Companion animals and mental health

A cross-sectional study

Heiðdís Björk Gunnarsdóttir

Thesis for the degree of Master of Public Health
University of Iceland
Faculty of Medicine
Centre of Public Health Sciences
School of Health Sciences

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Heiðdís Björk Gunnarsdóttir

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Leiðbeinandi: Elín Díanna Gunnarsdóttir

Meistaranámsnefnd: Elín Díanna Gunnarsdóttir,

Unnur Anna Valdimarsdóttir, Ragnhildur Guðmundsdóttir

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Supervisor: Elín Díanna Gunnarsdóttir

Masters committee: Elín Díanna Gunnarsdóttir,

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Ágrip

Með hverju árinu aukast geðræn vandamál í heiminum. Bilið milli þeirra forvarna sem við höfum til að koma í veg fyrir þau, þeirra meðferðarúrræða sem við höfum, og þeirrar byrði sem þau valda er gífurlegt. Gæludýr hafa verið nefnd sem möguleg forvörn og meðferðarúrræði.

Markmið rannsóknarinnar var að skoða hvort munur væri á gæludýraeigendum og þeim sem ekki eiga gæludýr; hvort gæludýraeigendur mætu heilsu sína betri, væru ólíklegri til að vera greindir með eða þjást af þunglyndi, kvíða og streitu og væru ánægðari með lífið en þeir sem ekki eiga gæludýr.

Rannsóknin notar gögn frá þversniðsrannsókn sem gerð var árið 2009. Úrtakið voru 5.294 Íslendingar á landsvísu á aldrinum 18-79 ára, svarhlutfall var 77,3%. DASS kvarðinn (Depression Anxiety Stress Scale) var notaður til að meta þunglyndi, kvíða og streitu. SWLS kvarðinn (Satisfaction With Life Scale) var notaður til að meta ánægju með lífið. $SPSS_{19}$ var notað í tölfræðilega úrvinnslu. Pearson´s kí kvaðrat og t-próf voru notuð til að meta hvort munur væri á milli hópanna. Tvíkosta lógistísk aðhvarfsgreining var notuð til að prófa tilgáturnar.

Gæludýraeigendur voru marktækt yngri, meira menntaðir, bjuggu frekar með öðrum en einir, hlutfallslega fleiri bjuggu í dreifbýli en þéttbýli, og áttu erfiðara með að ná endum saman um hver mánaðarmót miðað við þá sem ekki eiga gæludýr. Þegar tekið var tillit til þessara þátta mældust gæludýraeigendur í aukinni áhættu á einkennum þunglyndis (OR=1.26; 95%CI 1.01-1.57) og streitu (OR=1.49; 95%CI 1.10-2.01). Einnig skoruðu gæludýraeigendur lægra á SWLS kvarðanum (OR=1.57: 95%CI 1.25-1.98) sem gefur vísbendingar um að gæludýraeigendur gætu verið óánægðari með lífið miðað við þá sem ekki eiga gæludýr.

Niðurstöðurnar benda til þess að gæludýraeigendur séu jafnvel verr staddir andlega en þeir sem ekki eiga gæludýr. Þar sem um þversniðsrannsókn er að ræða er ekki hægt að fullyrða um orsakasamband, hugsanlega eru gæludýraeigendur öðruvísi að einhverju leyti en þeir sem ekki eiga gæludýr.

Abstract

The rate of mental health disorders is increasing every year worldwide. The gap between the burden caused by these disorders and the resources available to prevent and treat them is considerable. Companion animals have been suggested as a prevention and a treatment measure.

The aims of the study were to see if pet owners differed from non-pet owners, if they perceived their health to be better, were less likely to be diagnosed and suffer from depression, anxiety and stress, and were more satisfied with life than non-pet owners.

The study uses data from a cross-sectional questionnaire survey conducted in 2009, with a population based sample of 5.294 Icelanders, aged 18-79, and a response rate of 77.3%. DASS was used to measure depression, anxiety and stress. SWLS was used to measure satisfaction with life. $SPSS_{19}$ was used to analyze the data. Differences between pet owners and non-pet owners were examined with Pearson´s chi square tests and t-test. Binary logistic regression was used to test the association between pet ownership and psychological variables.

Pet owners were significantly younger, had higher education, lived more often with others and in rural areas. They were also more likely to find it more difficult to make ends meet than non-pet owners. Adjusting for these variables, pet owners were found to have higher odds of depressive symptoms (OR=1.26; 95%CI 1.01-1.57) and symptoms of stress (OR=1.49; 95%CI 1.10-2.01). Pet owners also scored lower on the SWLS scale (OR=1.57: 95%CI 1.25-1.98) and might therefore be presented with lower satisfaction with life.

Our data indicate that pet owners present with higher levels of depression and stress and lower levels of satisfaction with life. Since the study is cross-sectional, the direction of the observed association is not known.

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Table of contents

Table of figures

Abbreviations

AIDS	Acquired Immunodefiency Syndrome
CI	Confidence interval
DASS	Depression Anxiety Stress Scale
ECT	Electroconvulsive therapy
EU	European Union
HIV	Human Immunodefiency Virus
OR	Odds ratio
SPSS	Statistical Package for the Social Sciences
SWLS	Satisfaction With Life Scale
U.S.	United States
WHO	World Health Organization

1 Introduction

Mental health has in recent years gained more weight in the discussion on health promotion and is becoming accepted as a factor that needs at least as much attention as any other for individuals to live a wholesome, satisfying and meaningful life. What makes individuals satisfied with their lives can be different since they place different values to what they desire the most in life. Based on those values they place their own judgment on how well they are doing in life, so it is hard to accurately define what satisfaction with life is. Mental health has been defined, by The World Health Organization, as a part of overall health, that is, that being healthy is not only being free from sickness or disability but also gaining a state of physical, mental and social well being. Furthermore, it defines mental health as a state where a person can cope with the normal stress of life, work productively and make a contribution to the community they live in (1). The health of far too many individuals does not fit into this definition of mental health and this is an increasing problem as the rate of mental disorders is estimated to increase every year worldwide (2).

Depression is one of those mental disorders whose rate is increasing and today it is estimated to be the main cause of disability in the world. Depression ranks fourth on WHO's Global Burden of Disease, with around 121 million sufferers worldwide (3). Since it is growing, and resources seem to be insufficient (4) it is estimated to reach second place by 2020 (3). These figures may even be underestimated since depression can be hard to diagnose accurately. A standard definition of depression is that its episodes need to last for at least two weeks and the symptoms also need to reach a certain amount of severity, often referred to as mild, moderate or severe depression (5). Symptoms include lowering of mood, reduction of energy and decrease in activity. The patient finds it hard to enjoy life or take an interest in it. Sleep and appetite are diminished, followed by marked tiredness after minimum effort and reduced concentration. Self-esteem and self-confidence are in most cases reduced and some ideas of guilt or worthlessness are often present (6). Depression is a serious condition which diminishes an individual's activity in society and his contribution to it. If it becomes severe, an individual's capability to take care of himself decreases, even to the point where he becomes incapable of it. Severe depression can, and often does, have fatal consequences. It is assumed that around 850.000 suicides every year are linked to depression (3).

Anxiety is another mental health disorder known to have major effects on the lives of around 18% of the U.S. adult population (7) and 14% of the EU population (8). Prevalence of anxiety is substantially higher among women than men (9). Anxiety is not always harmful. In many situations it can even benefit individuals by, for example, helping them to stay alert and focused and in acting as a motivation for solving problems. However, when an individual experiences fear in circumstances where there is no apparent reason to be fearful, it might be a sign of an anxiety disorder. Generalized anxiety disorder, social phobia and post traumatic stress are examples of anxiety disorders (10). Symptoms are both mental and physical, for example: fear, worries, obsessive thoughts or compulsive behavior, excessive sweating, muscle tension, tachycardia, nervousness and diarrhea (5).

Stress is yet another mental condition, closely linked with anxiety, and often coexisting with it. Stress is a normal reflex in challenging situations. It can help us deal with brief stressful situations by

releasing hormones, such as adrenaline, which are secreted into the bloodstream to affect the whole body, often referred to as the "fight or flight" response. With increased heart beat and a rise of blood pressure, an increase in blood sugar and blood fat and a strengthening of the immune system, the body prepares us for both emotional and physical challenges. However, if the individual is under constant stress and unable to unwind, it can lead to an unhealthy condition. Muscles remain tense. Cholesterol levels rise significantly and the immune system is considerably weakened. Sleep deprivation is very common among "stressed out" individuals which can lead to severe tiredness. Since the immune system is weakened, individuals become sensitive to all sorts of diseases (11,12). Among other, stress has been shown to increase the risk of Ischemic Heart Disease (13), which is, according to WHO, one of the main contributors to the Global Burden of Disease worldwide (14).

If individuals with mental disorders get treatment, the chances for recovery are good. In depressive disorders alone recovery rates are up to 60-80%. The problem is that worldwide only around 25% of those who suffer from depression get the treatment they need (3). There seems to be a huge gap between the burden caused by mental disorders and the resources available to prevent and treat them, a gap that is far larger in low income countries than in high income countries (4). The most common treatments involve medication, psychotherapy or both (15,16). Other resources might involve physical activity and meditation (11). It has even been suggested that companion animals might benefit those suffering from mental disorders (17).

A number of studies have explored the relationship between humans and animals, and in particular tried to find out if there is any correlation between exposure to companion animals and various health factors. The results of these studies are contradicting.

A study conducted on pet owners following the acquisition of a new pet (dog or cat) reported a reduction in minor health problems (e.g., headache, hay fever, sleep difficulties, worrying, general tiredness, cold and flu) and an improvement on a general health questionnaire score (18). A study conducted on children who underwent surgery suggested that those children that had a canine visitation after the surgery were found to perceive less postoperative pain. One possible mechanism in explaining this was suggested to be because the dog directs thoughts away from pain and brings a sense of home as well as companionship (19). In a study conducted on adults with serious mental illnesses it was found that pets may help the recovery process by reducing anxiety and depression by providing empathy and company needed for the participants to avoid loneliness and give them the sense of being known and understood. Pet companionship also gave the participants an avenue for connecting with other humans and help in finding social support to assist in their recovery and thus gave the participants a stronger sense of belonging. The results indicate that caring for a pet and being responsible for their well-being gave the participants a sense of empowerment and the feeling that they mattered (17). Another study, conducted in a geriatric care unit, that compared residents who received either activities with a dog or some other type of activity, indicated that activities involving dogs may reduce depression and lower systolic blood pressure (20). Wilson (21) found that not only does petting a dog lower systolic blood pressure but also reduces diastolic blood pressure and heart rate in a study conducted on college students. She also found that petting a dog had calming effects on undergraduate students similar to relaxation activities, such as reading quietly, and that the

students' anxiety level was significantly lower compared to students reading aloud (22). Less verbal aggression and anxiety was reported among Alzheimer's patients who were exposed to companion animals compared to Alzheimer´s patients who were not (23). When anxiety levels of patients before undergoing ECT (electroconvulsive therapy) were studied it seemed that animal-assisted therapy decreased both anxiety and fear of impending therapy. The same study also measured depression levels but found no significant effect (24). More studies report reduction in anxiety levels. Patients hospitalized with heart failure were examined and it was found that animal-assisted therapy not only reduced anxiety but also improved cardiopulmonary pressures and neurohormone levels (25). Friedmann and Thomas (26) reported that following a myocardial infarction, dog owners were significantly less likely to die within one year compared to non-dog owners. Another study on the same condition found that pet owners had a lower mortality rate compared with non-pet owners. The study also found that the more depressed the individuals were the higher mortality rates were found. Mortality rates were thus lowest among non depressed pet owners and highest among depressed non-pet owners (27). When gay and bisexual men were studied no association between pet owners, with or without HIV, and depression were found. But among those who had AIDS, pet owners reported less depressive symptoms, especially those who had few confidants (28). This might mean that having a pet can buffer the strain of going from being HIV positive to having AIDS, if you have few to confine in. Siegel (29) suggested that pets can help the elderly in times of stress, for example in dealing with a loss of a friend or a family member, since non-pet owners visited the doctor more often when stressful life events occurred than did pet owners. Pet owners' need for companionship might thus be partially met by their pets and therefore help with the loss. Caregivers of Alzheimer's patient are also under a lot of stress in taking care of a cognitively impaired adult, but association with companion animals was found to temper this stress among young female and male caregivers but not among middle-aged female caregivers (30). Companion animals were also found to ease the stress following a change of residence among older adults when moving to a skilled rehabilitation unit (31). Results also suggest that older adults that have pets are more active in daily life than those who do not and that their level of deterioration of activities in daily living is less on average (32). Holding a pet has also been associated with considerably increased quality of life among lung transplant recipients (33).

Though most studies seem to indicate health benefits of exposure to companion animals, others indicate negative or no effect. In a study conducted on residents living independently results reported that caring for a pet results in poorer physical health, more depression and more use of pain relief medication. Also, that married women exposed to companion animals seemed to have poorer physical health than those not exposed (34). Another study conducted on cancer patients in radiation therapy found no statistically significant differences in mood, self-perceived health and sense of coherence (35). No effect was found on either physical or mental well-being among individuals suffering from chronic fatigue syndrome (36). Winefield et al. conclude that the health of the elderly is not related to their ownership of, or an attachment to, a companion animal, but depends on their health habits and social support (37).

Since nearly all of the studies mentioned above are conducted on rather small groups with special conditions, results are hard to generalize on to the general population. In fact there seems to be a lack

of large cross-sectional studies that focus on general national population to explore the impact that pets have on the health and well-being of their owners. A study that was conducted on a general Swedish population in 2009 seems to be the first of that kind. The aim of that study was to explore the differences between pet owners and non-pet owners concerning aspects of health, physical/leisure activities, work and sociodemographics. It was a one year retrospective study, based on data from a postal public health survey collected in 2004. The study sample included 43.589 participants and 39.995 of them answered whether they had a pet or not. Of the respondents, 37.5% were pet owners. The groups were found to differ with regard to socio-demographics, several health factors, leisure activities and aspects of work. Items were grouped into various areas; health, use of drugs, contact with healthcare institutions, habits of life, mental health and quality of life, need for support and assistance, home and household, housing and housing environment, work and work environment, reported sickness and demographics. Results indicated, when looking back three months, that pet owners more often reported symptoms of physical ill-health: pain in shoulders, hip/back, stomach and head, than non-pet owners. Pet owners also reported more symptoms of mental ill-health: anxiety, tiredness, insomnia and depression. On the other hand, looking back 12 months non-pet owners more frequently reported physical symptoms, like cardiovascular disease, high blood pressure, diabetes and cancer than pet owners. Non-pet owners suffered more often from general pain and difficulties, visited healthcare services more often and used more prescriptive medication. Overall pet owners perceived their general health to be better than non-pet owners (38). Cline (39) reported results from a study conducted on 201 adults of the United States general population. Data was used from a telephone survey conducted in 2006. Dog owners were 38% of the sample. The author hypothesized that dog ownership would decrease depression levels through satisfaction with social support and through physical activity, and that owning a dog would be associated with lower depression levels, more so for single dog owners than married, older than younger and with women rather than men. No main effects on depression were found, but results indicated that effects were different depending on marital status and sex. Greater beneficial effects on well-being were found among single individuals rather than married. Furthermore, dog ownership was found to lower depression among woman but not among men. Hypotheses that dog ownership would decrease depression with social support and through physical activity were not supported. McConnell et al. (40) reported results from three studies conducted with the purpose of examining the potential benefits of pet ownership on a general population. The first study, with 217 participants (77% pet owners), aimed to find out if pet owners enjoyed better well-being than non-pet owners. The second study, with 56 dog owners, aimed to find out if pet owners benefitted more when their pets fulfilled their social needs better. The third one, with 97 pet owners, aimed to find out if thoughts of one's pet could ease the negative feelings of social rejection. Pet owners were found to have greater self-esteem, greater levels of exercise and physical fitness, were less lonely, more conscientious and more extraverted than non-owners. They also tended to be less fearful and less preoccupied than non-owners. Results suggested that pet owners enjoyed better well-being, the more their pets fulfilled their social needs. The pets did not seem to replace or compete with human resources but rather complemented them. When the pet owners experienced negative feelings from a rejection experience, thinking of their pet seemed to be able to

ease those feelings just as well as thinking of their best human friend. Though this study is said to be a cross-sectional population based study, it can hardly be considered as such since participants were requested through e-mail at one university and it can be assumed that pet owners were more likely to respond to that request, hence the high rate of pet owners.

To draw a definite conclusion from these previous studies is hard. Their results are contradicting and are almost impossible to compare since methodology is very different from one study to another. Overall results might indicate a more beneficial effect towards pet owners but sample sizes are in most cases small and based on a specific group. The few population based studies show the same contradicting results.

Pet ownership is already common and increasing. Records in Iceland show that registered dogs have at least doubled the past 10 years (e-mail correspondence with the municipalities of Akureyri, Mosfellbær and Seltjarnarnes and the Public Health Authority of Suðurnes), and there are always some dogs that are not registered. According to Statistics Iceland in the year 2004 pets were in approximately 30% of Icelandic households (41). The Data used in the current study shows a similar percentage, 28% of the participants have pets. The impact of pet ownership, good or bad, might therefore be substantial. It is important to gain more information on the matter, both as a preventive measure and as a possible intervention measure.

2 Specific aims

Utilizing data from a study sampled from the entire nation, the aims of the study are threefold:

1. To see how pet owners perceive their own mental health compared to non-pet owners.
2. To compare prevalence of diagnoses and symptoms of depression, anxiety and/or stress in pet vs. non-pet owners.
3. To compare mental health factors; satisfaction with life, depression, anxiety and stress, between pet owners and non-pet owners.

Hypotheses:

- Pet owners perceive their health to be better than non-pet owners.
- Pet owners are less likely to report diagnosis of depression, anxiety and/or stress than non-pet owners.
- Pet owners are less likely to report symptoms of depression or anxiety and are more satisfied with life than non-pet owners.

3 Article

To be submitted to: Scandinavian Journal of Public Health.

3.1 Introduction

Mental health has in recent years gained more weight in the discussion on health promotion and is becoming accepted as a factor that needs at least as much attention as any other for individuals to live a wholesome, satisfying and meaningful life. Mental disorders are already common and their rate is estimated to increase every year worldwide (2). If individuals with mental disorders get treatment, the chances for recovery are good, but there seems to be a huge gap between the burden caused by mental disorders and the resources available to prevent and treat them, a gap that is far larger in low income countries than in high income countries (4). It has been suggested that companion animals might benefit those suffering from mental disorder (17).

A number of studies have explored the relationship between humans and animals, and in particular tried to find out if there are any correlations between exposure to companion animals and various health factors. The results of these studies are contradicting. Many of them have suggested that companion animals might benefit health of humans in various ways. Enjoying a pet's company might increase individuals overall wellbeing (40), reduce minor health problems and improve their general health (18). Results have also indicated that companion animals lessen children's perceived postoperative pain (19), reduce anxiety and depression (17,20-24,28), lessen stress (29-31), give an avenue for connecting with other humans and help in finding social support (17) and give individuals a sense of empowerment and importance (17). Their company might also reduce blood pressure and heart rate (20, 21), improve cardiopulmonary pressures and neurohormone levels (25), lower mortality rate following a myocardial infarction (26, 27) and increase quality of life (33). Other studies indicate negative effects such as: poorer physical health, more anxiety and depression and more use of pain relief medication (34,38). Yet others report no effects (35, 36, 37).

To draw a definite conclusion from these previous studies is hard. Their results contradict each other and are almost impossible to compare since methodology is very different from one study to another. Overall results might indicate a more beneficial effect towards pet owners but sample sizes are in most cases small and based on a specific group, only a few population based studies have been conducted so far.

Pets are in approximatly 30% of Icelandic households (41). Since pet ownership is already common and increasing the impact of pet ownership might be substancial. It is important to gain more information on the matter, both as a preventive measure and as a possible intervention measure. Aims of the current study were to see if pet owners might perceive their mental health to be better, if they were less likely to report diagnosis of a mental disorder, if they were less likely to report symptoms of depression, anxiety and stress and if they might seem more unsatisfied with life than non-pet owners.

3.2 Methods

3.2.1 Study design and population

A cross-sectional general health survey was conducted in October 2007 (Heilsa og líðan 2007) by the Public Health Institute of Iceland (now united with The Icelandic Directorate of Health) in cooperation with The Icelandic Directorate of Health, The Administration of Occupational Safety and Health in Iceland, The Icelandic Cancer Society, University of Iceland, Reykjavik University, University of Akureyri and The National University Hospital of Iceland. The study sample, 9.807 people, 18-79 years old, was randomly selected from Iceland's general population. A total of 5.909 individuals responded over a period of five months, a response rate of 60.3%. Participants in 2007 were asked if they were willing to participate in a second study a few years later which 5.411, 91.6%, agreed to. They were the study sample of the second study which was conducted in the fall of 2009 (Heilsa og líðan 2009). The data from 2009 was used to test the hypotheses in the current study. From the 5.411 that had agreed to participate 52 had likely past away and 56 moved abroad, so a letter was sent to the remaining 5.303 of the study sample on October 28th 2009, containing information about the study. The questionnaire was then sent on November 3rd, along with a letter about the conduction of the study. After the questionnaires were sent out it was clear that three of the 5.303 had died, five moved abroad and one could not answer because of language difficulties. The final sample was therefore 5.294. On November 13th, those who had already answered received a thank you note for participating, the others were reminded by letter to kindly participate. Those who still had not answered the questionnaire on November 23rd, just over 2.000 individuals, received a new copy of the questionnaire along with a reminder letter. Response rate was 77.3% or a total of 4.092 respondents. The study was reported to the Data Protection Authority and was approved by the National Bioethics Committee (permit nr.09-094).

3.2.2 Measures

The questionnaire had 117 questions about various health factors and background information. The following measures were selected to test the predicted hypotheses.

Pet ownership: Participants were asked if they had pets, with answers coded 0 for non-pet owners and 1 for pet owners. This was used as the independent variable.

Self-perceived mental health: Participants were asked "how do you perceive your general mental health" with answers on a four point scale from "very good" to "very bad". Answers were recoded to binary coding with 0 for good health and 1 for bad health.

Diagnoses: Participants were asked if they had been diagnosed with depression, anxiety and/or stress by a doctor or a psychologist. Participants answered with either yes or no. If they reported any diagnosis their answer was coded as 1 but if no diagnosis was reported their answer was coded as 0.

The Satisfaction with Life Scale (SWLS): The scale was used to measure global life satisfaction. The scale consists of five questions. Answer for each question is given on a seven point scale from "strongly disagree" to "strongly agree". Each point represents a number from one to seven. The scores of the five questions are then summed up to a total score and categorized after satisfaction into seven

categories: extremely dissatisfied, dissatisfied, slightly dissatisfied, neutral, slightly satisfied, satisfied and extremely satisfied. For the statistical analyzes a cut-off was made so that those dissatisfied were coded as 1 and those neutral and satisfied as 0. SWLS has proven to be a reliable and a valid measure of global life satisfaction (42).

Depression Anxiety Stress Scale (DASS): The scale was used to measure depression, anxiety and stress. The Scale consists of 42 questions, 14 questions to measure each condition; depression, anxiety and stress. Answers for each question were given on a four point scale from "did not apply to me at all" to "applied to me very much, or most of the time". Each point represents a number from zero to three. Scores for each condition are summed up and categorized into five categories: normal, mild, moderate, severe and extremely severe. Normal was coded as 0 and the categories that resemble cases (mild to extremely severe) were joined and coded as 1. DASS has proven to be a reliable and a valid measure of depression, anxiety and stress (43), and the Icelandic translation of DASS has proven to be compatible with the original one (44).

Covariates: Seven variables were thought to interact with the dependent variables and considered to be covariates. ***Age*** was a continuous variable, ***sex*** was coded into 1 for male and 2 for female, ***education*** was coded into 1 for primary education, 2 for secondary education, 3 for a university degree and 4 for other education, ***financial position*** was coded into 1 for easy to make ends meet, 2 for neither, 3 for hard to make ends meet, ***living conditions*** was coded into 1 for those living alone and 0 for those living with others, ***residence*** was coded into 1 for urban area with more than 5.000 inhabitants, 2 for urban area with 1.000-4.999 inhabitants, 3 for urban area with 200-999 inhabitants and 4 for rural area with less than 200 inhabitants, ***marital status*** was coded into 1 for being in a relationship but not living together, 2 for cohabiting, 3 for married, 4 for divorced, 5 for widowed and 6 for being single.

3.2.3 Statistical Analyses

To compare the background characteristics of pet owners to non-pet owners, Pearson´s chi square was used when the variables were categorical and t-tests when the variables were continuous. Prior to performing the analyses the assumptions of possible analyses was tested. Considerable skewness was in the distribution from SWLS and DASS; therefore, to meet the necessary assumptions and to avoid bias in the analyses, the scores were categorized into "normal" versus "cases" to make a binary logistic regression possible. All of the outcome variables were then categorical so binary logistic regression was used to test the hypotheses. For each analysis only those covariates that were associated with the specific outcome variable being analyzed were used (see table 2 and 3). Previous results had reported that dog ownership had a different impact on males and females, that dog ownership lowered depression among females but not among men (39). Females and males were therefore analyzed separately by filtering out, first females to analyze males, and then males to analyze females. The same variables were used as before to see if scores on SWLS and DASS scales differed. To analyze only those living alone, those living with others were filtered out of the data and analyzes on SWLS and DASS were conducted as before.

The statistical software $SPSS_{19}$ was used to analyze the data (SPSS Inc., Chicago, IL, USA).

3.3 Results

A total of 4.092 individuals responded to the questionnaire, a 77.3% response rate, and 3.983 answered whether there was a companion animal in the household (pet owner) or not (non-pet owner). Participants were 53% females and 47% males. Pet owners were 28% of the participants. The portion of males and females was comparable between pet owners and non-pet owners.

As seen in table 1 significant differences were found between pet owners and non-pet owners regarding age, education, financial position, place of residence, living conditions and marital status. Pet owners were younger, had higher education, lived more often with others and in rural areas, and found it more difficult to make ends meet than non-pet owners. Regarding marital status, a higher portion of single individuals and those cohabiting were pet owners than non-pet owners. However a higher portion of those in a relationship, married, divorced or widowed were non-pet owners than pet owners. Differences in leisure time activities were also examined, but were not significant.

After adjusting for covariates, pet owners were found to have higher odds of depressive symptoms (OR=1.26; 95%CI 1.01-1.57), symptoms of stress (OR=1.49; 95%CI 1.10-2.01) and dissatisfaction with life (OR=1.57: 95%CI 1.25-1.98) than non-pet owners (table 2). Other analyzes were not statistically significant.

Analyzing females and males separately indicates that female pet owners are more likely to be dissatisfied with life (OR 1.55; CI 1.18-2.03) and stressed (OR 1.50; CI 1.03-2.20), than female non-pet owners, and that male pet owners are more likely to be dissatisfied with life (OR 1.67; CI 1.23-2.28) than male non-pet owners (table 3). No significant results were found with respect to pet ownership when analyzing only those living alone.

3.4 Discussions

Our findings indicate that pet owners are more dissatisfied with life, and experience more depressive symptoms and more stress than non-pet owners. Similar results have previously been reported on depression, from two other large cross-sectional studies (34,38). One of them only focuses on older adults from 60-64, and might therefore not be comparable with our study. The other focuses on a broad age range, 18-84, similar to our study and is also comparable in methodology but has a relatively small study sample compared to our study. No studies were found to report similar results on stress and satisfaction with life. On the contrary, previous research has reported calming effects from animal companionship (17,21,30,31). Since these studies are all intervention studies that focus on a group with a specific condition; older adults, college students, mentally ill, caregivers of Alzheimer´s patients, their results are harder to generalize onto the general public. Enjoying the occasional company of a visitation pet and being responsible for its caring and well-being can be two entirely different things.

Part of the study´s strengths is its large sample size and valid measures of psychological morbidity. The study's limitations entail the fact that the cross-sectional study design prohibits any inferences on causality. Since the participants were only asked if there was a pet in the home or not, but not how long the pet had lived there, it is therefore not known if the pet had just arrived or if it had lived there for a decade. The effects of its duration might thus be skewed. It is also not known who in the

household is responsible for caring for the pet and this analysis could not disentangle different kinds of pets, for example dog, cat or fish. Since the causality of observed relationship cannot be established, the question remains whether pets might possibly be influencing their owners in a negative way, or might those that get pets somehow be different from those who do not, to begin with. Is it possible that people that already are depressed, stressed out and unsatisfied with life get a pet to try to make themselves happier, to gain more sense of empowerment and the feeling that they matter? This would be compatible with the results of the study by Wisdom et al. (17) where they found that pets gave the participants this feeling of increased empowerment and that they mattered more. Are there possibly other factors that are affecting pet owners rather than non-pet owners and thus giving off these results?

The groups were found to differ in both age and financial position. The pet owners were younger on average and found it more difficult to make ends meet each month. These factors may have influenced the mental health of pet owners. Age might matter in the context that pet owners are possibly struggling more with establishing themselves. More of the pet owners might be finishing their studies (living off loans), building a working career and alongside that starting a family and buying their first homes for example. The study is also conducted approximately a year after a major financial collapse in Iceland and since the results indicate that pet owners are more concerned financially and find it harder than non-pet owners to make ends meet, it might be a magnifying influence on stress. The financial collapse occurred in the fall of 2008 and in that year a total of 748 businesses went bankrupt, which was an increase of 18% (45) from the previous year. That collapse kept on going and in 2009, the same year that this study was conducted, a total of 910 (46) businesses went bankrupt. From all these businesses both employers and employees lost their income and financial security. At the same time as income might have decreased prices went up. After the financial collapse people sought ways to cut their expenditures. Keeping a pet always involves some expenditure; food, grooming, toys and veterinary expenses. When keeping a pet you also need to live in a house where pets are allowed. In Iceland pets are mostly not allowed in apartment buildings which means that pet owners do not have the same access to cheap housing as non-pet owners. This situation can lead to either the difficult decision of having to give the pet away or a negligence of the animal; when difficulties in making ends meet for example means that you have to choose between food and veterinary expenses for the pet or food and healthcare for you and your family. Both choices could result in an increased indisposition for the pet owners. Is it possible that financial worries and difficulties during this period of financial insecurity after the collapse created situations that influenced pet owners even more than non-pet owners? It would be interesting to see the same study conducted in a different financial environment. When pet owners were possibly less concerned by the financial side of keeping a companion animal and would therefore enjoy their companion to the fullest.

When the analyses were made on females and males separately, observed results appeared on satisfaction with life and stress with females but only on satisfaction with life with males. Female pet owners seem more likely to be stressed and unsatisfied with life than female non-pet owners. Male pet owners seem more likely to be unsatisfied with life than male non-pet owners. No significant results appeared on depression, but previous results have indicated that pets might lower depression in

women but not men (39). Earlier results have also indicated that pet ownership tempers stress, but only among young females and males, but not among middle-aged female (30). Other studies do not report differences between the sexes, most likely because the analyses have not been made with either only females or only males.

3.5 Conclusions

Before making large assumptions based on these results, this relationship needs to be analyzed further. Impact of pet ownership might be substantial, but before making any public health interventions or promotion directed to pet owners, the direction of this association needs to be better understood. It would be sensible to repeat the study in a different financial environment and to gather more prospective information on pet ownership, such as how many pets are in each household and what type, how long the pet has lived in the home and who is mainly responsible for caring for it.

Table 1: Descriptives

	N total	Pet owners	%	Non-pet owners	%	*p*
Sex	3983					0.113
Female	2125	620	55.4	1505	52.6	
Male	1858	500	44.6	1358	47.4	
Age[a]	55.16	48.48		57.38		<0.001
Education	3693					0.006
Primary education	1386	350	33.4	1036	39.2	
Secondary education	1255	367	35	888	33.6	
University	868	277	26.4	591	22.3	
Other	184	54	5.2	130	4.9	
Financial position[b]	3906					<0.001
Easy	1999	470	42.6	1529	54.6	
Neither	1162	329	29.8	833	29.7	
Hard	745	305	27.6	440	15.7	
Residence	3930					<0.001
Urban more than 5000	2506	622	56.1	1884	66.8	
Urban 1000-4999	748	228	20.6	520	18.4	
Urban 200-999	298	77	6.9	221	7.8	
Rural less than 200	378	182	16.4	196	6.9	
Living conditions	3944					<0.001
Lives alone	574	90	8.1	484	17.1	
Lives with other/s	3370	1025	91.9	2345	82.9	
Marital status	3913					<0.001
In a relationship	146	36	3.3	110	3.9	
Cohabiting	508	183	16.5	325	11.6	
Married	2473	685	61.9	1788	63.7	
Divorced	225	54	4.9	171	6.1	
Widowed	232	45	4.1	187	6.7	
Single	329	103	9.3	226	8.1	

[a]Age is given as a mean age of each group.

[b]How easy or hard it is to make ends meet every month.

Table 2: Odds ratio from binary logistic regression's on mental health factors

	OR	95 % CI		*p*
Self-perceived mental health[a]	1.054	0.862	1.289	0.609
Diagnosed with depr./anx./stress[b]	1.408	0.936	2.118	0.101
Dissatisfaction with life (SWLS)[c]	1.574	1.252	1.980	<0.001
Depressive symptoms (DASS)[d]	1.257	1.005	1.572	0.045
Anxiety symptoms (DASS)[e]	1.112	0.831	1.489	0.474
Stress symptoms (DASS)[f]	1.486	1.099	2.008	0.010

[a]Adjusted for education, financial position, place of residence, living conditions and marital status.
[b]Adjusted for sex, age, education, financial position, living conditions and marital status.
[c]Adjusted for education, financial status, living conditions and marital status.
[d]Adjusted for sex, education, financial position, living conditions and marital status.
[e]Adjusted for sex, education, financial position, living conditions and marital status.
[f]Adjusted for sex, age, financial position and marital status.

Table 3: Odds ratio from binary logistic regression's on mental health factors analyzed by sex

	OR	95% CI		*p*
Male				
Dissatisfaction with life (SWLS)[a]	1.669	1.225	2.275	0.001
Depressive symptoms (DASS)[b]	1.257	0.880	1.795	0.209
Anxiety symptoms (DASS)[c]	1.380	0.853	2.235	0.190
Stress symptoms (DASS)[d]	1.535	0.931	2.530	0.093
Female				
Dissatisfaction with life (SWLS)[a]	1.548	1.183	2.026	0.001
Depressive symptoms (DASS)[b]	1.261	0.946	1.682	0.114
Anxiety symptoms (DASS)[c]	0.975	0.675	1.407	0.890
Stress symptoms (DASS)[d]	1.503	1.026	2.200	0.036

[a]Adjusted for education, financial status, living conditions and marital status.
[b]Adjusted for education, financial position, living conditions and marital status.
[c]Adjusted for education, financial position, living conditions and marital status.
[d]Adjusted for age, financial position and marital status.

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