# THE EFFECT OF PET OWNERSHIP/ATTACHMENT ON THE STRESS LEVEL OF MULTIPLE SCLEROSIS PATIENTS

A Thesis

by

ASHLEY MARIE LOVEN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2004

Major Subject: Epidemiology

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Approved as to style and content by:

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| Margaret Slater<br>(Chair of Committee) | C. Jane Welsh<br>(Member) |
| Mary Meagher<br>(Member) | Evelyn Tiffany-Castiglioni<br>(Head of Department) |

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## ABSTRACT

The Effect of Pet Ownership/Attachment on the Stress Level of Multiple Sclerosis Patients. (August 2004)

Ashley Marie Loven, B.S., Texas A&M University

Chair of Advisory Committee: Dr. Margaret Slater

Multiple Sclerosis (MS) is the most common demyelinating disease affecting the central nervous system. Over 80% of MS patients are in the relapsing remitting stage. Symptoms range from fever, fatigue, emotional distress, tingling, numbness, optic neuritis, spasticity, muscle weakness, impaired coordination, to other abnormal neurological problems. Expression of symptoms is known as a relapse or exacerbation. The cause of relapses is unknown, but multiple factors seem to play a significant role. Possible factors that may influence MS onset and relapse consist of a genetic association, viruses, disruption of the blood-brain barrier, and stress. Stress has shown to have negative implications and may stimulate relapses. Thus, this study examined a possible stress intervention that most people already had available to them, companion animals. Companion animals have been shown to lower blood pressure, decrease heart rate, provide social support, and reduce stress. The main hypothesis was to evaluate whether or not pet ownership and/or attachment influenced the perceived stress level and number of negative life events experienced by MS patients in the relapsing remitting stage. Participants were given a questionnaire that consisted of 7 surveys. The questionnaire accessed quality of life, disease severity, number of negative life events,

perceived stress level, level of depression, social support, and pet ownership and attachment level. Our sample population consisted of MS patients seen at the University of Texas Southwestern Neurology clinic from February 23rd to May 21st, 2004. One hundred and forty seven relapsing remitting MS patients were included in the study. Multiple linear regression was used to compare the relationship of stress and number of negative life events to pet ownership and attachment. Results revealed that pet ownership and attachment levels did not affect the stress level and number of negative life events of MS patients. No confounders were identified. Interaction terms with disease severity as the dependent variable, pet ownership and perceived stress level or negative life events as the independent variables were not significant. The type of pet owned did not influence the attachment level of the MS patient. In conclusion, the results of this study did not support the hypothesis.

## DEDICATION

I would like to dedicate this thesis to my family and friends who supported me throughout college. Also, to my Dad (James Loven) and my aunt (Gay Nell Smith) in hopes that one day there will be a cure for MS.

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I want to thank the staff of the University of Texas Southwestern Neurology Clinic and Dr. Michael Racke for distributing the questionnaires and ensuring they were filled out and sent back to me. In addition, I am very grateful for the MS patients that so graciously devoted their time to filling out the questionnaire.

Another special group that participated in making sure the surveys were understandable and clear was the Brazos Valley MS Society. They volunteered their time and efforts to helping me put the questionnaire together.

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# INTRODUCTION

Multiple sclerosis (MS) is a neurodegenerative, autoimmune disease that affects the central nervous system, which consists of the brain, spinal cord, and optic nerves. According to a revision of the 1990 US Census, an estimate of 250,000 to 350,000 people in the United States have physician-diagnosed MS (Anderson et al., 1992). Epidemiological studies indicate a higher frequency of MS in temperate climates than in areas near the equator. Women have a higher incidence of relapsing-remitting MS compared to men, with a female: male ratio of 2:1 (Minagar and Alexander, 2003).

In multiple sclerosis, the immune system attacks the myelin sheath surrounding myelinated nerve fibers (Sherwood, 2001), resulting in scar tissue, which gives the disorder the name sclerosis. Myelin is fatty tissue that surrounds and protects the nerve fibers of the CNS and assists in the conduction of electrical impulses. The ability of nerves to conduct electrical impulses is disrupted when the myelin of the nerve fiber is destroyed or damaged. Damaged areas of myelin are referred to as plaques or lesions, and are thought to result from an immunological response (Rose, 1974). The MS lesion is characterized by an infiltration of lymphocytes, plasma cells, and macrophages contributing to the destruction of the myelin sheath (Janeway et al., 2001a). The destruction and inflammatory damage to the myelin sheath, known as demyelination, inhibits action potentials in the underlying axons, and thus produces various symptoms of MS (Sherwood, 2001; Van Noort, 1996).

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This thesis follows the style and format of the Journal of Neuroimmunology.

Symptoms of MS vary greatly depending on the extent and location of the myelin damage. Possible symptoms include fever, fatigue, emotional distress, tingling, numbness, optic neuritis, spasticity, muscle weakness, impaired coordination, and other abnormal neurological problems (Rose, 1974; Sherwood, 2001). There are 4 clinical stages of the disease: relapsing-remitting, secondary progressive, primary progressive, and progressive relapsing. This study only concentrates on the relapsing-remitting stage, which represents more than 80% of MS patients (Minagar and Alexander, 2003). In the relapsing-remitting stage, patients experience acute attacks on the myelin, damaging the nerve fibers and sometimes the axons themselves, resulting in the expression of the symptoms listed above. An MS "attack" is commonly called a relapse or exacerbation. In relapsing-remitting MS, a relapse is followed by remission, which may mean either complete or partial recovery.

**T cells in autoimmunity**

T cell autoimmunity plays a key role in the pathogenesis of MS. T cells regulate immune responses and are responsible for recognizing peptide antigens bound to human leukocyte antigen (HLA) class I or class II molecules on the surface of antigen-presenting cells (Hohlfeld et al., 1995). T cells possess many different antigen-specific receptors that are regulated by somatic gene rearrangement (Janeway et al., 2001b; Matis, 1990; Staudt and Lenardo, 1991). T cell antigen-specific receptor diversity allows for T cells to respond to a multitude of antigens. Antigen presenting cells associated with HLA class I process endogenous proteins such as viruses, and HLA class II process exogenous proteins (Hohlfeld et al., 1995). A peptide binding cleft is present

on both HLA class I and class II molecules that face the T cell receptor (TCR), with the majority of the peptides bound to HLA representing endogenous self peptides (Hohlfeld et al., 1995). The immune system produces autoreactive lymphocytes capable of reacting to self-antigen. The body either destroys the autoreactive lymphocytes in early development or accommodates these T cells by inactivating them and inducing a state of self tolerance (Hohlfeld et al., 1995). Self-tolerance allows the immune system to respond only to foreign antigen, and not to self antigen (Hohlfeld et al., 1995). In multiple sclerosis, self-tolerance is disrupted by a mechanism not yet determined. Two explanations have been suggested. The first theory suggests the inactivated T cells that are normally exposed to self antigen become activated (Hohlfeld et al., 1995). The second theory proposes the loss of self-tolerance allows expression of autoantigen on antigen-presenting cells that normally do not express detectable amounts of HLA class I or II molecules, for example most CNS cells (Hohlfeld et al., 1995). The actual pathogenic mechanisms engaged in MS remains controversial.

**Genetics and MS**

Since the etiology of MS is unknown, investigators evaluate factors that may influence onset and relapse. Many factors underlie susceptibility to the disease and exacerbations, such as a genetic predisposition, a viral infection, and/or environmental exposures. Genetic predisposition lies within susceptibility mapped by linkage and association. Linkage identifies genes of people with the disease within the same family. Association evaluates the genes that differ between those with the disease and those without the disease. In a meta-analysis, the genetic analysis statistically confirmed that

the HLA region on chromosome 6p21 supported a genetic linkage to MS (Haines et al., 2003). However, genetic association studies report inconclusive conclusions compared to each other regarding genetic association (Haines et al., 2003). Currently, conclusive evidence for a specific gene that may cause MS has not yet been identified.

**Viruses and MS**

As the search continues to find the cause of MS, viral infections pose important implications to the disease. Viruses have the capability to activate T cells, causing them to express adhesion molecules and thus allowing the T cells to cross the blood-brain barrier. This in turn, causes an immune reaction in the CNS (Van Noort, 1996). Studies show that the human herpes virus 6 (HHV-6) and Epstein-Barr virus (EBV) present significant associations with MS (Friedmann et al., 1999; Gilden, 2001; Levin et al., 2003). Conventional beliefs associated the canine distemper virus (CDV) and measles as possible causative agents for MS (Madden et al., 1981). Studies found that measles antibodies were significantly elevated in MS patients, but this was not true for that of CDV (Cook et al., 1978; Madden et al., 1981). Although associations between viruses and MS are significant, a causal link to a specific virus has not been made.

**Blood-Brain Barrier**

The blood-brain barrier (BBB) acts as a selective barrier that limits access of blood-borne materials into the CNS. The BBB consists of zonula occludens between endothelial cells of the capillaries, which prevent the passage of inappropriate substances into the CNS. It also involves zonula adherens that hold cerebral endothelial cells of capillaries in the CNS tightly together, maintaining the BBB's restrictive properties.

Inflammatory cytokines such as, IFN-γ, TNF-α, and IL-1β, disrupt the blood-brain barrier of MS patients when they come in contact with the cerebral endothelial cells and disturb the zonula occludens and adherens (Minagar and Alexander, 2003). It is possible the activation of T cells and their interaction with adhesion and migration molecules allows them to pass into the CNS. Alternatively, the endothelial cells lining the BBB may be prompted to increase surface expression of adhesion and migration molecules and in return attract activated T cells and permit their entry into the CNS (Van Noort, 1996). Whatever the mechanism that permits T cells to cross the BBB, the cytokines they produced in the CNS influence an acute immune response in the CNS. Immunohistochemical evaluation of MS lesions provides evidence of an immune reaction occurring in the CNS involving lymphocytes, macrophages, cytokines, and adhesion molecules (Gilden, 2001; Van Noort, 1996). During an MS attack, CNS proteins, including myelin basic protein, are attacked and destroyed (Poliak et al., 1997; Van Noort, 1996). Cytokines contribute to the signaling process for T cells to act upon antigen/HLA complexes, but T cells also require costimulatory molecules such as CD40 and CD8 for activation (Van Noort, 1996). According to Van Noort, costimulatory molecules are only present in damaged or stressed sites, which are the only sites where T cells may be activated (Van Noort, 1996).

**Stress and MS**

Stress is commonly known to have negative effects on disease processes, including MS. The hypothalamus-pituitary-adrenal axis, which is a feedback mechanism for intra-CNS stress responses, is more active in MS patients than normal

individuals (Van Noort, 1996). Mast cell degranulation can also be part of a stress-induced immune response. A study using rats found that in rats stressed by immobilization, an increase in mast cell degranulation occurs (Esposito et al., 2001). In addition, many mast cells have vasoactive properties and are thought to be capable of regulating the permeability of the blood-brain barrier (Theoharides, 1990). Degranulation of mast cells in stressed rats was associated with alterations in blood-brain barrier permeability and breakdown (Esposito et al., 2001). Change in blood-brain barrier permeability and breakdown are seen before new lesions form in MS patients (Esposito et al., 2001). Stress can also induce the production and release of nitric oxide from activated macrophages, which activates an adverse immune reaction, such as a MS relapse (Esch et al., 2002). According to Warren, MS patients reported undergoing more stress and stressful life events in the 2-year period prior to onset age of MS compared to controls (Warren et al., 1982). It has not been proven that stress causes MS, but it may stimulate exacerbations. In MS patients, it has been found that stress precipitates exacerbations within an average of 14 days (Ackerman et al., 2002). According to Ackerman, six weeks prior to an exacerbation, 85% of the MS patients in his study experienced one or more stressful life event (Ackerman et al., 2002). Since stress has such significant negative implications in MS patients, limiting the effects of stressful life events and stress prevention may prove an important early intervention in treating and living with MS.

**Human Animal Bond**

The human animal bond, also referred to as pet attachment, and its influences on human stress levels, is a field that has drawn considerable interest. Studies demonstrate that having a pet tends to lower blood pressure, provide social support, and reduce stress (Davis, 1991; Patronek and Glickman, 1993). A study evaluating heart rate and blood pressure in children while reading and resting revealed that the children's heart rate and blood pressure was lowered when an unfamiliar dog entered the room than when the dog was not present in the room (Friedmann et al., 1983). The one-year survival rate after discharge from a coronary care unit was significantly higher for those patients who owned pets (Friedmann et al., 1980). In a prospective study of 8000 people enrolled in a preventive health program in Australia, women over the age of 40 and men of all ages who owned a pet had lower blood pressure than those who did not own a pet (Rowan, 1991; Serpell, 1990).

Pet ownership not only has health benefits, but also provides social support for individuals. Humans need social support, and if lacking, individuals may suffer an increase in stress levels and experience feelings of depression (Friedmann et al., 1980; Katcher, 1981). Companion animals can provide social support and behavior benefits that lower the stress levels of individuals. Cats have been found to be a complementary part of patients' social network and emotional support (Stammbach and Turner, 1999). Twenty-two residents with Alzheimer's disease in a long-term care facility showed an increase in smiles, tactile contact, looks, and physical warmth in the presence of a dog (Batson et al., 1995). Furthermore, elderly people reported a decrease in depressive

symptoms when they formed emotional attachments to companion animals (Garrity et al., 1989).

Animal interactions, such as pet ownership and attachment, can help relieve stress and decrease the feelings of anxiety, depression, and emotional distress. People with a low support level from family and friends exhibit stronger pet attachments and report fewer illnesses than those who have a higher human support level (Garrity et al., 1989). In addition, a lower level of depression is associated with a higher level of pet attachment when the level of confidant support is low (Garrity et al., 1989).

The number and severity of disease-related symptoms, social and family environments, the availability and utilization of support systems, and the patients' personal assessment of the disease relate to the amount of stress MS individuals encounter (Jean et al., 1997). Physical and mental stress can increase a person's heart rate, blood pressure, and anxiety levels. In a study of 92 college students, it was found that the presence of an unfamiliar dog had a relaxing, anti-anxiety effect on the students, reducing cardiovascular dysfunction (Wilson, 1991). According to Allen, hypertensive patients given Lisinopril, an ACE inhibitor, in accompany with a pet ownership assignment had significantly lower responses to mental stress than those who were only given Lisinopril (Allen et al., 2001). While performing stressful tasks in the presence of a pet dog, adult women showed less physiological reactivity (autonomic response), than when performing the same tasks with a female human friend present (Allen et al., 1991). If pets are able to lower patients' responses to stress, they may not only protect the owner from the risks and consequences of coronary heart disease, but may also reduce

the severity of MS. MS patients must consider lifestyle changes that reduce psychosocial and psychological stressors and so help decrease severity of disease-related symptoms (Jean et al., 1997).

No studies have evaluated the pet attachment levels of MS patients in relation to their stress levels. Interactions with animals may lower the everyday stress MS patients experience and so decrease the severity of MS symptoms. This research project aimed to evaluate the stress levels of MS patients and whether the presence of a pet, as well as the extent of patient/pet attachment, can affect the stress level or response to stress of MS patients. The objectives determined were: (1) the current assessment of quality of life and disease severity of the MS patient; (2) the stress incurred from life events within the last 12 months; (3) the patients' perceived stress level in the last month, including their mood in the last 2 weeks; (4) the patients' social support network; and (5) the patients' attachment level, if any, to the pets currently owned or interacted with during the last 12 months. Responses to questionnaires were used to quantify MS patients' stress levels and pet attachment levels, and to compare whether attachment to a pet makes a difference in the perceived stress level of the MS patient.

# MATERIALS AND METHODS

## Participants

Multiple Sclerosis patients from the University of Texas Southwestern Neurology (UTSN) clinic were recruited for participation in this study. The Texas A&M University and University of Texas Southwestern Medical Center Institutional Review Board approved this study. This study recruited only people who voluntarily consented to participation. Recruitment of participants involved giving MS patients 18 years of age and older an introductory letter along with the study survey, when they appeared for their normally scheduled appointment at the UTSN clinic. The introductory letter consisted of an explanation of the study, the approximate time it would take the participant to complete the survey, the method of return of the survey, emphasis on anonymity of the information the participants provided, and reassurance that the study was strictly voluntary. Individual responses were anonymous and neither the investigators nor the physicians knew peoples' personal responses. Compensation was not provided for completing the survey. To obtain an adequate number of 300-400 respondents, approximately 500 surveys and introductory letters were printed and given to the UTSN clinic to distribute to MS patients. This study only focused on MS patients in the relapsing-remitting stage of MS, including male and female, adults 18 years of age or older, and of diverse ethnicities. The UTSN clinic provides care to those who are not able to pay, on Medicare and/or Medicaid, and those with private insurance. Participants completed the survey in the clinic while they waited for their appointment. If a person chose not to participate in the study, a request to check the box on the first page of the

survey stating, “I chose not to participate” existed. Once they had completed the survey, the participant presented the first page of the survey to their physician for him/her to verify their current stage of disease. Participants dropped their completed survey in a box, which were mailed to the investigators for data analysis. The surveys were kept in a secure locked office in the Veterinary Medical Science Building at Texas A&M University. Once the surveys were returned, they were assigned a unique identification number to provide a reference as to which data belonged to which survey. The data was entered into a customized MS Access database. Random sampling of 10% of the surveys was used to check for accuracy of data entry. Data from the surveys was also checked by comparing the maximum and minimum values of each response questionnaire to the actual range of values each questionnaire exhibited. The data was uploaded into the statistical software package SPSS v.11.0.

**Questionnaires**

A combination of six validated questionnaires and one widely used questionnaire were included to quantify the variables. The Functional Assessment of Multiple Sclerosis Quality of Life Instrument (FAMSQL) was used to evaluate the quality of life and to judge disease severity, which was a potential confounding factor (Cella et al., 1996). The Life Events Scale (LES) and Perceived Stress Survey (PSS) assessed the number of negative life events that had occurred in the participants' life in the past 12 months and the stress level of the participants, respectively (Cohen et al., 1991); (Cohen and Williamson, 1988). A section of the Patient Health Questionnaire (PHQ) was used to determine depression levels (Spitzer et al., 1994). The Social Support Questionnaire

(SSQ) was used to assess patients' social support network (Sarason et al., 1987). The Companion Animal Bonding Questionnaire (CABQ) and Comfort from Companion Animals Questionnaire (CCAQ) evaluated the patients' attachment level to their pet(s) (Poresky et al., 1987); (Zasloff, 1996).

A brief questionnaire inquiring about demographic variables such as age, sex, ethnicity, employment, income, and education were used to acquire general information regarding the participants. The answers to this demographic questionnaire were categorical variables.

The FAMSQLI is divided into six subscales: Mobility, Symptoms, Emotional Well-Being (depression), General Contentment, Thinking and Fatigue, and Family/Social Well-Being. It was used to judge potential confounders such as quality of life and disease severity a patient exhibited. "Quality of life is a term used in contemporary social science to refer to a person's subjective sense of well-being or satisfaction with important areas of life" (Cella et al., 1996). The FAMSQLI assessed patient functioning using a five-point (0-4) Likert-type response scale consisting of items that have general relevance for chronic illness and specific relevance to the symptoms and problems associated with MS (Cella et al., 1996). The response ratings range from 0 (not experiencing what the question is asking at all) to 4 (experiencing what the question is asking very much). Reverse coding was used for negative events. A higher score indicates a higher quality of life compared to a lower score. To explore meaningful quantitative descriptions about participants, the questions in the FAMSQLI are designed to assess the same trait in each subscale and measure the trait on a linear scale so that the

responses may be added and quantified (Cella et al., 1996). FAMSQLI consists of 59 items. A total score can range from the lowest quality of life and severe disability at 0 to the highest quality of life and no disability at 236. The questionnaire is self-explanatory and allows for the patient to answer quickly and accurately. The survey's validation consisted of multiple patient groups and compared the means between them. The results revealed consistent and complementary evidence for internal consistency, test-retest reliability, content validity, concurrent validity, and construct validity (Cella et al., 1996). Cronbach's alpha ranged from 0.82 to 0.96 and indicated homogeneity of the questions, ensuring internal consistency (Cella et al., 1996). The test-retest reliability coefficients ranged from 0.85 to 0.91 to express reliability (Cella et al., 1996). The FAMSQLI provides a way for surveying MS patients and evaluating the symptoms, problems, and psychosocial issues they possess to provide a measure of disease severity and quality of life with high levels of validity and reliability.

Specific questions that related to the patients functionality were selected and resulted in the inclusion of 36 questions. These 36 questions produced the disease severity score that was obtained as a subset of the FAMSQLI. A factor analysis was run on the questions to evaluate their ability to describe the questions' relationships with each other. These questions combined together were tested for reliability and resulted in a Cronbach's alpha equal to 0.94.

The LES evaluates life events that can be viewed as positive or negative. It is composed of 24 questions. Eleven questions contain yes/no responses and a six-point Likert rating scale to assess if the event had a positive or negative impact on the

participant. The ratings range from 'very good' to 'very bad'. If the participant considers the event to be 'bad' at all it is considered a negative event. The remaining 13 questions ask about the occurrence of a negative event and have only a yes/no response available. A total score represents the number of negative life events that occurred in the participant's life in the past 12 months and can range from 0 (no negative life events) to 24 (negative life events). The questions in the LES were compiled by Cohen (Cohen et al., 1991) and originated from the List of Recent Experiences by Henderson (Henderson et al., 1981). This questionnaire was chosen based on its ability to question relevant negative life events that occur in large numbers of populations studied (Cohen et al., 1991).

The PSS10 was the third component of the total survey. The PSS10 consists of ten items presented in a five-point Likert scale and measures the degree of stress that one experiences in life situations, viewed as stressful by the patient (Cohen and Williamson, 1988). The responses rate how often the participant felt or thought a certain way and range from 0 (never) to 4 (very often). A total score can range from 0 to 40 with a higher score indicating a higher stress level versus a lower score. The items evaluate how unpredictable, uncontrollable, and overloaded the respondents perceive their lives (Cohen and Williamson, 1988). The PSS10 was chosen because the items are easy to understand and it can be self administered quickly. The PSS10 is diverse in that it contains items that express negative and positive wording, which can easily be scored. It demonstrated a high internal reliability alpha coefficient score of 0.78 as well as a high degree of validity (Cohen et al., 1983).

The section of the PHQ utilized by this study assessed a measure of depression severity (Spitzer et al., 1999). The PHQ was originally derived from the PRIME-MD, which was longer and required physician assistance. The PHQ represents a revised and shortened version of the PRIME-MD that can be self-administered in a timely manner. The PHQ section that inquires about depression consists of 9 questions in a 4 point-Likert scale, asking for a response rating of 0 (not experiencing the question being asked at all) to 3 (experiencing the question being asked nearly every day). A total score can range from 0 to 27 with a higher score indicating a more severe level of depression. This questionnaire provides a mean to quantify responses and a way to categorize responses. A person filling out the depression section of the PHQ can be categorized by the DSM-IV as either "major depressive" or "other depressive". Also, those not considered depressive exist. If a person answers question 1 or 2 with "more than half the days" or "nearly everyday" and five or more questions experiencing the question at least "more than half the days", they are grouped into the category as a major depressive. If a person answers question 1 or 2 with "more than half the days" or "nearly everyday" and two, three, or four more questions with at least "more than half the days", they are grouped into the category as other depressive. Question 9 will be counted for both "major depressive" and "other depressive" if the respondents experience it at all. The depressive section of the PHQ demonstrated a sensitivity of 73% and specificity of 94% (Spitzer et al., 1999). Compared to a mental health professional interview the PHQ depressive section experienced a correlation coefficient of 0.84 indicating criterion

validity (Spitzer et al., 1999). The criterion validity measures the ability of the PHQ to expresses the actual level of depression.

The Social Support Questionnaire used in this study was the SSQ6. The SSQ6 is a short form of the SSQ consisting of 6 questions, shortened from the original SSQ that contains 27 questions (Sarason et al., 1987). Each question has two parts, with the first part of the question assessing the number of individuals that the person feels they have available to them for support. The second part uses a 6 point-Likert scale to rate the person's satisfaction with their perceived social support. The response choices range from 0 (very dissatisfied) to 5 (very satisfied) expressing a potential range of total scores of 0 to 30. A higher score indicates a higher degree of satisfaction with the person's perceived social support. This questionnaire is easily self-administered and can be completed quickly. Its internal reliability ranged from 0.90 to 0.93 for both parts of the question (Sarason et al., 1987). The correlation of the SSQ6 with the Social Network List resulted in 0.39 compared to the original SSQ of 0.43 (Sarason et al., 1987). The original SSQ and the SSQ6 were highly correlated with each other, and the SSQ6 provided a good measure of perceived social support comparable to that of the SSQ.

The CABQ provides a direct measure of companion animal bonding which stresses the strength of the human-animal bond versus just pet ownership (Poresky et al., 1987). Two versions of the CABQ exist: the contemporary scale and the childhood scale. This study used the contemporary scale, which assesses the human animal bond in the present tense in contrast to the childhood scale that is written in the past tense. The questionnaire can be self-administered and is easy to read and understand. The

CABQ represents animals of all kinds that can be used for companionship, not just dogs. The CABQ consists of eight questions and is based on a five-point Likert scale with responses of each item ranging from 1 to 5, with a 5 indicating a high level of attachment. A total score can range from 8 to 40 with a higher score resulting in a higher level of attachment. The scale exhibited a high internal reliability expressing a Cronbach alpha of 0.82 and showed significant correlation indicating construct validity between scores on the Pet Attitude Scale and the Childhood Bonding Scale of a 0.39 and 0.40, respectively (Poresky et al., 1987). Construct validity represents how well the question that is being asked actually measures the characteristic it proposes to measure.

The CCAS measures the level of emotional attachment and perceived comfort received from a pet. It is relatively short and easily understood. The construct validity of the CCAS correlated with the Lexington Attachment to Pets Scale (LAPS) with a coefficient of -0.68 ($p<0.05$) (Zasloff, 1996). The scales are inversely related. The Cronbach alpha from a pilot reliability test resulted in a value of 0.85 ($p<0.01$) (Zasloff, 1996). A four-point Likert scale measures responses from 1 (strongly disagree) to 4 (strongly agree), and a higher score results in greater perceived comfort and attachment from the pet. A total score can range from the lowest attachment of 11 to the highest level of attachment at 44.

Table 1 identifies the response categories for the different demographic variables.

Table 1
Data collected via survey

| Variables | Response Categories |
|---|---|
| **Demographics** | |
| Age range | 5 year intervals |
| Sex | male, female |
| Ethnicity | |
| Employed | yes/no |
| Work outside home | yes/no, job title |
| Household income range | $15,000/year intervals |
| Education | |
| Seen a psychologist/counselor | yes/no |
| **FAMSQLI** | rating scale 0 to 4 |
| **LES** | yes/no, rating scale 1 to 6 |
| **PSS** | rating scale 0 to 4 |
| **PHQ** | rating scale 0 to 4 |
| **SSQ** | list individual's initials, rating scale 0 to 5 |
| **CABQ** | rating scale 1 to 5 |
| Presently own pet | yes/no |
| Past 12 months own pet | yes/no |
| Type of pet | dog, cat, horse, rabbit, rodent, reptile, other |
| **CCAQ** | Rating scale 1 to 4 |

## Statistical Analysis

Statistical package SPSS for Windows v. 11.0 was used to analyze the data. For categorical variables (age, sex, ethnicity, employment status, work outside of home, household income range, education, whether or not the patient has seen a counselor before, and pet ownership) percentages for each category were calculated. The median and range was calculated for the ordinal variables. The mean, median, range, and

standard deviation were calculated for the continuous variables (quality of life score, disease severity score, life events score, perceived stress score, depression score, social support by number of individuals and satisfaction with support, and pet attachment levels). Histograms were used for evaluation of normality for each continuous and ordinal variable.

The scores from the LES or the PSS10 were used to compute values that represent the number of negative life events experienced within the last 12 months and the perceived stress level, respectively, as the dependent variables. Pet ownership and attachment level was defined by yes/no variables and the CABQ and CCAQ scores represent the independent variables. Multiple linear regression models using the LES and PSS10 as the dependent variables were fit separately. Possible confounders and/or effect modifiers consisted of age, sex, ethnicity, employment, income, education, quality of life, disease severity, depression, and social network (human support). The possible confounding variables were evaluated by comparing the change in the regression coefficients of the pet variables as they were assessed individually to when they were assessed with the other independent variables.

The general linear model as first-order terms present as:

$Y= \beta o + \beta_1 X_1 + \beta_2 X_2 + \ldots.. + \beta_k X_k + \varepsilon$ assuming that the effects of the independent variables are additive. Second and third order modeling could be used if needed for good model fit. An F-test and the p-value for each coefficient were used to evaluate the significance of the variables in relation to the outcome variable. The independent variables were inserted into the model individually to assess changes in the regression

coefficients and changes in significance. Selection for interactions between independent variables was based on biological plausibility and significance of the independent variable.

The four basic assumptions of multiple linear regression were applied and tested. Assuming that (1) the errors had equal variances (homoscedasticity), (2) the residuals (errors) were normally and independently distributed, (3) the model use correct (linear), and (4) that the values of the dependent variables were statistically independent of one another (independence) gave rise to the use of valid regression analyses. To test the homoscedasticity, a plot of the standardized residuals against the predicted values was conducted. A scatter of points resembling a horizontal band indicated constant variance. A normal probability plot of the residuals (errors) examined normality of the residuals. Normal distribution of the residuals resulted in the probability plot exhibiting a straight line at 45° to the horizontal. To test if the models were linear, a plot of the residuals against each of the continuous predictor variables or transformations of the Y-variable was performed. Independence of the dependent variables was assumed by the nature of the survey resulting from each observation originating from different individuals.

Correlation coefficients describing how LES and PSS relate to each other were determined using nonparametric correlations. Since the data was not normally distributed Spearman's rank correlation was used to compare the correlation amongst the variables.

An interaction term in the model with pet ownership and perceived stress level as the independent variables evaluated disease severity as the dependent variable. Also, an

interaction term evaluating disease severity as the dependent variable, with pet ownership and the number of negative life events as the independent variable, was calculated.

A Mann-Whitney test was performed to establish if there was a significant difference in attachment levels according to the type of pet that was owned. Few people owned a pet other than a dog or cat. Those that did own a pet other than a dog or cat also owned a dog. The data were divided and sorted by dog owners, and/or cat owners, and all other pets. The same dummy variable was given to a dog, a dog and cat, and a dog and other pet owner. The people that owned only cats were given the opposite dummy variable of the dog, dog and cat, and dog and other pet owner.

Regression analysis was run on a subset of the data including the younger patients 18-43 years of age to assess if pet ownership and attachment had a significant effect on their LES and PSS scores.

# RESULTS

## Data Collection

Data collection started February 23rd of 2004 and proceeded until May 21st 2004. A total of 204 surveys were distributed amongst patients at the UTSN clinic. Included in the study were 147 participants in the relapsing-remitting stage of MS. Of the MS patients that completed the survey, 122 patients currently owned a pet or had owned a pet within the last 12 months and 25 patients did not currently or within the last 12 months own a pet. Participants that completed the survey and were excluded from the study were 2 benign MS patients, 39 secondary progressive MS patients, 6 primary progressive MS patients, 4 other CNS disease patients, 2 that chose not to participate, and 3 whom did not complete the full survey. The 3 that did not complete the full survey randomly skipped pages and did not miss the same sections as each other.

Demographics of the study population were collected. Ethnicity was defined as Caucasian or other. African American, Hispanic, Asian, or other was grouped together to form one "other" variable due to few responses in each category. Only one respondent indicated that they finished 12th grade but did not indicate if he/she graduated high school or not. See table 2 for numbers and percents of the demographic variables pertaining to the study population.

Table 2
Demographic variables of the study population

| Demographic Variables | Pet Owners | Non-Pet Owners | P-value |
|---|---|---|---|
| | N=122 | N=25 | |
| **Age Range** | | | 0.9 |
| 18-23 | 4 (3.3%) | 2 (8.0%) | |
| 24-28 | 7 (5.7%) | 1 (4.0%) | |
| 29-33 | 13 (10.7%) | 3 (12.0%) | |
| 34-38 | 20 (16.4%) | 6 (24.0%) | |
| 39-43 | 20 (16.4%) | 3 (12.0%) | |
| 44-48 | 25 (20.5%) | 3 (12.0%) | |
| 49-53 | 11 (9.0%) | 3 (12.0%) | |
| 54-58 | 15 (12.3%) | 3 (12.0%) | |
| 59-63 | 6 (4.9%) | 1 (4.0%) | |
| 64-68 | 1 (0.8%) | 0 (0.0%) | |
| **Median** | 39-43 | 39-43 | |
| **Range** | (18-23)-(64-68) | (18-23)-(59-63) | |
| **Sex** | | | 0.5 |
| Male | 16 (13.1%) | 2 (8.0%) | |
| Female | 106 (86.9%) | 23 (92.0%) | |
| **Ethnicity** | | | |
| Caucasian | 116(95.1%) | 19(76.0%) | |
| African American | 0(0.0%) | 5(20.0%) | |
| Hispanic | 4(3.25%) | 0(0.0%) | |
| Asian | 0(0.0%) | 0(0.0%) | |
| Other | 2(1.64%) | 1(4.0%) | |
| **Ethnicity (Collapsed)** | | | 0.01 |
| Caucasian | 116 (95.1%) | 19 (76.0%) | |
| Other | 6 (4.9%) | 6 (24%) | |
| **Employed** | | | 0.8 |
| Yes | 79 (64.8%) | 15 (60.0%) | |
| No | 43 (35.2%) | 10 (40.0%) | |
| **Work Outside Home** | | | 0.1 |
| Yes | 42 (34.4%) | 13 (52.0%) | |
| No | 80 (65.6%) | 12 (48.0%) | |

Table 2 Continued

| Demographic Variables | Pet Owners | Non-Pet Owners | P-value |
|---|---|---|---|
| **Household Income Range** | | | 0.7 |
| 0-15,000 | 8(6.6%) | 2(8.0%) | |
| 15,001-30,000 | 8(6.6%) | 4(16.0%) | |
| 30,001-45,000 | 17(13.9%) | 2(8.0%) | |
| 45,001-60,000 | 14(11.5%) | 3(12.0%) | |
| 60,001-75,000 | 10(8.2%) | 1(4.0%) | |
| 75,001-90,000 | 13(10.7%) | 5(20.0%) | |
| 90,001-105,000 | 15(12.3%) | 2(8.0%) | |
| 105,000+ | 37(30.3%) | 6(24.0%) | |
| **Median** | 75,001-90,000 | 75,001-90,000 | |
| **Range** | (0-15,000)-(105,000+) | (0-15,000)-(105,000+) | |
| **Education** | | | 0.3 |
| Finished 12th grade | 1(0.8%) | 0(0.0%) | |
| Graduated High School | 15(12.3%) | 2(8%) | |
| GED | 0(0.0%) | 1(4.0%) | |
| Some College | 40(32.8%) | 9(36.0%) | |
| Bachelor's Degree | 43(35.2%) | 11(44.0%) | |
| Some Graduate School | 4(3.3%) | 0(0.0%) | |
| Graduate Degree | 19(15.6%) | 2(8.0%) | |
| **Seen Counselor** | | | 0.5 |
| Yes | 67 (54.9%) | 16 (64.0%) | |
| No | 55 (45.1%) | 9 (36.0%) | |
| **Total** | 122 (83%) | 25 (17%) | |

[a] Ethnicity defined as Caucasian or other.

Descriptive statistics of the continuous variables were also calculated. The number of patients that fell into the major depressive and other depressive categories was so small they were not taken into account as separate variables in the analyses. The PHQ was missing from the first 50 questionnaires because of a printing error when the surveys were made. The CABQ and CCAQ only included participants that own pets. One participant did not fill out the CCAQ, so N = 121 instead of 122. See table 3.

Table 3
Descriptive statistics for continuous variables

| Continuous Variable | Mean | Median | Range | Std. Dev. |
|---|---|---|---|---|
| **FAMSQLI** | 164 | 176 | (44-231) | 42.4 |
| **Disease Severity** | 98 | 103 | (19-146) | 27.8 |
| **LES** | 3.5 | 3 | (0-12) | 2.6 |
| **PSS** | 18 | 17 | (1-36) | 8.0 |
| **PHQ** | 7 | 5 | (0-26) | 6.2 |
| **MD**[a] | 19 | 19 | (16-21) | 1.9 |
| **OD**[b] | 12 | 12 | (11-13) | 0.8 |
| **SSQ # individuals** | 21 | 17 | (0-54) | 12.0 |
| **SSQ Satisfaction Score** | 24 | 26 | (0-30) | 7.6 |
| **CABQ** | 31 | 32 | (13-40) | 5.9 |
| **CCAQ** | 37 | 39 | (14-44) | 7.1 |

MD[a] (score for major depressive) N=6 (4.1%)
OD[b] (score for other depressive**)** N=7 (4.8%)

Histograms were constructed for the independent ordinal variables and the continuous variables, as well as the dependent variables to assess normality. See Figures 1-11. Age was categorized by five-year intervals starting with 1 representing 18-23 years to 10 signifying 64-68 years. See Figure 1. Income was also categorized into 15,000 dollar increments. One represented 0-15,000, 2 represented 15,001-30,000 and so on to 8 representing 105,000+. See Figure 2.

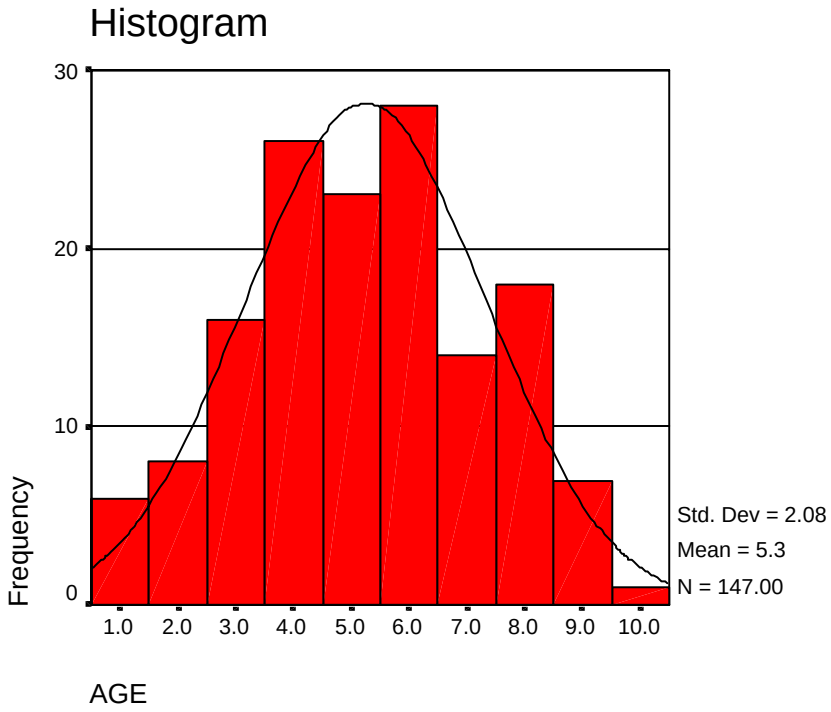


Fig. 1. Histogram of age

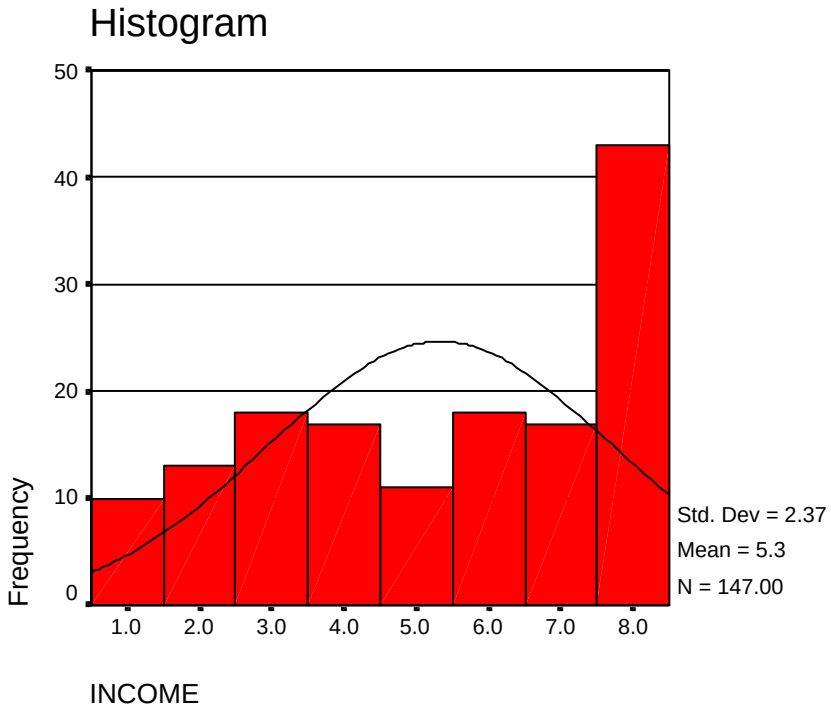


Fig. 2. Histogram of income

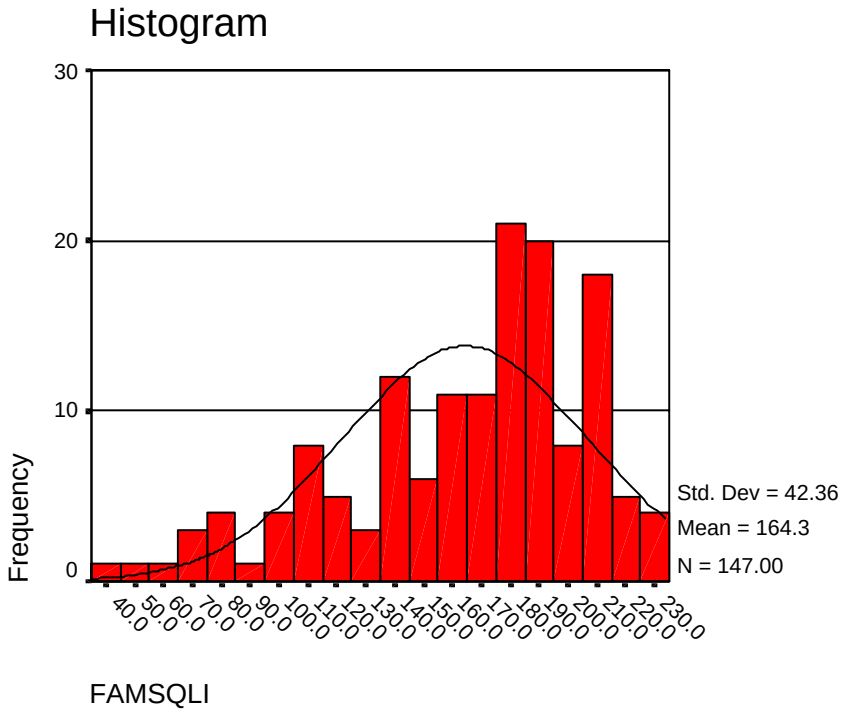


Fig. 3. Histogram of the FAMSQLI score

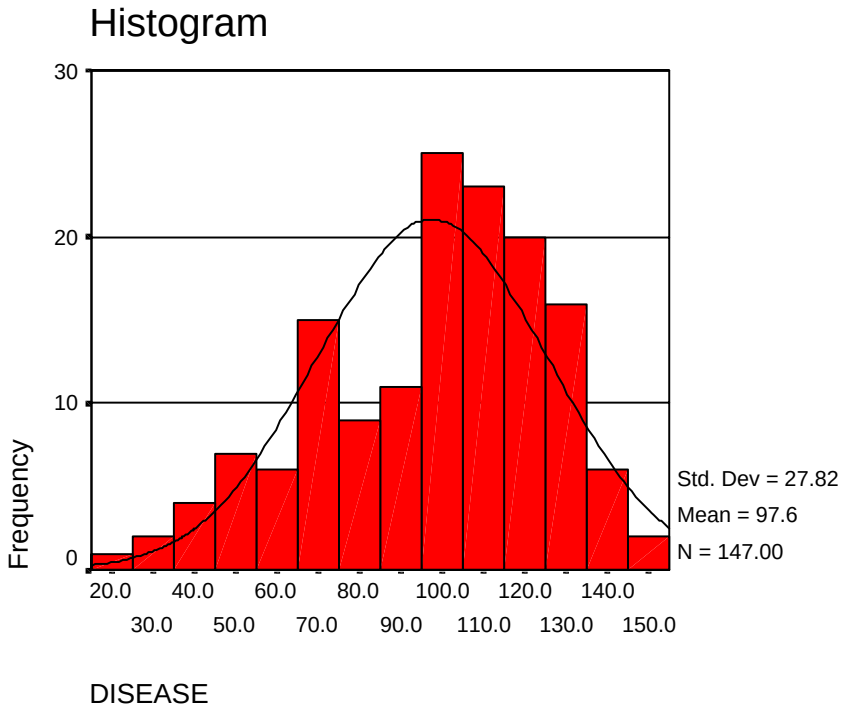


Fig. 4. Histogram of the disease severity score

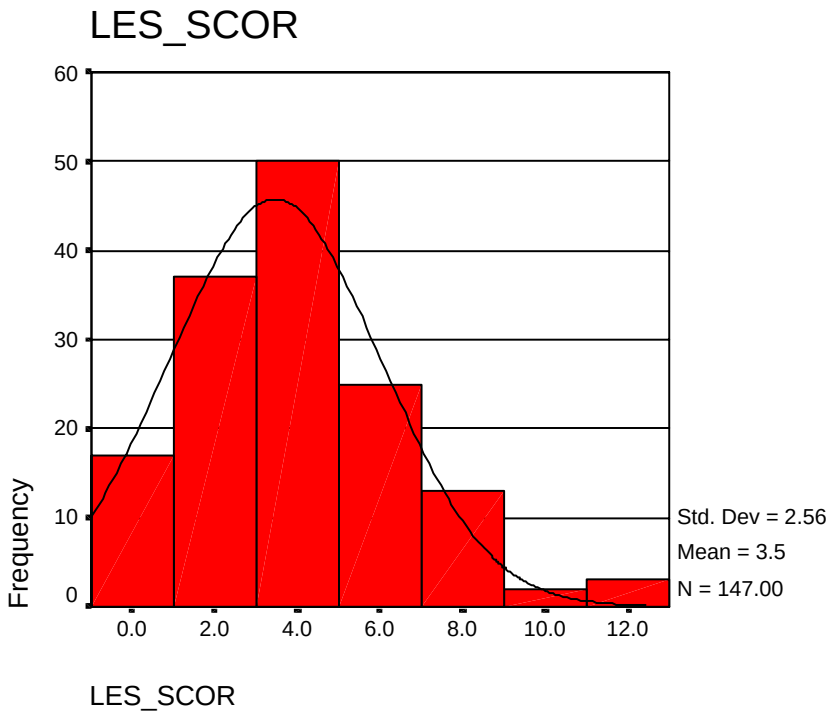


Fig. 5. Histogram of the LES score

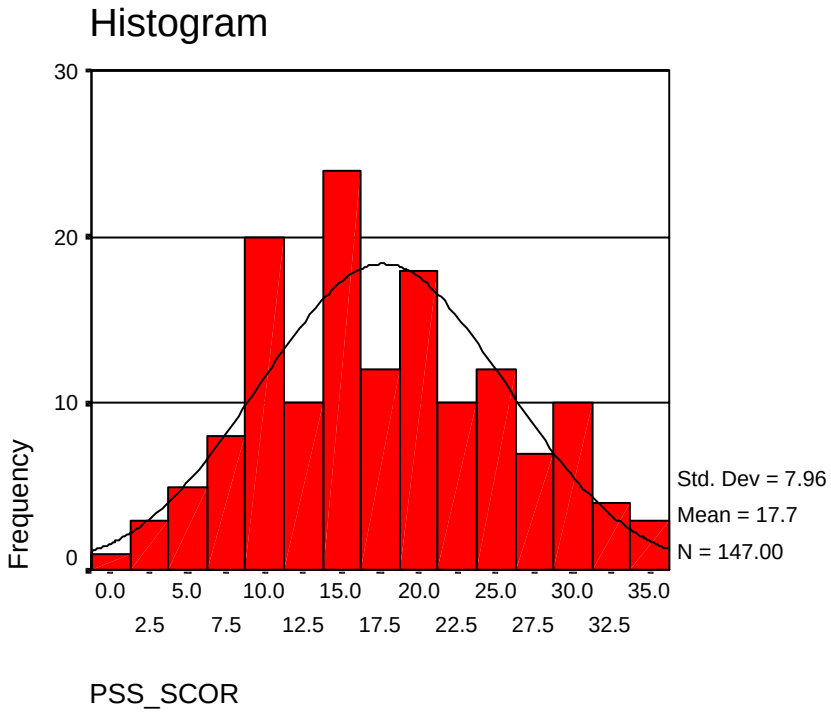


Fig. 6. Histogram of the PSS score

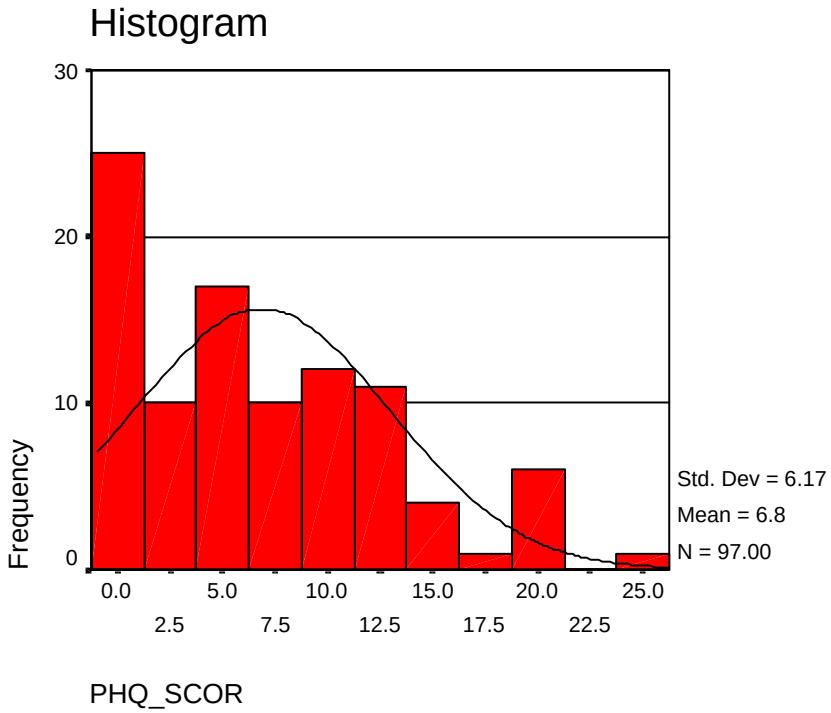


Fig. 7. Histogram of the PHQ score

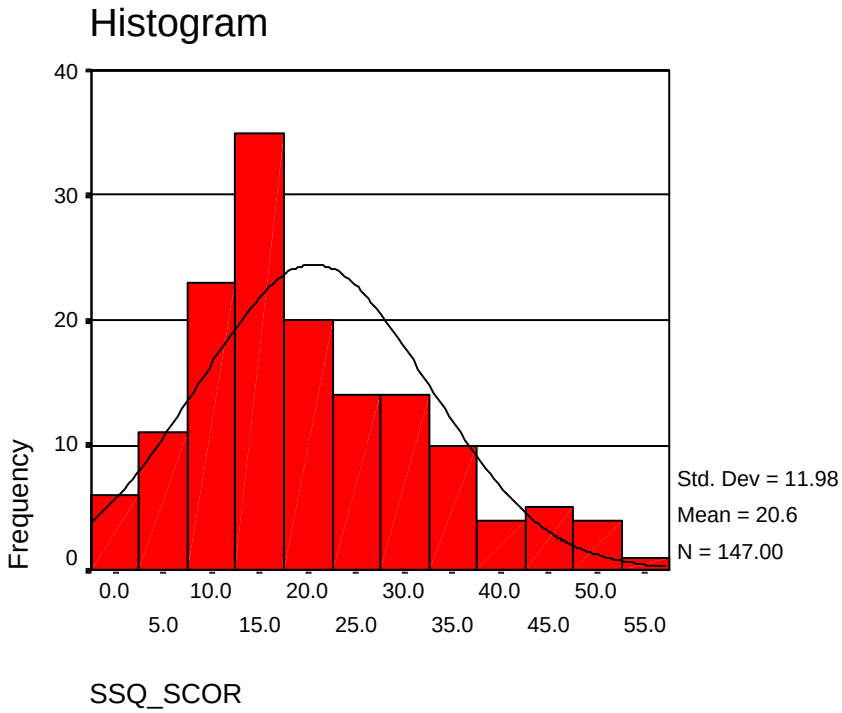


Fig. 8. Histogram of the SSQ score for number of individuals

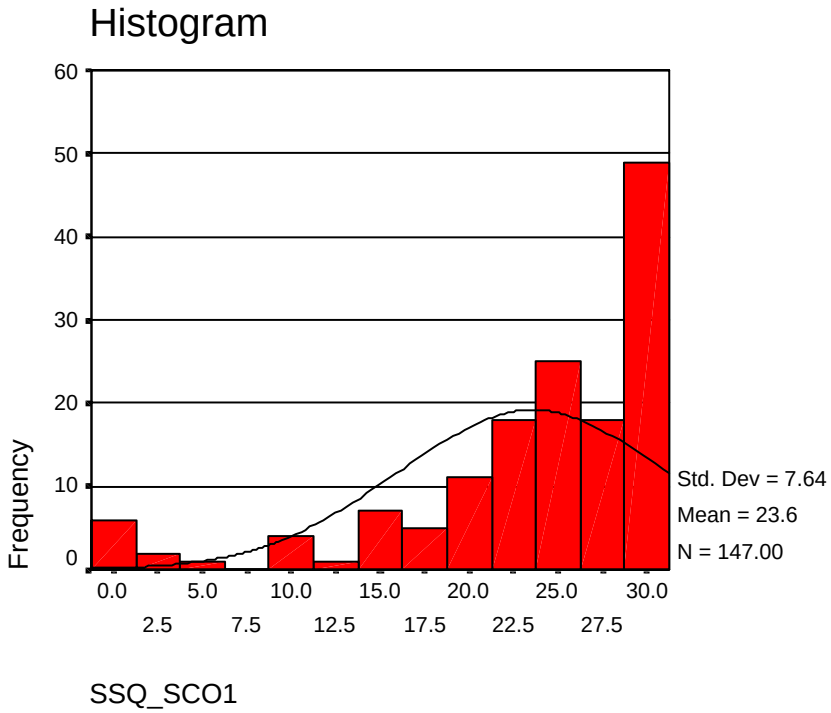


Fig. 9. Histogram of the SSQ score for satisfaction

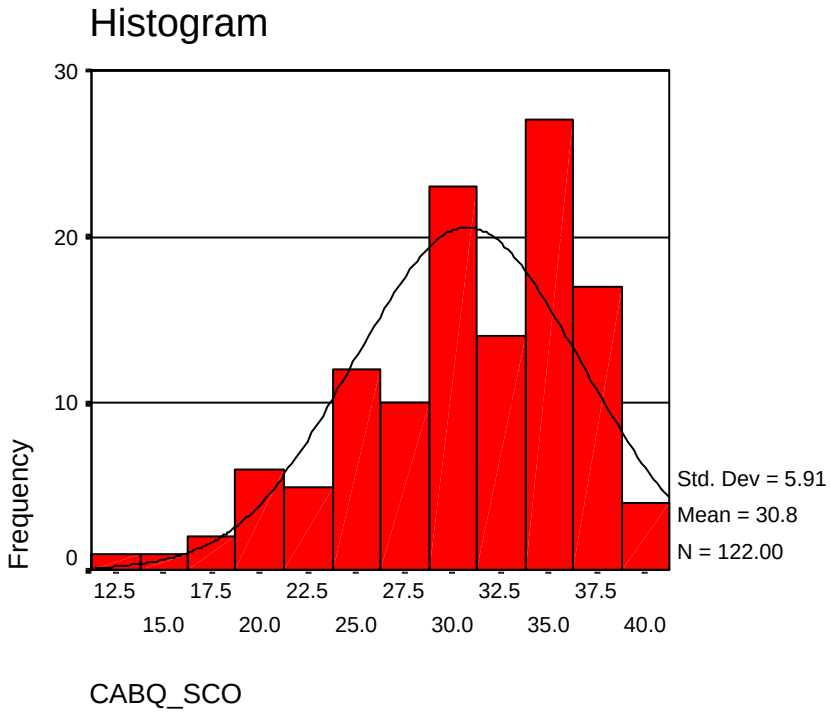


Fig. 10. Histogram of the CABQ score

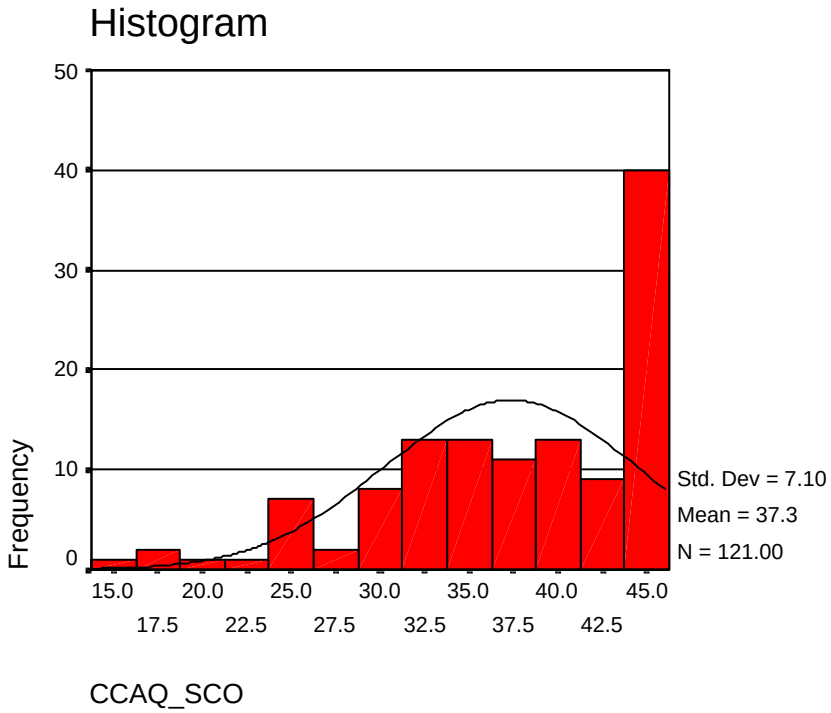


Fig. 11. Histogram of the CCAQ score

The LES and PSS dependent variables were fit separately with pet ownership status and the CABQ and CCAQ as independent variables. The variables were examined separately and in conjunction with each remaining independent variable to evaluate confounding, interaction, and significance. P-values of 0.0 in the tables represents less than 0.001. If either independent variable was significant, the interaction term was examined for all models with more than one independent variable. All models fit the assumption for linear regression. See tables 4 through 11.

Table 4
LES regression coefficients of individual variables

| Variables | Regression Coefficient of Individual Variables | P-value | $R^2$ |
|---|---|---|---|
| **Age** | -0.003 | 1.0 | 0.00 |
| **Sex** | -0.329 | 0.6 | 0.00 |
| **Ethnicity (Caucasian)**[a] | -0.593 | 0.4 | 0.00 |
| **Employed** | -0.261 | 0.6 | 0.00 |
| **Work Outside Home** | -0.275 | 0.5 | 0.00 |
| **Income** | -0.301 | 0.0[b] | 0.08 |
| **Education** | -0.058 | 0.7 | 0.00 |
| **FAMSQLI** | -0.017 | 0.0[b] | 0.08 |
| **Disease Severity** | -0.024 | 0.001[b] | 0.07 |
| **PHQ (depression level)** | 0.114 | 0.01[b] | 0.07 |
| **Social Support Network (# of Individuals)** | -0.002 | 0.9 | 0.00 |
| **Social Support Network (Satisfaction)** | -0.063 | 0.02[b] | 0.04 |
| **Pet Ownership** | 0.067 | 0.9 | 0.00 |
| **CABQ** | 0.021 | 0.6 | 0.00 |
| **CCAQ** | 0.043 | 0.2 | 0.02 |

[a] Not enough other ethnicities to evaluate separately
[b] Significant $p<0.05$

Table 5
LES regression coefficients of pet ownership and other variables in the variable column

| | Regression Coefficients (p-value) | | |
|---|---|---|---|
| **Variables** | **Pet Ownership** | **Other Variables** | **$R^2$** |
| **Age** | 0.069 (0.9) | -0.004 (1.0) | 0.00 |
| **Sex** | 0.084 (0.9) | -0.335 (0.6) | 0.00 |
| **Ethnicity (Caucasian)[a]** | 0.194 (0.7) | -0.662 (0.4) | 0.01 |
| **Employed Work Outside Home** | 0.080 (0.9) | -0.263 (0.6) | 0.00 |
| **Income** | 0.106 (0.9) | -0.284 (0.5) | 0.00 |
| **Education** | 0.189 (0.7) | -0.303 (0.001) | 0.08 |
| **FAMSQLI** | 0.128 (0.8) | -0.060 (0.7) | 0.00 |
| **Disease Severity** | -0.055 (0.9) | -0.018 (0.0) | 0.08 |
| **PHQ (depression level)** | -0.032 (1.0) | -0.024 (0.0) | 0.07 |
| **Social Support Network (# of Individuals)** | -0.157 (0.8) | 0.114 (0.0) | 0.07 |
| **Social Support Network (Satisfaction)** | 0.069 (0.9) | -0.002 (0.9) | 0.00 |
| | 0.195 (0.7) | -0.064 (0.0) | 0.04 |

[a] Not enough other ethnicities to evaluate separately

Table 6
LES regression coefficients of CABQ and other variables in the variable column

| | Regression Coefficients (p-value) | | |
|---|---|---|---|
| **Variables** | **C.A.B.Q.** | **Other Variables** | **$R^2$** |
| **Age** | 0.023 (0.6) | -0.044 (0.7) | 0.00 |
| **Sex** | 0.019 (0.6) | -0.183 (0.8) | 0.00 |
| **Ethnicity (Caucasian)** | 0.021(0.6) | -0.738 (0.5) | 0.01 |
| **Employed** | 0.018 (0.7) | -0.403 (0.4) | 0.01 |
| **Work Outside Home** | 0.018 (0.6) | -0.430 (0.4) | 0.01 |
| **Income** | 0.028 (0.5) | -0.259 (0.01) | 0.06 |
| **Education** | 0.027(0.5) | -0.024 (0.9) | 0.00 |
| **FAMSQLI** | 0.023 (0.5) | -0.016 (0.002) | 0.08 |
| **Disease Severity** | 0.023 (0.5) | -0.022 (0.01) | 0.06 |
| **PHQ (depression level)** | 0.007 (0.9) | -0.106 (0.04) | 0.06 |
| **Social Support Network (# of Individuals)** | 0.025 (0.5) | -0.014 (0.5) | 0.01 |
| **Social Support Network (Satisfaction)** | 0.040 (0.3) | -0.103 (0.002) | 0.08 |

[a] Not enough other ethnicities to evaluate separately

Table 7
LES regression coefficients of CCAQ and other variables in the variable column

| | Regression Coefficients (p-value) | | |
|---|---|---|---|
| **Variables** | **C.C.A.Q.** | **Other Variables** | **$R^2$** |
| **Age** | 0.045 (0.1) | -0.065 (0.6) | 0.02 |
| **Sex** | 0.042 (0.2) | -0.076 (0.9) | 0.02 |
| **Ethnicity (Caucasian)[a]** | 0.043 (0.2) | -0.739 (0.5) | 0.02 |
| **Employed** | 0.041 (0.2) | -0.326 (0.5) | 0.02 |
| **Work Outside Home** | 0.043 (0.2) | -0.344 (0.5) | 0.02 |
| **Income** | 0.050 (0.1) | -0.278 (0.004) | 0.08 |
| **Education** | 0.046 (0.1) | 0.007 (1.0) | 0.02 |
| **FAMSQLI** | 0.046 (0.1) | -0.016 (0.002) | 0.09 |
| **Disease Severity** | 0.044(0.1) | -0.022 (0.01) | 0.08 |
| **PHQ (depression level)** | 0.017(0.7) | 0.106 (0.04) | 0.06 |
| **Social Support Network (# of Individuals)** | 0.048 (0.1) | -0.018 (0.3) | 0.02 |
| **Social Support Network (Satisfaction)** | 0.060 (0.0) | -0.108 (0.001) | 0.10 |

[a] Not enough other ethnicities to evaluate separately

Table 8
PSS regression coefficients of individual variables

| Variables | Regression Coefficient of Individual Variables | P-value | $R^2$ |
|---|---|---|---|
| **Age** | -0.212 | 0.5 | 0.00 |
| **Sex** | -2.659 | 0.2 | 0.01 |
| **Ethnicity (Caucasian)**[a] | 1.996 | 0.4 | 0.01 |
| **Employed** | -2.970 | 0.03[b] | 0.03 |
| **Work Outside Home** | -3.132 | 0.02[b] | 0.04 |
| **Income** | -0.787 | 0.004[b] | 0.06 |
| **Education** | -1.151 | 0.04[b] | 0.03 |
| **FAMSQLI** | -0.133 | 0.0[b] | 0.50 |
| **Disease Severity** | -0.186 | 0.0[b] | 0.42 |
| **PHQ (depression level)** | 0.752 | 0.0[b] | 0.33 |
| **Social Support Network (# of Individuals)** | -0.170 | 0.002[b] | 0.07 |
| **Social Support Network (Satisfaction)** | -0.410 | 0.0[b] | 0.16 |
| **Pet Ownership** | 0.129 | 0.9 | 0.00 |
| **CABQ** | 0.118 | 0.3 | 0.01 |
| **CCAQ** | 0.029 | 0.8 | 0.00 |

[a] Not enough other ethnicities to evaluate separately

Table 9
PSS regression coefficients of pet ownership and other variables in the variable column

| | Regression Coefficients (p-value) | | |
|---|---|---|---|
| **Variables** | **Pet Ownership** | **Other Variables** | **$R^2$** |
| **Age** | 0.204 (1.0) | -0.214 (0.5) | 0.003 |
| **Sex** | 0.265 (0.9) | -2.677 (0.2) | 0.012 |
| **Ethnicity (Caucasian)[a]** | -0.271 (0.9) | 2.094 (0.4) | 0.005 |
| **Employed** | 0.270 (0.9) | -2.978 (0.03) | 0.032 |
| **Work Outside Home** | 0.560 (0.7) | -3.178 (0.02) | 0.037 |
| **Income** | 0.447 (0.8) | -0.792 (0.004) | 0.056 |
| **Education** | 0.384 (0.8) | -1.158 (0.04) | 0.031 |
| **FAMSQLI** | -0.797 (0.5) | -0.133 (0.0) | 0.499 |
| **Disease Severity** | -0.636 (0.6) | -0.186 (0.0) | 0.421 |
| **PHQ (depression level)** | -0.678 (0.7) | 0.751 (0.0) | 0.333 |
| **Social Support Network (# of Individuals)** | 0.244 (0.9) | -0.170 (0.002) | 0.066 |
| **Social Support Network (Satisfaction)** | 0.953 (0.6) | -0.415 (0.0) | 0.157 |

[a] Not enough other ethnicities to evaluate separately

Table 10
PSS regression coefficients of CABQ and other variables in the variable column

| Variables | Regression Coefficients (p-value) C.A.B.Q. | Other Variables | $R^2$ |
|---|---|---|---|
| **Age** | 0.126 (0.3) | -0.281 (0.4) | 0.01 |
| **Sex** | 0.086 (0.5) | -2.795 (0.2) | 0.02 |
| **Ethnicity (Caucasian)**[a] | 0.118 (0.3) | 2.639 (0.4) | 0.01 |
| **Employed** | 0.089 (0.50 | -3.083 (0.05) | 0.02 |
| **Work Outside Home** | 0.098 (0.4) | -2.914 (0.06) | 0.04 |
| **Income** | 0.139 (0.3) | -0.757 (0.015) | 0.06 |
| **Education** | 0.113(0.4) | -0.728 (0.2) | 0.02 |
| **FAMSQLI** | 0.132 (0.1) | -0.133 (0.0) | 0.49 |
| **Disease Severity** | 0.130 (0.2) | -0.185 (0.0) | 0.42 |
| **PHQ (depression level)** | 0.259 (0.1) | 0.778 (0.0) | 0.35 |
| **Social Support Network (# of Individuals)** | 0.165 (0.2) | -0.185 (0.002) | 0.08 |
| **Social Support Network (Satisfaction)** | 0.203 (0.1) | -0.470 (0.0) | 0.17 |

[a] Not enough other ethnicities to evaluate separately

Table 11
PSS regression coefficients of CCAQ and other variables in the variable column

| Variables | Regression Coefficients (p-value) C.C.A.Q. | Other Variables | $R^2$ |
|---|---|---|---|
| **Age** | 0.039 (0.7) | -0.291 (0.4) | 0.01 |
| **Sex** | 0.000 (1.0) | -3.182 (0.1) | 0.02 |
| **Ethnicity (Caucasian)**[a] | 0.028 (0.8) | 2.713 (0.4) | 0.01 |
| **Employed** | 0.007 (1.0) | -3.100 (0.05) | 0.03 |
| **Work Outside Home** | 0.008 (1.0) | -2.905 (0.1) | 0.03 |
| **Income** | 0.049 (0.6) | -0.784 (0.012) | 0.05 |
| **Education** | 0.038 (0.7) | -0.678 (0.3) | 0.01 |
| **FAMSQLI** | 0.057 (0.4) | -0.132 (0.0) | 0.49 |
| **Disease Severity** | 0.038 (0.6) | -0.184 (0.0) | 0.41 |
| **PHQ (depression level)** | 0.092 (0.3) | 0.759 (0.0) | 0.33 |
| **Social Support Network (# of Individuals)** | 0.084(0.4) | -0.186 (0.002) | 0.08 |
| **Social Support Network (Satisfaction)** | 0.103(0.3) | -0.458 (0.0) | 0.15 |

[a] Not enough other ethnicities to evaluate separately

A significant interaction occurred with LES as the dependent variable and pet ownership and household income serving as the independent variables. See graph in figure 12.

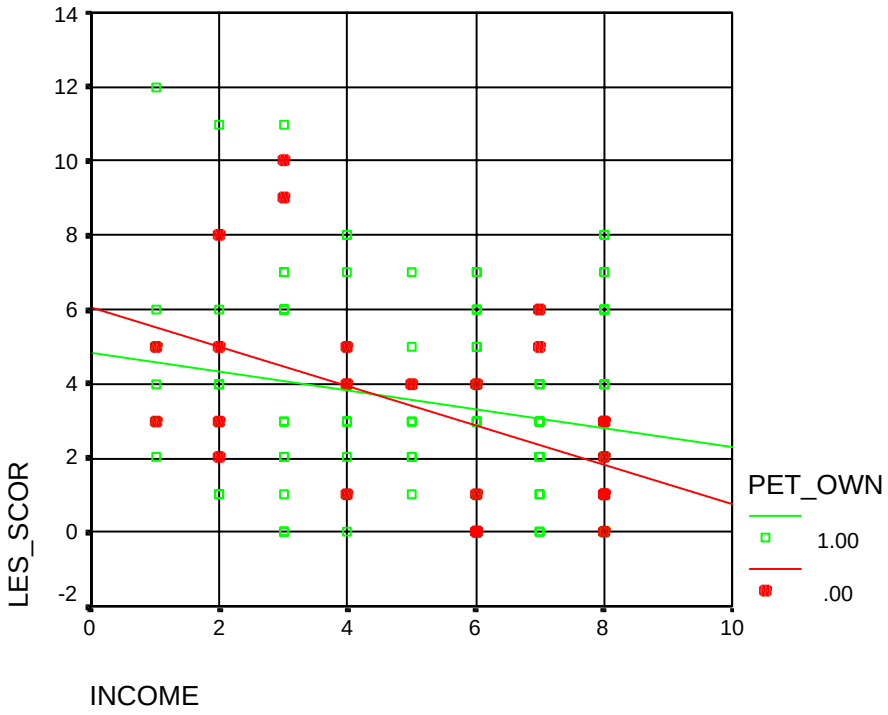


Fig. 12. Interaction graph of LES score with income and pet ownership

**Disease Severity Components**

The questions that comprised the disease severity score were taken as a subset of the FAMSQLI questionnaire. The factor analysis for the questions that comprise the disease severity score revealed that 39% of the variance could be explained within the first component. See tables 12 and 13 for factor analysis data.

Table 12
Factor analysis for questions that comprise the disease severity score: total variance explained

| | Initial EigenValues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| **Component** | **Total** | **% of Variance** | **Cumulative %** | **Total** | **% of Variance** | **Cumulative %** |
| 1 | 14.019 | 38.943 | 38.94259 | 14.019 | 38.943 | 38.943 |
| 2 | 2.184 | 6.065 | 45.00787 | 2.184 | 6.065 | 45.008 |
| 3 | 1.859 | 5.165 | 50.17256 | 1.859 | 5.165 | 50.173 |
| 4 | 1.590 | 4.417 | 54.58987 | 1.590 | 4.417 | 54.590 |
| 5 | 1.543 | 4.286 | 58.87616 | 1.543 | 4.286 | 58.876 |
| 6 | 1.376 | 3.822 | 62.69861 | 1.376 | 3.822 | 62.699 |
| 7 | 1.220 | 3.390 | 66.08851 | 1.220 | 3.390 | 66.089 |
| 8 | 1.040 | 2.890 | 68.97868 | 1.040 | 2.890 | 68.979 |
| 9 | .919 | 2.551 | 71.53012 | | | |
| 10 | .881 | 2.446 | 73.9766 | | | |
| 11 | .852 | 2.366 | 76.34244 | | | |
| 12 | .761 | 2.114 | 78.45605 | | | |
| 13 | .660 | 1.835 | 80.29058 | | | |
| 14 | .638 | 1.772 | 82.06297 | | | |
| 15 | .608 | 1.688 | 83.75127 | | | |
| 16 | .570 | 1.584 | 85.33538 | | | |
| 17 | .533 | 1.481 | 86.81613 | | | |
| 18 | .519 | 1.443 | 88.25912 | | | |
| 19 | .499 | 1.386 | 89.64552 | | | |
| 20 | .439 | 1.220 | 90.8651 | | | |
| 21 | .409 | 1.137 | 92.00178 | | | |
| 22 | .349 | .969 | 92.97118 | | | |
| 23 | .331 | .919 | 93.89048 | | | |
| 24 | .306 | .851 | 94.74108 | | | |
| 25 | .276 | .766 | 95.50733 | | | |
| 26 | .248 | .688 | 96.19509 | | | |
| 27 | .241 | .669 | 96.86424 | | | |
| 28 | .214 | .596 | 97.46 | | | |
| 29 | .177 | .492 | 97.9517 | | | |
| 30 | .151 | .420 | 98.37165 | | | |
| 31 | .141 | .391 | 98.76278 | | | |
| 32 | .116 | .323 | 99.08588 | | | |
| 33 | .099 | .276 | 99.36167 | | | |
| 34 | .088 | .245 | 99.60654 | | | |
| 35 | .086 | .240 | 99.84623 | | | |
| 36 | .055 | .154 | 100 | | | |

Extraction Method: Principal Component Analysis.

The factors within the first component were all above 0.3 with the exception of the question referring to sexually active status within the last 12 months. The Cronbach's alpha of the disease severity questions was 0.94 indicating that these questions combined together to make a disease severity score expressed a high internal reliability.

Table 13
Factor analysis for questions that comprise the disease severity score: component matrix[a]

| | Component | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| @1_NEEDS | 0.805 | 0.231 | -0.036 | 0.130 | -0.109 | 0.106 | -0.003 | -0.114 |
| @2_WORK | 0.514 | 0.198 | -0.066 | 0.072 | -0.087 | 0.214 | -0.319 | 0.041 |
| @3_WALKI | 0.715 | 0.431 | -0.028 | -0.036 | 0.094 | 0.080 | 0.030 | -0.233 |
| @4_SOCIA | 0.807 | 0.231 | 0.078 | 0.230 | -0.065 | 0.117 | -0.034 | 0.025 |
| @5_LEGS | 0.590 | 0.282 | -0.165 | -0.217 | 0.193 | 0.067 | 0.182 | -0.120 |
| @6_GETTI | 0.645 | 0.379 | 0.000 | 0.196 | 0.058 | 0.209 | 0.055 | -0.164 |
| @7_PLANS | 0.731 | 0.352 | -0.005 | 0.282 | -0.044 | 0.140 | 0.023 | -0.093 |
| @8_NAUSE | 0.538 | -0.016 | 0.137 | 0.001 | 0.083 | -0.066 | -0.618 | 0.158 |
| @9_PAIN | 0.684 | 0.254 | 0.292 | -0.285 | -0.148 | -0.006 | 0.050 | -0.051 |
| @10_SICK | 0.687 | 0.044 | 0.315 | -0.060 | -0.095 | -0.242 | -0.381 | 0.081 |
| @11_WEAK | 0.754 | 0.187 | 0.183 | -0.128 | -0.095 | -0.191 | -0.057 | -0.099 |
| @12_PAIN | 0.674 | 0.121 | 0.313 | -0.314 | -0.094 | -0.056 | 0.012 | -0.245 |
| @13_HEAD | 0.533 | -0.365 | 0.278 | -0.112 | 0.103 | -0.264 | -0.088 | -0.039 |
| @14_MUSC | 0.419 | -0.032 | 0.247 | -0.233 | -0.172 | -0.068 | 0.088 | 0.102 |
| @29_LACK | 0.785 | -0.159 | -0.146 | 0.087 | -0.298 | -0.201 | 0.257 | 0.011 |
| @30_TIRE | 0.770 | -0.186 | -0.121 | 0.097 | -0.301 | -0.248 | 0.225 | -0.010 |
| @31_TROU | 0.795 | -0.243 | -0.172 | 0.087 | -0.296 | -0.136 | 0.065 | -0.011 |
| @32_TROU | 0.782 | -0.155 | -0.249 | 0.267 | -0.207 | -0.096 | -0.041 | 0.076 |
| @33_REST | 0.752 | -0.166 | -0.236 | 0.224 | -0.201 | -0.111 | -0.032 | 0.000 |
| @34_REME | 0.724 | -0.346 | -0.283 | -0.266 | 0.137 | 0.175 | -0.056 | 0.009 |
| @35_CONC | 0.746 | -0.357 | -0.257 | -0.272 | 0.104 | 0.148 | -0.085 | 0.005 |
| @36_THIN | 0.739 | -0.329 | -0.301 | -0.276 | 0.151 | 0.146 | -0.018 | 0.008 |
| @37_LEAR | 0.684 | -0.274 | -0.273 | -0.210 | 0.151 | 0.265 | -0.103 | -0.021 |
| @45_SIDE | 0.393 | -0.179 | 0.362 | 0.311 | 0.102 | -0.096 | 0.230 | 0.312 |
| @46_TIME | 0.721 | -0.046 | 0.130 | 0.292 | -0.076 | -0.052 | -0.206 | 0.002 |
| @48_SEXU | 0.145 | 0.204 | -0.028 | -0.048 | -0.336 | 0.452 | -0.048 | 0.638 |
| @50_PROU | 0.531 | -0.115 | 0.024 | 0.112 | 0.048 | 0.302 | 0.038 | -0.089 |
| @51_NERV | 0.548 | 0.042 | 0.132 | -0.090 | 0.070 | 0.002 | 0.426 | 0.174 |
| @52_WORR | 0.492 | -0.108 | 0.375 | -0.157 | 0.158 | 0.253 | 0.243 | 0.279 |
| @53_SLEE | 0.406 | -0.224 | 0.286 | -0.190 | 0.160 | -0.250 | -0.003 | 0.003 |
| @54_HEAT | 0.457 | 0.074 | -0.328 | 0.103 | 0.173 | -0.191 | 0.154 | 0.044 |
| @55_CONT | 0.404 | 0.416 | -0.422 | -0.018 | 0.392 | -0.309 | -0.023 | 0.157 |
| @56_URIN | 0.348 | 0.373 | -0.137 | -0.022 | 0.453 | -0.364 | 0.006 | 0.365 |
| @57_CHIL | 0.389 | -0.257 | 0.191 | 0.354 | 0.491 | 0.091 | -0.065 | -0.057 |
| @58_FEVE | 0.350 | -0.279 | 0.277 | 0.447 | 0.353 | 0.213 | 0.103 | -0.114 |
| @59_MUSC | 0.608 | 0.196 | 0.214 | -0.263 | 0.071 | 0.126 | 0.091 | -0.050 |

Extraction Method: Principal Component Analysis.
[a] 8 components extracted with eigenvalues >1.0.

**Correlations**

Spearman rank correlation coefficients were determined to assess the correlation between the dependent variables, LES and PSS. See table 14.

Table 14
Spearman rank correlation coefficient of dependent variables: nonparametric

| | | | LES_SCOR | PSS_SCOR |
|---|---|---|---|---|
| **Spearman's rho** | **LES_SCOR** | Correlation Coefficient | 1.000 | .370[a] |
| | | Sig. (2-tailed) | . | .000 |
| | | N | 147 | 147 |
| | **PSS_SCOR** | Correlation Coefficient | .370[a] | 1.000 |
| | | Sig. (2-tailed) | .000 | . |
| | | N | 147 | 147 |

[a] Correlation is significant at the .01 level (2-tailed).

Spearman rank correlation coefficients were also determined to assess the correlation between the independent variables. See Table 15 for data.

Table 15
Spearman rank correlation coefficients of independent variables

| | | | AGE | SEX | CAUCASIA | INCOME |
|---|---|---|---|---|---|---|
| Spearman's rho | AGE | Correlation Coefficient | 1 | -.013 | .113 | .329[a] |
| | | Sig. (2-tailed) | . | .880 | .173 | .000 |
| | | N | 147 | 147 | 147 | 147 |
| | INCOME | Correlation Coefficient | .329[a] | .002 | .123 | 1 |
| | | Sig. (2-tailed) | .000 | .979 | .137 | . |
| | | N | 147 | 147 | 147 | 147 |
| | FAMSQLI | Correlation Coefficient | -.058 | .021 | -.018 | .316[a] |
| | | Sig. (2-tailed) | .486 | .800 | .827 | .000 |
| | | N | 147 | 147 | 147 | 147 |
| | DISEASE | Correlation Coefficient | -.061 | .065 | .001 | .310[a] |
| | | Sig. (2-tailed) | .465 | .433 | .994 | .000 |
| | | N | 147 | 147 | 147 | 147 |
| | LES_SCOR | Correlation Coefficient | -.059 | -.080 | -.101 | -.260[a] |
| | | Sig. (2-tailed) | .474 | .338 | .221 | .001 |
| | | N | 147 | 147 | 147 | 147 |
| | PSS_SCOR | Correlation Coefficient | -.073 | -.095 | .070 | -.237[a] |
| | | Sig. (2-tailed) | .382 | .254 | .397 | .004 |
| | | N | 147 | 147 | 147 | 147 |
| | PHQ_SCOR | Correlation Coefficient | .004 | -.088 | .132 | -.287[a] |
| | | Sig. (2-tailed) | .969 | .392 | .198 | .004 |
| | | N | 97 | 97 | 97 | 97 |
| | SSQ_SCOR | Correlation Coefficient | -.128 | -.169[b] | -.142 | .118 |
| | | Sig. (2-tailed) | .123 | .041 | .086 | .156 |
| | | N | 147 | 147 | 147 | 147 |
| | SSQ_SCO1 | Correlation Coefficient | -.088 | .050 | -.170[b] | -.009 |
| | | Sig. (2-tailed) | .289 | .545 | .040 | .917 |
| | | N | 147 | 147 | 147 | 147 |
| | CABQ_SCO | Correlation Coefficient | .071 | -.214[b] | -.001 | .079 |
| | | Sig. (2-tailed) | .434 | .018 | .995 | .386 |
| | | N | 122 | 122 | 122 | 122 |
| | CCAQ_SCO | Correlation Coefficient | .174 | -.240[a] | .041 | .068 |
| | | Sig. (2-tailed) | .056 | .008 | .654 | .458 |
| | | N | 121 | 121 | 121 | 121 |

[a] Correlation is significant at the 0.05 level (2-tailed)
[b] Correlation is significant at the 0.01 level (2-tailed

Table 15 Continued

| | | | FAMSQLI | DISEASE | LES_SCOR | PSS_SCOR |
|---|---|---|---|---|---|---|
| Spearman's rho | AGE | Correlation Coefficient | -.058 | -.061 | -.059 | -.073 |
| | | Sig. (2-tailed) | .486 | .465 | .474 | .382 |
| | | N | 147 | 147 | 147 | 147 |
| | INCOME | Correlation Coefficient | .316[a] | .310[a] | -.260[a] | -.237[a] |
| | | Sig. (2-tailed) | .000 | .000 | .001 | .004 |
| | | N | 147 | 147 | 147 | 147 |
| | FAMSQLI | Correlation Coefficient | 1 | .963[a] | -.254[a] | -.658[a] |
| | | Sig. (2-tailed) | . | .000 | .002 | .000 |
| | | N | 147 | 147 | 147 | 147 |
| | DISEASE | Correlation Coefficient | .963[a] | 1 | -.243[a] | -.603[a] |
| | | Sig. (2-tailed) | .000 | . | .003 | .000 |
| | | N | 147 | 147 | 147 | 147 |
| | LES_SCOR | Correlation Coefficient | -.254[a] | -.243[a] | 1 | .370[a] |
| | | Sig. (2-tailed) | .002 | .003 | . | .000 |
| | | N | 147 | 147 | 147 | 147 |
| | PSS_SCOR | Correlation Coefficient | -.658[a] | -.603[a] | .370[a] | 1 |
| | | Sig. (2-tailed) | .000 | .000 | .000 | . |
| | | N | 147 | 147 | 147 | 147 |
| | PHQ_SCOR | Correlation Coefficient | -.632[a] | -.626[a] | .162 | .546[a] |
| | | Sig. (2-tailed) | .000 | .000 | 0.114 | .000 |
| | | N | 97 | 97 | 97 | 97 |
| | SSQ_SCOR | Correlation Coefficient | .369[a] | .348[a] | .0130 | -.238[a] |
| | | Sig. (2-tailed) | .000 | .000 | .876 | .004 |
| | | N | 147 | 147 | 147 | 147 |
| | SSQ_SCO1 | Correlation Coefficient | .428[a] | .359[a] | -.162 | -.414[a] |
| | | Sig. (2-tailed) | .000 | .000 | .050 | .000 |
| | | N | 147 | 147 | 147 | 147 |
| | CABQ_SCO | Correlation Coefficient | .016 | .004 | .099 | .075 |
| | | Sig. (2-tailed) | .858 | .966 | .279 | .410 |
| | | N | 122 | 122 | 122 | 122 |
| | CCAQ_SCO | Correlation Coefficient | .019 | -.017 | .175 | .016 |
| | | Sig. (2-tailed) | .840 | .849 | .055 | .863 |
| | | N | 121 | 121 | 121 | 121 |

[a] Correlation is significant at the 0.05 level (2-tailed)
[b] Correlation is significant at the 0.01 level (2-tailed

Table 15 Continued

| | | | PHQ_SCOR | SSQ_SCOR | SSQ_SCO1 |
|---|---|---|---|---|---|
| Spearman's rho | AGE | Correlation Coefficient | .004 | -.128 | -.088 |
| | | Sig. (2-tailed) | .969 | .123 | .289 |
| | | N | 97 | 147 | 147 |
| | INCOME | Correlation Coefficient | -.287[a] | .118 | -.009 |
| | | Sig. (2-tailed) | .004 | .156 | .917 |
| | | N | 97 | 147 | 147 |
| | FAMSQLI | Correlation Coefficient | -.632[a] | .369[a] | .428[a] |
| | | Sig. (2-tailed) | .000 | .000 | .000 |
| | | N | 97 | 147 | 147 |
| | DISEASE | Correlation Coefficient | -.626[a] | .348[a] | .359[a] |
| | | Sig. (2-tailed) | .000 | .000 | .000 |
| | | N | 97 | 147 | 147 |
| | LES_SCOR | Correlation Coefficient | .162 | .013 | -.162 |
| | | Sig. (2-tailed) | .114 | .876 | .050 |
| | | N | 97 | 147 | 147 |
| | PSS_SCOR | Correlation Coefficient | .546 | -.238[a] | -.414[a] |
| | | Sig. (2-tailed) | .000 | .004 | .000 |
| | | N | 97 | 147 | 147 |
| | PHQ_SCOR | Correlation Coefficient | 1 | -.260[b] | -.246[b] |
| | | Sig. (2-tailed) | . | .010 | .015 |
| | | N | 97 | 97 | 97 |
| | SSQ_SCOR | Correlation Coefficient | -.260[b] | 1 | .293[a] |
| | | Sig. (2-tailed) | .010 | . | .000 |
| | | N | 97 | 147 | 147 |
| | SSQ_SCO1 | Correlation Coefficient | -.246[b] | .293[a] | 1 |
| | | Sig. (2-tailed) | .015 | .000 | . |
| | | N | 97 | 147 | 147 |
| | CABQ_SCO | Correlation Coefficient | -.110 | .087 | .184[b] |
| | | Sig. (2-tailed) | .336 | .340 | .043 |
| | | N | 78 | 122 | 122 |
| | CCAQ_SCO | Correlation Coefficient | -.051 | .135 | .197[b] |
| | | Sig. (2-tailed) | .658 | .140 | .031 |
| | | N | 77 | 121 | 121 |

[a] Correlation is significant at the 0.05 level (2-tailed)
[b] Correlation is significant at the 0.01 level (2-tailed

Table 15 Continued

| | | | PET_OWN | CABQ_SCO | CCAQ_SCO |
|---|---|---|---|---|---|
| Spearman's rho | AGE | Correlation Coefficient | 0.061 | 0.071 | 0.174 |
| | | Sig. (2-tailed) | 0.463 | 0.434 | 0.056 |
| | | N | 147 | 122 | 121 |
| | INCOME | Correlation Coefficient | 0.066 | 0.08 | 0.068 |
| | | Sig. (2-tailed) | 0.429 | 0.386 | 0.458 |
| | | N | 147 | 122 | 121 |
| | FAMSQLI | Correlation Coefficient | -0.055 | 0.017 | 0.019 |
| | | Sig. (2-tailed) | 0.508 | 0.858 | 0.84 |
| | | N | 147 | 122 | 121 |
| | DISEASE | Correlation Coefficient | -0.054 | 0.004 | -0.017 |
| | | Sig. (2-tailed) | 0.518 | 0.966 | 0.849 |
| | | N | 147 | 122 | 121 |
| | LES_SCOR | Correlation Coefficient | 0.02 | 0.099 | 0.175 |
| | | Sig. (2-tailed) | 0.806 | 0.279 | 0.055 |
| | | N | 147 | 122 | 121 |
| | PSS_SCOR | Correlation Coefficient | -0.018 | 0.075 | 0.0159 |
| | | Sig. (2-tailed) | 0.827 | 0.41 | 0.863 |
| | | N | 147 | 122 | 121 |
| | PHQ_SCOR | Correlation Coefficient | 0.008 | -0.11 | -0.051 |
| | | Sig. (2-tailed) | 0.935 | 0.336 | 0.658 |
| | | N | 97 | 78 | 77 |
| | SSQ_SCOR | Correlation Coefficient | -0.001 | 0.087 | 0.139 |
| | | Sig. (2-tailed) | 0.99 | 0.34 | 0.14 |
| | | N | 147 | 122 | 121 |
| | SSQ_SCO1 | Correlation Coefficient | -0.004 | .184[b] | .197[b] |
| | | Sig. (2-tailed) | 0.963 | 0.043 | 0.031 |
| | | N | 147 | 122 | 121 |
| | CABQ_SCO | Correlation Coefficient | . | 1 | .688[a] |
| | | Sig. (2-tailed) | . | . | 0 |
| | | N | 122 | 122 | 121 |
| | CCAQ_SCO | Correlation Coefficient | . | .688[a] | 1 |
| | | Sig. (2-tailed) | . | 0 | . |
| | | N | 121 | 121 | 121 |

[a] Correlation is significant at the 0.05 level (2-tailed)
[b] Correlation is significant at the 0.01 level (2-tailed)

**Interactions**

The interaction term with disease severity as the dependent variable and pet ownership and perceived stress level as the independent variables was insignificant. See table 16.

Table 16
Interaction between PSS score and pet ownership with disease severity as dependent variable

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Corrected Model** | 68402.878[a] | 48 | 1425.060 | 3.134 | 0.000 |
| **Intercept** | 623210.361 | 1 | 623210.361 | 1370.719 | 0.000 |
| **PSS_SCOR** | 61884.007 | 34 | 1820.118 | 4.003 | 0.000 |
| **PET_OWN** | 1263.558 | 1 | 1263.558 | 2.779 | 0.1 |
| **PSS_SCOR * PET_OWN** | 2594.956 | 13 | 199.612 | 0.439 | 0.95 |
| **Error** | 44556.632 | 98 | 454.660 | | |
| **Total** | 1513012.000 | 147 | | | |
| **Corrected Total** | 112959.510 | 146 | | | |

a R Squared = 0.606 (Adjusted R Squared = 0.412)

The interaction term with disease severity as the dependent variable and pet ownership and LES score as the independent variables was also insignificant. See table 17.

Table 17
Interaction between LES score and pet ownership with disease severity as dependent variable

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| **Corrected Model** | 23485.229[a] | 20 | 1174.261 | 1.654 | 0.05 |
| **Intercept** | 355709.625 | 1 | 355709.625 | 500.920 | 0.000 |
| **LES_SCOR** | 19303.280 | 12 | 1608.607 | 2.265 | 0.01 |
| **PET_OWN** | 490.922 | 1 | 490.922 | 0.691 | 0.41 |
| **LES_SCOR * PET_OWN** | 1564.848 | 7 | 223.550 | 0.315 | 0.95 |
| **Error** | 89474.281 | 126 | 710.113 | | |
| **Total** | 1513012.000 | 147 | | | |
| **Corrected Total** | 112959.510 | 146 | | | |

a R Squared = 0.208 (Adjusted R Squared = 0.082)

**Type of Pet Owned**

There were 21 patients that owned only cats and 101 patients that owned a dog, a dog and cat, and a dog and other animal. There were very few people who owned a pet other than a dog or cat, but the people who owned other animals also owned dogs. The Mann-Whitney test revealed that there was not a significant difference in attachment levels for either questionnaire, CABQ or CCAQ, according to the type of pet that was owned. See tables 18 and 19.

Table 18
Significant test for attachment level (defined by the CABQ score) of cat owners vs. dog and/or all others

| Test Statistics[a] | |
|---|---|
| | **CABQ_SCO** |
| **Mann-Whitney U** | 806.000 |
| **Wilcoxon W** | 1037.000 |
| **Z** | -1.730 |
| **Asymp. Sig. (2-tailed)** | 0.08 |

[a] Grouping Variable: CAT

Table 19
Significant test for attachment level (defined by the CCAQ score) of cat owners vs. dog and/or all others

| Test Statistics[a] | |
|---|---|
| | **CCAQ_SCO** |
| **Mann-Whitney U** | 915.000 |
| **Wilcoxon W** | 1125.000 |
| **Z** | -0.676 |
| **Asymp. Sig. (2-tailed)** | 0.5 |

[a] Grouping Variable: CAT

**Younger Age Group**

The younger age group of 18-43 did not experience significant effects on their LES and PSS scores from pet ownership and attachment. See tables 20 and 21.

Table 20
LES regression coefficients

| Variable | Regression Coefficient of Variable | P-value | $R^2$ |
|---|---|---|---|
| Age (18-43) | -0.087 | 0.67 | 0.002 |
| Pet Ownership and Age | 0.567 | 0.357 | 0.014 |
| CABQ and Age | 0.025 | 0.571 | 0.005 |
| CCAQ and Age | 0.034 | 0.363 | 0.014 |

Table 21
PSS regression coefficients

| Variable | Regression Coefficient of Variable | P-value | $R^2$ |
|---|---|---|---|
| Age (18-43) | 0.924 | 0.171 | 0.024 |
| Pet Ownership and Age | -0.558 | 0.784 | 0.025 |
| CABQ and Age | 0.086 | 0.58 | 0.038 |
| CCAQ and Age | 0.019 | 0.882 | 0.036 |

# DISCUSSION AND CONCLUSIONS

Previous studies have found that pet ownership and attachment have positive influences on peoples' stress levels. In this study our objective was find if this was true for MS patients in the relapsing-remitting stage of MS, since stress has negative impacts on them. In this study, pet ownership and attachment were not significantly related to the stress level of MS patients.

The median age for the study population for both pet owners and non-pet owners was 39-43 years. The age distribution was consistent with other studies of patients in the relapsing remitting stage (Ackerman et al., 2002; Mohr et al., 2000). As with most autoimmune diseases, it was not surprising to find that the majority of the participants were female. The most prevalent ethnicity of our population was Caucasian. The employment rate of pet owners versus non-pet owners was similar. Of the pet owners, more than 65% worked outside the home. There was relatively equal percent of non-pet owners who worked outside the home compared to those who did not. A large number of MS patients surveyed in this study reported a household income of $105,000 or greater. Other studies report that MS has characteristically been associated with higher socioeconomic status (Lauer, 1994; Pryse-Phillips, 1996). Also, the majority of the patients surveyed had at least some college education. Interesting, but not significant, more non-pet owners have seen a counselor as opposed to pet owners.

The dependent variables were the perceived stress level in the last month designated by the PSS score and the number of negative life events experienced within

the last 12 months determined by the LES score. The PSS score was normally distributed among the study population with a mean score of 17.7. The observed scores for the PSS ranged across most of the range of a possible PSS score of 1 to 36. Mohr used the Profile of Mood States (POMS) to evaluate psychological stress and reported a mean score of 51.19 with a range of 4 to 176, which corresponds to a lower stress level compared to the current study (Mohr et al., 2000). The LES was not normally distributed with a mean score of 3.5 and a median of 3.0. Ackerman reported that subjects averaged 1.6 negative life events per year ((Ackerman et al., 2002) and Mohr reported and average of 1.38 negative life events (Mohr et al., 2000) in his study population. The patients in our study experienced slightly more negative life events than reported in other studies. A box-cox analysis was run on the LES to see if a transformation would be beneficial. The box-cox analysis suggested that the LES values be raised to the 0.40. After raising the values to 0.40 a test of normality revealed that the LES was still not normally distributed. So, regression analysis proceeded with the original LES score. A nonparametric correlation between PSS and LES revealed a small, but significant correlation between the two variables. The low correlation value indicated that the two questionnaires were not assessing the same item; hence the regression analyses were fit separately.

The main exposure variables in this study were pet ownership status within the past 12 months and the attachment level the MS patient experienced to their companion pet, defined by their CABQ and CCAQ scores. The majority of MS patients in this study owned a companion animal. Of the participants that owned a companion animal,

most reported that they were highly attached. The CABQ and CCAQ were highly correlated, indicating that they assessed the same type of attachment information and our results demonstrated consistency between the two. The majority of MS patients in this study demonstrated a high level of attachment to their pet.

The FAMSQLI determined the patients' quality of life and reported an average score of 164.3 with over half of the patients experiencing a score of 176 or above. Most patients had a relatively good quality of life. The disease severity score had a mean score of 97.6 and a median of 103, indicating that our study population experienced a high level of disability. Despite the severity of their disease the majority of patients managed to maintain a good outlook on life and viewed life events as positive. The PHQ score for the study population exhibited a mean of 6.8 representing that most of the patients experienced low levels of depressed feelings. Two measures of social support were calculated. The first was the SSQ based on the number of individuals that the patient had available to them for social support. The second was the SSQ based on the satisfaction of the support provided by the individuals. The SSQ level based on satisfaction was higher overall than the SSQ based on number of individuals. No relationship between pet attachment and social support based on satisfaction or number of individuals was significant, indicating regardless of the patients' social support status it did not influence their pet attachment level.

Linear regression was conducted on the independent variables individually with each dependent variable. Only 4 independent variables were found to be significantly associated with the LES score with a p-value of $<0.05$. The significant independent

variables associated with LES consisted of income, FAMSQLI score, disease severity score, PHQ score, and SSQ score based on satisfaction. An increase in income had a decrease in number of negative life events by 0.3. Fewer negative life events were associated with a better quality of life. As disease severity changed so did the number of negative life events by 0.024. It was not surprising to find that the disease severity score was also significant due to the fact that it was a subset of the FAMSQLI. As the number of negative life events a patient experienced increased so did their depression level by 0.114. The satisfaction experienced from their social network was associated with a decrease in number of negative life events. Neither pet ownership nor the attachment variables were significantly associated with LES.

Multiple linear regression was performed with LES as the dependent variable with pet ownership being forced into the model and each remaining independent variable inserted into the model individually. The variables that changed the coefficient of pet ownership and/or the other variables noticeably were evaluated for linearity and interaction. Some variables changed the sign of the coefficient, but pet ownership continued to be not significantly associated with LES. The interaction term was also not significant. Possible explanations consisted of an unstable model due to few non-pet owners or a small amount of confounding. The household income variable had a significant interaction with pet ownership. The interaction indicated that people with a high income who owned a pet had a higher LES score compared to those who did not own a pet. Those that had a lower income and owned pets had lower LES scores indicating that having a pet did help with the way they viewed life events. LES was

evaluated as the dependent variable with either CABQ or CCAQ included. The other independent variables were inserted separately and no relevant changes in the regression coefficients were identified. No interactions were found to be significant.

Multiple linear regression was also performed with PSS as the dependent variable and pet ownership included with each additional independent variable inserted into the model individually. The majority of the variables were significantly associated with the PSS score with the exception of age, sex, ethnicity, and the pet associated variables. A positive change in employment, work outside of the home status, income, education, quality of life, disease severity, and social support based on number of individuals and satisfaction were all associated with a small decrease in PSS. An increase in depression levels resulted in an increase in PSS scores by 0.752. As with the LES scores, the PSS scores resulted in no important changes noted in the regression coefficients of the independent variables. Therefore, pet ownership and attachment did not exhibit an influence on stress levels of MS patients in this study.

In order to evaluate the effect of stress and pets on disease severity, additional models were examined. An interaction term composed of disease severity as the dependent variable with pet ownership and perceived stress level as the independent variables was not significant. Also, the interaction term with disease severity as the dependent variable with pet ownership and number of negative life events as predictor variables was not significant. Therefore, pet ownership did not influence the patients' disease severity significantly.

The type of pet owned whether it was a cat only or a dog, a dog and cat, or a dog and other animal did not differ significantly with level of attachment. Thus, the type of pet the patient owned did not influence their attachment levels. A box and whisker plot revealed that cat owners exhibited a narrower range of attachment levels versus dog owners.

Since earlier stages of disease might fluctuate more, a younger age group of MS patients was considered to evaluate if pet ownership and attachment had an effect on their LES and PSS scores. This study did not find that the younger population experienced significant decreases in their LES and PSS scores as a result of pet ownership and attachment levels.

The results of this study did not support our hypothesis. Pet ownership and/or attachment did not have a positive effect on MS patients' stress levels in the relapsing-remitting stage. These results were not expected since pet ownership has previously been shown to alleviate stress, lower blood pressure, and decrease heart rate in other populations.

**Strengths and Limitations**

Even though the UTSN clinic is a specialty neurology clinic it still provides care for those not able to pay, which allowed this study to obtain a representative sample based on income. Though, no causal interferences can be drawn from cross-sectional studies, they can provide an application in planning for health care. Since this study only recruited participants from the UTSN clinic, selection biases exist in that not every MS patient had an equal chance of being selected for the study. Selection bias could

have existed because the surveys were only being administered in English, but all of our possible respondents spoke English so this was not a problem. Non-respondent bias was minimal due to only 2 people choosing not to participate, but information regarding them was not obtainable. Limitations were placed on external reliability because the specific sampling frame did not represent the entire population of MS patients or a random sample of them. The sampling frame was limited to patients of the UTSN clinic in Dallas, TX. We speculated since this population had a relatively high education level they were able to obtain jobs that paid a higher income. Those that did not work, but reported a large household income, must have had a significant other that was able to pay the medical expenses for them. We are not sure why there were so few respondents that did not own pets, but our thoughts are that most of the respondents could afford pets and a larger income could lead to a bigger house with a yard that could accommodate pets. Also, Dallas is a metropolitan area with many surrounding towns and cities consisting of rural areas that enable people to have pets.

The sample size of this study was not an optimal sample size. The original goal was to obtain 300-400 participants, but due to time constraints this was not possible. Not enough non-pet owners responded or existed within the study population making it difficult to have a representative sample. Though it applied to very few questionnaires, some surveys included in the questionnaire were not filled out resulting in missing data.

This study did not take into account the use of disease modifying drugs such as Interferon-β and Copaxone® which could have impacted our study results especially disease severity.

**Recommendations**

Recommendations for future studies include an increase in sample size. This study lacked a large enough number of patients that did not own pets. Also, surveying more clinics to obtain a more representative sample of the MS population should prove beneficial. It would have been valuable to know if the patients were having a relapse at time of filling out the questionnaire to evaluate if the relapse had an effect on their perceived stress level. Also, knowledge of how long the patient had been diagnosed and how long the patient thought they had MS would be advantageous to determine if the time of diagnosis is associated with stress levels. In addition, the use of antidepressant drugs could have an effect on the patients' depression level, which in turn could affect their stress level. Therefore, having data regarding the use of antidepressant drugs could add to the analysis of stress levels. This study also did not obtain information regarding marital status. Future studies should address this issue because people with partners have been shown to experience less stress compared to those without partners (Mohr et al., 2002).

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# APPENDIX

## INTRODUCTORY LETTER AND SURVEY

Dear Sir/Madam,

We are conducting a study to evaluate how life events influence MS onset and relapses and possible methods for lowering stress. We are asking for your participation in filling out the enclosed surveys. It will take approximately 30 minutes for you to fill them out. Once you have completed the surveys give them to your doctor so that he may indicate what stage of MS you are currently in. You or your doctor will then place the surveys in the box for completed surveys. Please do not put your name or any personal identifying information on the survey. They are completely anonymous. If you choose not to participate, please check the box on the first page that reads "I chose **not to** participate". If at any time you feel uncomfortable about the questions you do not have to continue. If you feel distressed or upset please notify your doctor. We appreciate your time and participation in helping us conduct this study. Once the study is complete, results will be sent to your doctor's office for you to read. If you have any questions you may ask the staff at the clinic or contact me. My contact information is:

Ashley Loven, BS, MS degree candidate
Phone: 979-696-5310
E-mail: aloven@cvm.tamu.edu
Address: Department of Veterinary Anatomy and Public Health
College of Veterinary Medicine
Texas A&M University
College Station, TX 77843-4458

**Remember the survey is anonymous! Neither we nor your doctor will know your personal responses to the survey. Please answer truthfully to the best of your knowledge and ability.**

Please take a few minutes to fill out and hand in the survey. The information you provide now may benefit MS patients for years to come. Thank you!

Sincerely,

Ashley M. Loven
Graduate Student
Texas A&M University

Margaret Slater DVM, PhD
Associate Professor
mslater@cvm.tamu.edu (979) 845-3286

Have your doctor indicate what stage of Multiple Sclerosis you are currently in:

☐ **Benign MS**

Patients have very few relapses with only mild symptoms. Between these relapses, patients recover completely and the disease never progresses beyond a mild level of disability.

☐ **Relapsing-remitting MS**

The patient experiences relapses of the disease. Afterward, the patient recovers either partially or completely. Disability can get worse over time.

☐ **Secondary Progressive MS**

Starts out as relapsing-remitting MS, but gets worse with or without relapses.

☐ **Primary Progressive MS**

Continually worsens with no real relapses or recoveries. A patient's MS may proceed in this way from the beginning; there may be temporary minor improvements and occasional periods in which the disease does not get worse.

☐ **Progressive-relapsing MS**

Disability worsens progressively over time, as in primary progressive MS. There are also periods of worsening symptoms, as in relapsing-remitting MS, but lost function does not return afterward.

_____ _____

Dr. Signature Date

Please check the following box if you do not wish to participate in the survey:

☐ I chose not to participate.

# General Information

**1. Please indicate your age range:**

☐ 18-23 ☐ 24-28 ☐ 29-33 ☐ 34-38 ☐ 39-43 ☐ 44-48

☐ 49-53 ☐ 54-58 ☐ 59-63 ☐ 64-68 ☐ 69-73 ☐ 74-78

☐ 79-83 ☐ 84-88 ☐ 89-93 ☐ 94-98 ☐ 99+

**2. ☐ Male ☐ Female**

**3. Ethnicity**

☐ Caucasian ☐ African American ☐ Hispanic ☐ Asian

☐ Other: _____

**4. Are you employed?**

☐ Yes ☐ No

**5. Do you work outside the home?**

☐ No ☐ Yes: Job title:_____

**6. Household income range:**

☐ 0-15,000 ☐ 15,001-30,000 ☐ 30,001-45,000 ☐ 45,001-60,000

☐ 60,001-75,000 ☐ 75,001-90,000 ☐ 90,001-105,000 ☐ 105,000+

**7. Education**

☐ Finished ___ grade ☐ Graduated High School ☐ GED
☐ Some College ☐ Bachelor's Degree
☐ Some Grad. School ☐ Graduate Degree (specify)_____

**8. Have you ever seen a psychologist or counselor before?**

☐ Yes ☐ No

**Please do not put your name on this survey. Neither we nor your doctor need to know who this personal information pertains to! This is to ensure that the information you provide remains anonymous and unidentifiable.

**F.A.M.S.Q.L.I.**

## Please indicate how true each statement has been for you during the past 7 days.

| Mobility | not at all | a little bit | some-what | quite a bit | very much |
|---|---|---|---|---|---|
| **1.** Because of my physical condition, I have trouble meeting the needs of my family…… | 0 | 1 | 2 | 3 | 4 |
| **2.** I am able to work (include work in home)…….. | 0 | 1 | 2 | 3 | 4 |
| **3.** I have trouble walking……. | 0 | 1 | 2 | 3 | 4 |
| **4.** I have to limit my social activity because of my condition……. | 0 | 1 | 2 | 3 | 4 |
| **5.** My legs are strong…… | 0 | 1 | 2 | 3 | 4 |
| **6.** I have trouble getting around in public places……. | 0 | 1 | 2 | 3 | 4 |
| **7.** I have to make plans around my condition…….. | 0 | 1 | 2 | 3 | 4 |
| **Symptoms** | **not at all** | **a little bit** | **some-what** | **quite a bit** | **very much** |
| **8.** I have nausea (vomiting sensations)……..... | 0 | 1 | 2 | 3 | 4 |
| **9.** I have pain…… | 0 | 1 | 2 | 3 | 4 |
| **10.** I feel sick……... | 0 | 1 | 2 | 3 | 4 |
| **11.** I feel weak all over…… | 0 | 1 | 2 | 3 | 4 |
| **12.** I have pain in my joints……. | 0 | 1 | 2 | 3 | 4 |
| **13.** I am bothered by headaches…….. | 0 | 1 | 2 | 3 | 4 |
| **14.** I am bothered by muscle pains…….. | 0 | 1 | 2 | 3 | 4 |

| Emotional Well-Being | not at all | a little bit | some-what | quite a bit | very much |
|---|---|---|---|---|---|
| **15.** I feel sad…….. | 0 | 1 | 2 | 3 | 4 |
| **16.** I am losing hope in the fight against my illness…… | 0 | 1 | 2 | 3 | 4 |
| **17.** I am able to enjoy life…….. | 0 | 1 | 2 | 3 | 4 |
| **18.** I feel trapped by my condition…….. | 0 | 1 | 2 | 3 | 4 |
| **19.** I am depressed about my condition…….. | 0 | 1 | 2 | 3 | 4 |
| **20.** I feel useless…….. | 0 | 1 | 2 | 3 | 4 |
| **21.** I feel overwhelmed by my condition…… | 0 | 1 | 2 | 3 | 4 |
| **General Contentment** | **not at all** | **a little bit** | **some-what** | **quite a bit** | **very much** |
| **22.** My work (include work in home) is fulfilling…….. | 0 | 1 | 2 | 3 | 4 |
| **23.** I have accepted my illness…… | 0 | 1 | 2 | 3 | 4 |
| **24.** I am enjoying the things I usually do for fun……... | 0 | 1 | 2 | 3 | 4 |
| **25.** I am content with the quality of my life right now….. | 0 | 1 | 2 | 3 | 4 |
| **26.** I am frustrated by my condition……... | 0 | 1 | 2 | 3 | 4 |
| **27.** I feel a sense of purpose in my life…….. | 0 | 1 | 2 | 3 | 4 |
| **28.** I feel motivated to do things……. | 0 | 1 | 2 | 3 | 4 |

| Thinking and Fatigue | not at all | a little bit | some-what | quite a bit | very much |
|---|---|---|---|---|---|
| **29.** I have a lack of energy……. | 0 | 1 | 2 | 3 | 4 |
| **30.** I feel tired…… | 0 | 1 | 2 | 3 | 4 |
| **31.** I have trouble starting things because I am tired……. | 0 | 1 | 2 | 3 | 4 |
| **32.** I have trouble finishing things because I am tired…... | 0 | 1 | 2 | 3 | 4 |
| **33.** I need to rest during the day…… | 0 | 1 | 2 | 3 | 4 |
| **34.** I have trouble remembering things……. | 0 | 1 | 2 | 3 | 4 |
| **35.** I have trouble concentrating…… | 0 | 1 | 2 | 3 | 4 |
| **36.** My thinking is slow……. | 0 | 1 | 2 | 3 | 4 |
| **37.** I have trouble learning new tasks or directions……... | 0 | 1 | 2 | 3 | 4 |
| **Family/Social Well-Being** | **not at all** | **a little bit** | **some-what** | **quite a bit** | **very much** |
| **38.** I feel distant from my friends…….. | 0 | 1 | 2 | 3 | 4 |
| **39.** I get emotional support from my family……. | 0 | 1 | 2 | 3 | 4 |
| **40.** I get support from my friends and neighbors…….. | 0 | 1 | 2 | 3 | 4 |
| **41.** My family has accepted my illness……. | 0 | 1 | 2 | 3 | 4 |
| **42.** Family communication about my illness is poor…… | 0 | 1 | 2 | 3 | 4 |
| **43.** My family has trouble understanding when my condition gets worse……... | 0 | 1 | 2 | 3 | 4 |
| **44.** I feel "left out" of things…….. | 0 | 1 | 2 | 3 | 4 |

| Additional Concerns | not at all | a little bit | some-what | quite a bit | very much |
|---|---|---|---|---|---|
| **45.** I am bothered by side effects of treatment……..... | 0 | 1 | 2 | 3 | 4 |
| **46.** I am forced to spend time in bed..... | 0 | 1 | 2 | 3 | 4 |
| **47.** I feel close to my partner (or the person who is my main support)..... | 0 | 1 | 2 | 3 | 4 |
| **48.** Have you been sexually active during the past year? No___ Yes___ If yes: I am satisfied with my sex life..... | 0 | 1 | 2 | 3 | 4 |
| **49.** My doctor is available to answer my questions..... | 0 | 1 | 2 | 3 | 4 |
| **50.** I am proud of how I am coping with illness..... | 0 | 1 | 2 | 3 | 4 |
| **51.** I feel nervous..... | 0 | 1 | 2 | 3 | 4 |
| **52.** I worry that my condition will get worse..... | 0 | 1 | 2 | 3 | 4 |
| **53.** I am sleeping well..... | 0 | 1 | 2 | 3 | 4 |
| **54.** Heat worsens my symptoms..... | 0 | 1 | 2 | 3 | 4 |
| **55.** I lose control of my urine..... | 0 | 1 | 2 | 3 | 4 |
| **56.** I urinate more frequently than usual..... | 0 | 1 | 2 | 3 | 4 |
| **57.** I am bothered by the chills..... | 0 | 1 | 2 | 3 | 4 |
| **58.** I am bothered by fevers..... | 0 | 1 | 2 | 3 | 4 |
| **59.** I am bothered by muscle spasms..... | 0 | 1 | 2 | 3 | 4 |

## L.E.S.

The following questions deal with positive or negative stress events present at the time of onset or exacerbations of Multiple Sclerosis in your life. Please answer the questions according to the stress events that **occurred in the past 12 months.** If an event did occur check yes and rate it if applicable (indicated by rating scale), and if an event did not occur check no.
**In the last 12 months…..**

1. Have you moved?
   No [ ] Yes [ ]

   Overall, would you say that your moving was a good or bad experience?

   ___very good (1) ___slightly bad (4)
   ___moderately good (2) ___moderately bad (5)
   ___slightly good (3) ___very bad (6)

2. Have you broken off an engagement to be married or ended an intimate relationship?
   No [ ] Yes [ ]

   How would you rate your feelings about breaking up?

   ___very good (1) ___ slightly bad (4)
   ___moderately good (2) ___moderately bad (5)
   ___slightly good (3) ___very bad (6)

3. Did you get married in the last 12 months?
   No [ ] Yes [ ]

   Overall, would you rate getting married as a good or bad experience?

   ___very good (1) ___slightly bad (4)
   ___moderately good (2) ___moderately bad (5)
   ___slightly good (3) ___very bad (6)

4. Did someone you were close to die during the last 12 months?
   No [ ] Yes [ ]

5. Were you separated or divorced during the last 12 months?
   No [ ] Yes [ ]

   Overall, would you rate your separation or divorce as a good or bad experience?

   ___very good (1) ___slightly bad (4)
   ___moderately good (2) ___moderately bad (5)
   ___slightly good (3) ___very bad (6)

6. Did you break up with a close friend during the last 12 months?
No [ ] Yes [ ]

Overall, would you rate breaking up as a good or bad experience?

___very good (1) ___ slightly bad (4)
___moderately good (2) ___moderately bad (5)
___slightly good (3) ___very bad (6)

7. Have you had any important relationship, for example, with your spouse, a close friend, your boss, or a family member become significantly worse during the last 12 months (this should not include the relationship referred to in item 6 above)?
No [ ] Yes [ ]

8. Did you have a child or adopt a child during the last 12 months?
No [ ] Yes [ ]

Overall, would you rate having a child and adjusting to having a child as a good or bad experience?

___very good (1) ___slightly bad (4)
___moderately good (2) ___moderately bad (5)
___slightly good (3) ___very bad (6)

9. Have you, a very close friend, or close family member had an accident that required emergency medical treatment during the last 12 months?
No [ ] Yes [ ]

10. Have you, a very close friend, or close family member been hospitalized for a serious (life threatening) illness during the last 12 months?
No [ ] Yes [ ]

11a. (Women) Have you been pregnant during the last 12 months?
No [ ] Yes [ ]

How would you rate being pregnant?

___very good (1) ___slightly bad (4)
___moderately good (2) ___moderately bad (5)
___slightly good (3) ___very bad (6)

11b. (men) Has your wife, partner, or girlfriend been pregnant during the last 12 months? (Check NO if you do not have a wife, partner, or girlfriend.)
No [ ] Yes [ ]

How do you feel about the pregnancy?

___very good (1) ___slightly bad (4)
___moderately good (2) ___moderately bad (5)
___slightly good (3) ___very bad (6)

12a. (Women) Have you had an abortion during the last 12 months?
No [ ] Yes [ ]

12b. (Men) Has your wife, partner, or girlfriend had an abortion during the last 12 months? (Check NO if you do not have a wife, partner, or girlfriend.)
No [ ] Yes [ ]

13a. (Women) Have you had a miscarriage or stillbirth during the last 12 months?
No [ ] Yes [ ]

13b. (Men) Has your wife, partner, or girlfriend had miscarriage or stillbirth during the last 12 months? (Check NO if you do not have a wife, partner, or girlfriend.)
No [ ] Yes [ ]

14. Have you or your spouse/partner lost or changed jobs or been involuntarily unemployed during the last 12 months?
No [ ] Yes [ ]

How would you rate your feelings about leaving your job?

___very good (1)
___moderately good (2)
___slightly good (3)
___slightly bad (4)
___moderately bad (5)
___very bad (6)

15. During the last 12 months, have you or your spouse/partner suffered a significant business or investment loss or has a business you owned failed?
No [ ] Yes [ ]

16. During the last 12 months, have you or your spouse/partner had any serious problems or disappointment at work or in an educational course (university, training program, etc.)?
No [ ] Yes [ ]

17. Have you or your spouse/partner had significant success at work or in an educational course (university, training program, etc.) during the last 12 months?
No [ ] Yes [ ]

18. Has there been significant change in your personal finances during the last 12 months?
No [ ] Yes [ ]

19. Has your house been broken into and/or burglarized during the last 12 months?
No [ ] Yes [ ]

20. Have you or your spouse/partner or other member of your immediate family been assaulted or mugged during the last 12 months?
No [ ] Yes [ ]

21. Has the behavior of any member of your family been a significant problem for you during the last 12 months?
No [ ] Yes [ ]

22. Have you or your spouse/partner had to appear in court during the last 12 months as either a defendant, a witness in a criminal case, or as party to a suit?

No [ ] Yes [ ]

How would you rate the court experience?

___very good (1)
___moderately good (2)
___slightly good (3)
___slightly bad (4)
___moderately bad (5)
___very bad (6)

23. Have you had a pet (animal) to whom you were attached die, or get lost, or did you have to give it away during the last 12 months?

No [ ] Yes [ ]

24. Other than the events we have already asked about, have any other important things happened to you or to a very close friend or close family member in the last 12 months that made that period significantly different from a typical year?

No [ ] Yes [ ]

How would you rate your feelings about this experience?

___very good (1)
___moderately good (2)
___slightly good (3)
___slightly bad (4)
___moderately bad (5)
___very bad (6)

**P.S.S.**

The questions in this section ask you about your feelings and thoughts **during the last month**. In each case, please circle **how often** you felt or thought a certain way.

| | **never** | **almost never** | **some-times** | **fairly often** | **very often** |
|---|---|---|---|---|---|
| 1. In the last month, how often have you become upset because of something that happened unexpectedly? | 1 | 2 | 3 | 4 | 5 |
| 2. In the last month, how often have you felt that you were unable to control the important things in your life? | 1 | 2 | 3 | 4 | 5 |
| 3. In the last month, how often have you felt nervous and "stressed"? | 1 | 2 | 3 | 4 | 5 |
| 4. In the last month, how often have you felt confident about your ability to handle your personal problems? | 1 | 2 | 3 | 4 | 5 |
| 5. In the last month, how often have you felt that things were going your way? | 1 | 2 | 3 | 4 | 5 |
| 6. In the last month, how often have you found that you could not cope with all the things that you had to do? | 1 | 2 | 3 | 4 | 5 |
| 7. In the last month, how often have you been able to control irritations in your life? | 1 | 2 | 3 | 4 | 5 |
| 8. In the last month, how often have you felt that you were on top of things? | 1 | 2 | 3 | 4 | 5 |
| 9. In the last month, how often have you been angered because of things that were outside of your control? | 1 | 2 | 3 | 4 | 5 |
| 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? | 1 | 2 | 3 | 4 | 5 |

**P.P.Q.**

---

**The following questions concern your mood. In the last 2 weeks how often have you been bothered by any of the following...**

| | Not at all | Several days | More than half the days | Nearly every day |
|---|---|---|---|---|
| 1. Little interest or pleasure in doing things? | 1 | 2 | 3 | 4 |
| 2. Feeling down, depressed, or hopeless? | 1 | 2 | 3 | 4 |
| 3. Trouble falling or staying asleep or sleeping too much? | 1 | 2 | 3 | 4 |
| 4. Feeling tired or having little energy? | 1 | 2 | 3 | 4 |
| 5. Poor appetite or overeating? | 1 | 2 | 3 | 4 |
| 6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down? | 1 | 2 | 3 | 4 |
| 7. Trouble concentrating on things, such as reading the newspaper or watching television? | 1 | 2 | 3 | 4 |
| 8. Moving or speaking so slowly that other people have noticed? Or the opposite – being so fidgety or restless that you were moving around a lot more than usual? | 1 | 2 | 3 | 4 |
| 9. In the last 2 weeks, have you had thoughts that you would be better off dead or of hurting yourself in some way? | 1 | 2 | 3 | 4 |

## S.S.Q.

The following ask about people in your environment who provide you with help or support. Each question has two parts. (1) Under each question, list the individuals of all the people you know, excluding yourself, whom you can count on for help or support for the item. You may either give the person's initials or their relationship to you. Do not list more than 9 individuals for each item. (2) For the second part of each question, please circle how satisfied you are with the overall support available to you for each item.

**0 = Very Dissatisfied to 5 = Very Satisfied.**

**1. Who can you really count on to distract you from your worries when you feel under stress?**
Initials: _____

How satisfied are you with the support available to you in this area? **0-----1-----2-----3-----4-----5**

**2. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?**
Initials: _____

How satisfied are you with the support available to you in this area? **0-----1-----2-----3-----4-----5**

**3. Who accepts you totally, including both your worst and your best points?**
Initials: _____

How satisfied are you with the support available to you in this area? **0-----1-----2-----3-----4-----5**

**4. Whom can you really count on to care about you, regardless of what is happening to you?**
Initials: _____

How satisfied are you with the support available to you in this area? **0-----1-----2-----3-----4-----5**

**5. Whom can you really count on to help you feel better when you are generally down in the dumps?**
Initials: _____

How satisfied are you with the support available to you in this area? **0-----1-----2-----3-----4-----5**

**6. Whom can you really count on to console (comfort) you when you are very upset?**
Initials: _____

How satisfied are you with the support available to you in this area? **0-----1-----2-----3-----4-----5**

**C.A.B.Q.**

The following questions ask you about the quality of your relationship or social interaction with your pet or companion animal. In each case, please circle how often the interaction occurred. If you answer **NO** to the first two questions leave the rest of the responses and next page blank.

---

1. Do you presently own a pet or companion animal?
___Yes ___No

2. In the past 12 months, did you own a pet or companion animal?
___Yes ___No

**If the answer to the above 2 questions is NO you are done with the survey.**
**If the answer to one of them is YES please continue.**
**THANK YOU FOR YOUR TIME!**

↓

3. What kind of pet or companion animal do you or have you owned/interacted with in the past 12 months?
___Dog ___Cat ___Horse ___Rabbit ___ Rodent ___Reptile ___Other

| | **Never** | **Rarely** | **Often** | **Generally** | **Always** |
|---|---|---|---|---|---|
| 4. How often are you responsible for your companion animal's care? | 1 | 2 | 3 | 4 | 5 |
| 5. How often do you clean up after your companion animal? | 1 | 2 | 3 | 4 | 5 |
| 6. How often do you hold, stroke, or pet your companion animal? | 1 | 2 | 3 | 4 | 5 |
| 7. How often does your companion animal sleep in your room? | 1 | 2 | 3 | 4 | 5 |
| 8. How often do you feel that your companion animal is responsive to you? | 1 | 2 | 3 | 4 | 5 |
| 9. How often do you feel that you have a close relationship with your companion animal? | 1 | 2 | 3 | 4 | 5 |
| 10. How often do you travel with your companion animal? | 1 | 2 | 3 | 4 | 5 |
| 11. How often do you sleep near your companion animal? | 1 | 2 | 3 | 4 | 5 |

**C.C.A.Q.**

**Please answer the following questions by rating your response with a 1-4 scale.**

| | **strongly disagree** | **disagree** | **agree** | **strongly agree** |
|---|---|---|---|---|
| 1. My pet provides me with companionship. | 1 | 2 | 3 | 4 |
| 2. Having a pet gives me something to care for. | 1 | 2 | 3 | 4 |
| 3. My pet provides me with pleasurable activity. | 1 | 2 | 3 | 4 |
| 4. My pet is a source of constancy in my life. | 1 | 2 | 3 | 4 |
| 5. My pet makes me feel needed. | 1 | 2 | 3 | 4 |
| 6. My pet makes me laugh and play. | 1 | 2 | 3 | 4 |
| 7. Having a pet gives me something to love. | 1 | 2 | 3 | 4 |
| 8. I get comfort from touching my pet. | 1 | 2 | 3 | 4 |
| 9. I enjoy watching my pet. | 1 | 2 | 3 | 4 |
| 10. My pet makes me feel loved. | 1 | 2 | 3 | 4 |
| 11. My pet makes me feel trusted. | 1 | 2 | 3 | 4 |

**You are now done with the survey. THANK YOU VERY MUCH!**

# VITA

**Ashley Marie Loven**
1718 Circle Dr.
Tyler, TX 75703
(979) 324-4113

## Education

2004 Master of Science in Epidemiology, Texas A&M University, College Station, TX

2001 Bachelor of Science in Biomedical Science, Minor in Business Administration, Texas A&M University, College Station, TX

## Experience

01/03-06/04 Program Coordinator, Aggie Feral Cat Alliance of Texas.

01/04-05/04 Teaching Assistant, Biomedical Anatomy, VAPH 305, Department of Veterinary Anatomy and Public Health, Texas A&M University, College Station, TX.

01/03-01/04 Graduate Research Assistant to Dr. Margaret Slater, Department of Veterinary and Public Health, Texas A&M University, College Station, TX.

10/01-01/03 Source Net Solutions, Transaction Processor, College Station, TX

07/97-01/03 Copeland Road Animal Hospital, Veterinary Technician/Receptionist, Tyler, TX (Weekends & Holidays)

## Publications

"The Effect of Pet Ownership/Attachment on the Stress Level of Multiple Sclerosis Patients" by: Loven, A.; Slater, M.; Welsh, J.; Meagher, M.; Racke, M.

"Report to the Norwich Terrier Club of America" by: Loven, A. and Slater, M.