a relationship between the amount of interaction with the pet and subjective stress, a Pearson correlation was performed. A significant negative correlation was found between subjective stress scores and pet interaction levels ($r = -.08$, $p < .01$). This suggests that, the more individuals interact with their pet, the lower their perceived stress. Second, to examine whether there was a relationship between amount of interaction with the pet and social support, a second Pearson correlation was conducted. A significant positive correlation was found between perceived social support scores and pet interaction levels ($r = .06$, $p < .02$). This suggests that individuals who interact with their pets more frequently have higher levels of perceived social support. However, it is important to note that each of these effect sizes were small, suggesting that level of interaction with pets explains only a small proportion of the variance in subjective stress and in social support.

Discussion

Summary of Results

Although the findings of the current study did not support the hypothesis, it is worth mentioning that these results suggest something even more important: across levels of objective stress and perceived social support among these participants, pet ownership was associated with lower levels of subjective stress. Furthermore, although the effect size was small, the greater their level of interaction with the pet, the lower

participants' subjective stress scores were. These findings are consistent with previous findings which have suggested that pets are associated with reduced physiological responses to stress (Allen, et al., 2002; Allen et Al., 2001; Friedmann & Thomas, 1995).

Strengths and Limitations

The current study had a number of strengths that lend confidence to the results. Perhaps the most noteworthy strength is the number of participants. With a sample of over 1,500 people, it is unlikely that non-significant results were due to a lack of power. However, a large sample does have its drawbacks. One example of this is that significant associations were found in the current study that had relatively small effect sizes. A second strength of the current study is its brevity and straightforwardness. Participants may be less likely to become bored or confused during brief studies, making their answers more accurate reflections of their true feelings and behavior.

However, there are some limitations of the current study that should be addressed. First, although self-report is the only way to assess one's perceptions (of stress, for example), the data for the current study relied exclusively on self report. This raises the possibility that participants may have misrepresented their true feelings or true experiences. Two of the ways in which this might have happened are that participants may have not taken the study seriously, and may have answered the questions haphazardly and that participants may have under-reported or over-reported their stress levels or levels of social support. The first of these concerns is alleviated by the fact that the scales used in this study had high internal reliability. The Perceived Stress scale had a Cronbach's alpha of .92 and the Social Support Scale had a Cronbach's alpha of .94. Since Cronbach's alpha measures the inter-item associations of each scale, it is unlikely

such high levels of internal reliability would be found if participants had responded to the scales in a haphazard manner. The second of these concerns is alleviated by the fact that the goal of the study was to examine differences in stress levels across pet owners and non-pet owners, rather than to estimate participants' levels of stress. It is unlikely that only pet owners would under-report their level of subjective stress, or that non-pet owners would over-report it.

Another possible limitation may be that the study was conducted on the Internet. It is possible, though unlikely, that respondents could fill out the questionnaire more than once. In order to help eliminate this problem, respondents' IP addresses were recorded. Responses in which the same IP address appeared more than once on the same date were deleted. Furthermore, when thinking of the possible limitations associated with Internet studies, it is also important to note the strengths that Internet studies have over traditional studies. One of these is the ability to easily gather a large number of participants. This can be seen in the current study, in which there were well over 1000 participants from several countries, making the results more applicable to the general population than a study consisting of a sample from one particular college campus, state, or country. Online surveys also tend to be faster and more convenient for participants. It has also been found in a study by Church (2001), that participants tend to provide more complete answers to online surveys when compared to paper formats of surveys. Thus, despite the possible limitations associated with Internet research, the benefits of such studies appear to outweigh the costs.

Additional Directions for Future Research

Studies of this nature are of particular interest to those in the animal therapy field. Since the majority of therapy programs and research on such programs utilize dogs, it would be interesting to conduct in-depth studies which explored the use of other species of animals in therapy programs. Most participants in the current study had dogs or cats. However, in a study by DeSchriver and Riddick (1990), 27 elderly aquarium watchers tended to experience a decrease in pulse rate and muscle tension when compared to a control group. Furthermore, bird companionship has previously been associated with a significant decrease in depression in 40 adults in a rehabilitation home (Jessen, Cardiello, & Baun, 1996). In another study by Eddy (1996), a reduction in heart rate was noted in a snake owner in response to interaction with the pet snake. It is suggested by this research that most human-animal bonds would prove beneficial, regardless of pet type. Therefore, it is suggested that programs which utilize animals other than dogs can prove beneficial to those with certain allergies or conditions which make being in the presence of a dog either difficult or impossible.

It has already been suggested that individuals have lower levels of stress when they interact with an animal they know than when they interact with an animal they do not know (Baun et. al., 1984). Future research could explore this in the context of animal therapy. Perhaps a comparison could be made between the benefits of therapy programs which utilize the same animal at each therapy site and those that alternate between different therapy animals. Based on the findings of previous research, it is expected that programs utilizing the same therapy animal would prove to be more beneficial as there is more potential for the formation of a bond between the animal and the individual receiving therapy. This type of research could prove extremely valuable to the design of

animal assisted therapy programs. Valuable information may also be obtained if we compared traditional animal therapy programs (animal visitation) with institutions such as nursing homes that have acquired "community pets," or animals which live on the premises and remain there permanently with the residents. If the latter type of program proves to be more beneficial, this may be additional support for the theory that bonding with an animal may in fact serve as a form of social support.

A third direction for future research lies in examining the relationship between pet ownership and stress among different groups. It is also worth mentioning the lack of range in the objective stress scores. The range of the objective stress scale in the current study suggests that almost all participants had fairly low levels of objective stress (M = 173.63, SD = 104.45, Possible Range = 0-1073). In other words, almost no participants had encountered many disruptive life events in the last year. This suggests that a more powerful test of the current hypothesis should utilize participants with a broader range of objective stress levels. I expect the results of this type of study would suggest that pet ownership may in fact have its limitations.

Conclusion

In the current study we have examined pet ownership as a means of reducing subjective stress levels. We have also examined social support as the mechanism for the stress reducing effect of pets. The results of this study suggest that, regardless of objective stress or social support levels, pet owners have lower levels of perceived stress than non-pet owners. Perhaps these and future findings will prove valuable not only when considering the relationship between humans and animals in general, but also in a

more applied setting when designing more efficient and personalized animal therapy programs.

References

Allen, K., Blascovich, J., & Mendes, W. (2002). Cardiovascular reactivity and the presence of pets, friends, and spouses: The truth about cats and dogs. *Psychosomatic Medicine, 64*, 727-739.

Allen, K., Blascovich, J., Tomaka, J., & Kelsey, R.M. (1991). Presence of human friends and pet dogs as moderators of autonomic responses to stress in women. *Journal of Personality and Social Psychology, 61*, 582-589.

Allen, K., Shykoff, B., & Izzo, J. (2001). Pet ownership, but not ace inhibitor therapy, blunts home blood pressure responses to mental stress. *Hypertension, 38*, 815-820.

Anda, R., Williamson, D., Escobedo, P., Remington, E., Mast, E., & Madans, H. (1992). Self-perceived stress and the risk of peptic ulcer disease. A longitudinal study of U.S. adults. *Archives of Internal Medicine, 152*, 829-833.

Aneshensel, C.S. & Stone, J.D. (1982). Stress and depression: A test of the buffering model of social support. *Archives of General Psychiatry, 39 (12),* 1392-1396.

Barker, S. & Dawson, K. (1998). The effects of animal-assisted therapy on anxiety ratings of hospitalized psychiatric patients. *Psychiatric Services, 49,* 797-801.

Barker, S., Knisely, J., McCain, N., & Best, A. (2005). Measuring stress and immune response in healthcare professionals following interaction with a therapy dog: a pilot study. *Psychological Reports, 96,* 713-729.

Bertera, E.M. (2005). Mental health in U.S. adults: The role of positive social support and social negativity in personal relationships. *Journal of Social and Personal Relationships, 22*, 33-48.

Calvert, M. (1989). Human-pet interaction and loneliness: a test of concepts from Roy's adaptation model. *Nursing Science Quarterly, 2(4),* 194-202.

Carroll, B., Curtis,G., Davies, B., Mendels, J., & Sugarman, A. (1976). Urinary free cortisol excretion in depression. *Psychological Medicine, 6(1),* 43-50.

Carroll, D., Ring, C., Hunt, K., Ford, G., & Macintyre, S. (2003). Blood pressure reactions to stress and the prediction of future blood pressure: Effects of sex, age, and socioeconomic position. *Psychosomatic Medicine, 65,* 1058-1054.

Charnetsky, C.J., Riggers, S., & Brennan, F. (2004). Effect of petting a dog on immune system function. *Psychological Reports, 3,2,* 1087-1091.

Church, A. (2001). Is there a method to our madness? The impact of data collection methodology on organizational survey results. *Personnel Psychology, 54(4),* 937-969.

Cobb, J., & Steptoe, A., (1996). Psychosocial stress and susceptibility to upper respiratory tract illness in an adult population sample. *Psychosomatic Medicine, 58,* 404-412.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior, 24,* 385-396.

Cohen, S., Tyrrell, D., & Smith, A. (1993). Negative life events, perceived stress, negative affect, and susceptibility to the common cold. *Journal of Personality and Social Psychology, 64(1),* 131-140.

Cohen, S., & Wills, T.A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98,* 310-357.

DeLongis, A., Folkman, S., & Lazarus, R. (1988). The impact of daily stress on health

and mood: psychological and social resources as mediators. Journal of *Personality and Social Psychology, 54(3),* 486-495.

DeSchriver, M., & Riddick, C. (1990). Effects of watching aquariums on elders' stress. *Anthrozoos, 4(1),* 44-48.

Dembicki, D. & Anderson, J. (1996). Pet ownership may be a factor in improved health of the elderly. *Journal of Nutrition for the Elderly, 15,* 15-31.

Edney, A. (1995). Companion animals and human health: an overview. *Journal of the Royal Society of Medicine, 88,* 704-708.

Eddy, T.J. (1991). Reductions in cardiac activity in response to a pet snake. *Journal of nervous and mental disease, 184,* 573-575

Ericsson, N., Hansen, N.K., & Fitzgerald, S. (2002). Benefits of assistance dogs: A review. *Rehabilitation Psychology, 47,* 251-277.

Fauvel, J., Quelin, P., Ducher, M., Rakotomalala, H., & Laville, M. (2001). Perceived job stress but not individual cardiovascular reactivity to stress is related to higher blood pressure at work. *Hypertension, 38,* 71-75.

Friedmann, E. & Thomas, S. (1995). Pet ownership, social support, and one-year survival after acute myocardial infarction in the cardiac arrhythmia suppression trial (CAST). *American Journal of Cardiology, 76,* 1213-1217.

Garrity, T., Stallones, L., Marx, M., & Johnson, T. (1989). Pet ownership and attachment as supportive factors in the health of the elderly. *Anthrozoos, 3(1),* 35-44.

Goeders, N. (2003). The impact of stress on addiction. *European Neuropsychopharmacology, 13,* 435-441.

Hall, M., Vasko, R., Buysse, D., Ombao, H., Chen, Q., Cashmere, D., Kupfer, D., & Thayer, J. (2004). Acute stress affects heart rate variability during sleep. *Psychosomatic Medicine, 66,* 56-62.

Heslop, P., Smith, G.D., Carroll, D., Macleod, J., Hyland, F., & Hart, C. (2001). Perceived stress and coronary heart disease risk factors: The contribution of s ocio-economic position. British Journal of Health Psychology, 6, 167-168.

Holmes, T., & Rahe, R.. (1967). The Social Readjustment Rating Scale. *Journal of Psychosomatic Research, 11,* 213-218.

Horowitz, M., Schaefer, C., Hiroto, D., Wilner, N., & Levin, B. (1977). Life event questionnaires for measuring presumptive stress. *Psychosomatic Medicine, 39,* 413-431.

House, J., Umberson, D., & Landis, K. (1988). Structure and processes of social support. *Annual Review of Sociology, 14,* 293-318.

Ingaramo, R.A., & Santana, M. (2005). Exaggerated blood pressure reaction to mental stress and target organ damage. *American Journal of Hypertension, 18,1,* A89.

Jessen, J., Cardiello, F., & Baun, M. (1996). Avian companionship in alleviation of depression, loneliness, and low morale of older adults in skilled rehabilitation units. *Psychological Reports, 78(2),* 339-348.

Kingwell, B., Lomdahl, A., & Anderson, W. (2001). Presence of a pet dog and human cardiovascular responses to mild mental stress. *Clinical Autonomic Research, 11,* 313-317.

Kirschbaum, C. & Hellhammer, D. (1994). Salivary cortisol in psychoneuroendocrine research: recent developments and applications. *Psychoneuroendocrinology, 19(4),* 313-333.

Kirschbaum, C., Wolf, O., May, M., Wippich, W., & Hellhammer, D. (1996). Stress and treatment-induced elevations of cortisol levels associated with impaired declarative memory in healthy adults. *Life Sciences, 58(17),* 1475-1483.

Kulkarni, S., O'Farrell, I., Erasi, M. & Kochar, M. (1998). Stress and hypertension. *Wisconsin Medical Journal, 11,* 34-38.

Lepore, S., Allen, K., & Evans, G. (1993). Social support lowers cardiovascular reactivity to an acute stressor. *Psychosomatic Medicine, 55,* 518-524.

Lett, H., Blumenthal, J., Babyak, M., Strauman, T., Robins, C., & Sherwood, A. (2005). Social support and coronary heart disease: Epidemiologic evidence and implications for treatment. *Psychosomatic Medicine, 67,* 869-878.

Martin, P.R. & Soon, K. (1993). The relationship between perceived stress, social support and chronic headaches. *Headache, 33,* 307-314.

McNicholas, J. & Collis, G.M. (2001). Children's representations of pets in their social networks. *Child Care, Health, and Development, 27,* 279-294.

Muldoon, M., Bachen, E., Manuck, S., Waldstein, S., Bricker, P., & Bennett, J. Acute cholesterol responses to mental stress and change in posture. *Arch Intern Med, 152,* 775-780.

Ostir, G., Simonsick, E., Kasper, J., & Guralnik, J. (2002). Satisfaction with support given and its association with subsequent health status. *Journal of Aging and Health, 14(3),* 355-369.

Poresky, R. & Hendrix, C. (1990). Differential effects of pet presence and pet-bonding on young children. *Psychological Reports, 67(1),* 51-54.

Prato-Previde, E., Fallani, G., & Valsecchi, P. (2006). Gender differences in owners interacting with pet dogs: An observational study. *Ethology, 112(1),* 64-73.

Sachs-Ericsson, N., Hansen, N., & Fitzgerald, S. (2002). Benefits of assistance dogs: A review. *Rehabilitation Psychology, 47,* 251-277.

Sandstrom, A., Rhodin, I., Lundberg, M., Olsson, T., & Nyberg, L. (2005). Impaired cognitive performance in patients with chronic burnout syndrome. *Journal of Biological Psychology, 69,* 271-279.

Serpell, J. (1991). Beneficial effects of pet ownership on some aspects of human health and behaviour. *Journal of the Royal Society of Medicine, 84,* 717-720.

Siegel, J.M. (1990). Stressful life events and use of physician services among the elderly: The moderating role of pet ownership. *Journal of Personality and Social Psychology, 58,* 1081-1086.

Sobo, E., Eng, B., & Kassity-Krich, N. (2006). Canine visitation (pet) therapy: pilot data on decreases in child pain perception. *Journal of Holistic Medicine, 24(1),* 51-57.

Triebenbacher, S. (1998). Pets as transitional objects: their role in children's emotional development. *Psychological Reports, 82(1),* 191-200.

Uchino, B. & Garvey, T. (1997). The availability of social support reduces cardiovascular reactivity to acute psychological stress. *Journal of Behavioral Medicine, 20(1),* 15-27.

Virues-Ortega, J. & Buela-Casal, G. (2006). Psychophysiological effects of human-

animal interaction: Theoretical issues and long term interaction effects. *Journal of Nervous and Mental Disorders, 194,* 52-57.

Vormbrock, J. & Grossberg, J. (1988). Cardiovascular effects of human-pet dog interactions. *Journal of Behavioral Medicine, 11,* 509-517.

Waldstein, S.R., & Katzel, L. (2005). Stress-induced blood pressure reactivity and cognitive function. *Neurology,* 24, 1746-1749.

Wells, M., & Perrine, R. (2001). Critters in the cube farm: Perceived psychological and organizational effect of pets in the workplace. *Journal of Occupational Health Psychology, 6(1),* 81-87.

Wilson, C. (1991). The pet as an anxiolytic intervention. *Journal of Nervous and Mental Disorders, 179,* 482-489.

Zimet, G.D., Dahlem, N.W., Zimet, S.G. & Farley, G.K. (1988). The Multidimensional Scale of Perceived Social Support. *Journal of Personality Assessment,* 52, 30-41.