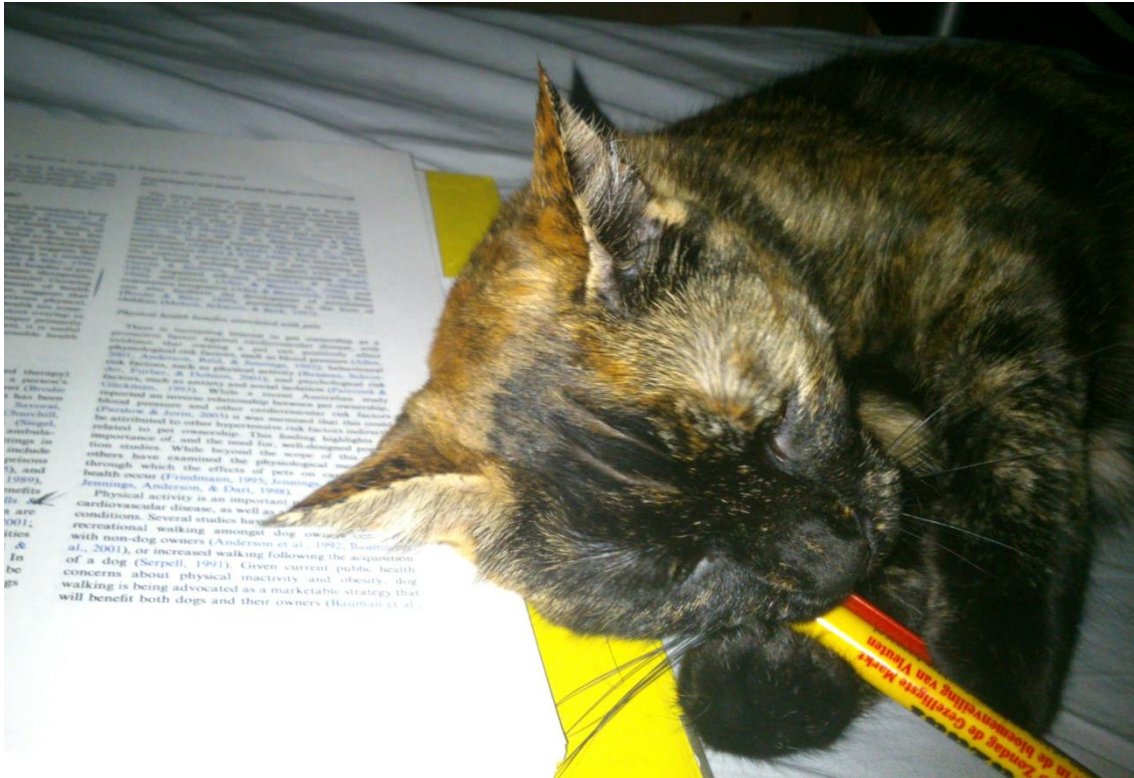


The influence of dogs and cats on the mental health and emotional wellbeing of their owners in the Netherlands.



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Summary

The lives of cats and dogs have been bound to human lives for an extensive period of time. Sharing homes, shelters, enriching lives, caring for and protecting their owners; such a close relationship might have an effect on the mental health and wellbeing of their owner. There has been extensive research abroad regarding pets and their impact on mental health, but to this day there has been no such research in the Netherlands.

This paper will explore the effects of cat and dog ownership on the mental health and wellbeing of their owner.

This was done by conducting a survey online with a broad spectrum of participants. Different age groups, pet owners and non-pet owners all took part in the questionnaire. The questionnaire consisted partly of self-made questions based on guideline questions (mainly questions favored by health institutions) and the MHC-SF (Mental Health Continuum-Short Form), an accredited form of estimating mental health. A total of 466 participants completed the entire survey and their results were evaluated using SPSS 17.0.

Pet owners in general (both cat and dog owners) visited a psychiatrist significantly more often than non-pet owners. Cat owners had a higher number of visits to the psychiatrist. However, pet owners scored significantly higher on the emotional part of the MHC-SF, indicating a better emotional health.

Overall pet owners did slightly worse than non-pet owners. Interestingly so, cat owners almost consistently had worse scores than dog owners and non-owners alike, thus lowering the mean for pet owners.

The conclusion from this research seems to be that with pet ownership comes a better emotional health, but more use of a psychiatrist. Cat owners seem to be in poorer emotional health compared to dog owners and non-owners, which is very fascinating and needs yet further investigation. This may be explained by the low maintenance character and appeal of cats which owners in poorer health could find comfort in.

Introduction

There are almost 1.5 million dogs and 2.9 million cats in the Netherlands, which indicates that more than half of the Dutch families own either a cat or a dog (Fediaf, 2010). This leads to impressive estimated 2.12 billion euros spent each year on pets, covering expenses such as food, veterinary services and insurance (University of Wageningen 2011).

For countless years dogs and cats have fulfilled their roles as protectors, shepherds, farmdogs, confidantes, hunters, pest control and as companions (Messent et al, 1981). The diversity of the species of pets kept has also expanded; exotic pets like lizards, snakes, sugar gliders and chinchillas dominate in some households. Even their roles in society have broadened: animal-assisted therapy, service dogs and detectors of disease. Most people consider their pets (mainly cats and dogs) as family members, as dear to them as any child (Cohen, 2002). Partly because of the close and intensive contact with pets, the question arose whether keeping companion animals could improve mental health and heighten emotional wellbeing. Pet owners spent a considerable amount of time, money and energy on their pet, without seemingly getting something in return. But is this statement true? Most pet owners will strongly disagree and share their view that their pet has kept them happy, healthy, less lonely and gives them affection (Staats et al, 2006). Their pets are the first living thing they greet when entering their homes and a whooping amount of pets sleep in beds, pets accompany their owners on vacation and the loss of a pet causes great bereavement. So this makes researchers wonder: Do our pets make us happier?

There has been extensive research on the effect of pets on mental health but some studies failed to demonstrate an effect, some have been hindered by methodological problems and some show great effect, but most evidence is inconclusive (Heady 1999).

This study will begin with the focus on the owner: attachment and compatibility are important factors of pet ownership. Then more attention will be paid to pet owners as a study group, followed by results from pet owners in general and from physically disabled owners.

The chapters thereafter focus on the perceived mental health advantages, social health and loneliness. The introduction ends with a short chapter about oxytocin and the aim of this study.

Attachment and compatibility

One important aspect to consider is that every pet in a household has one owner who is the prime caretaker of the pet and may also benefit more from the possible positive influence of their pet due to the considerable amount of time spent in proximity to their pet (Parslow et al, 2005, Heady, 1999). However being the primary caretaker is not always related to attachment; for some caretakers their pet can feel like a burden (Parslow et al, 2005).

It is also important to question the level of attachment to one's pet because feelings of attachment differs in each cycle of a person's life. Pet attachment is particularly important among divorced owners, never married and widowed owners, childless couples, newlyweds and empty nesters (Albert and Bulcroft, 1988). This may partly be explained by either the loss of human companionship or the amount of free time. In one particular study the researchers focused on the compatibility and attachment of owners with their pet (Budge et al, 1998). A pet that is not compatible with his or her owner can lead to frustrations and anger on both sides. Compatibility is described as the fit between the animal and the owner on physical, behavioral, and psychological dimensions. People who are more compatible with their pet report better mental health overall and these associations cannot be attributed to levels of attachment or social support. Compatibility is positively related to higher well-being, more positive affect and a greater sense of well-being, as well as less anxiety and distress.. People who were more attached to their pets also scored higher in well-being and positive affect, had less anxiety and distress. Attachment and compatibility were independent of each other, but both had positive effects on diverse aspects of mental health (Budge et al, 1998).

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Pet owners as a study group

In research one of the main factors is to assign the groups as randomly as possible for unbiased results. But pet ownership is not something that can be forced if it is not wanted, which makes random assignment to groups a rather difficult affair.

It is understandable that random assignment of a pet to an owner just for experimental purposes is something most participants are unwilling to do. People who own pets choose this life for themselves and by involving them in an experiment enables the participant to enter a self-chosen group. Pet ownership is based on free will, prior experiences, education, but is also associated with factors such as income, house-ownership, a stable relationship and children. All these factors may contribute to health status, especially a higher income which may contribute positively to health status (Gunasekare et al, 2012). This would obscure the effect from pet ownership in wealthy pet owners. But there is also a chance that good health is a premise for pet ownership.

This may lead to the theory that it should not be whether pet ownership promotes good health, but *under what circumstances* a pet might promote good health (Siegel et al, 2010).

Most pet owners live with other people (mostly married with or without children) making it difficult to entangle the benefits and perceived emotional support derived by animals and human companions. But this can be observed by studying people who live alone with little or no human support. There are no differences in mental health between female owners and non-owners in the age range of 70-75 (Siegel et al, 2010). However this study studied only females from 70-75 years of age and they were followed during a period of six successive years. Because there was no question regarding pet attachment, the results of females who lived alone were compared to non-owners. The results of the females who lived alone did not differ significantly from the results of the non-owners.

Pet ownership in general

Pet owners were less likely to feel lonely, got to know people easier and were more likely to be civically engaged (Woods et al 2005).

The above mentioned findings are the most common findings in studies with a positive outcome. However, some of these positive findings were not found in larger replicas of older studies and some studies mention no positive results at all.

A large survey (n=1011) existing of Australian residents age 60-64 found that owners reported more depressive symptoms (Parslow et al, 2005). Being the prime caretaker of a pet was associated with negative health outcomes including more symptoms of depression. The personality of caretakers and pet owners was examined and revealed that men who cared for pets had higher extraversion scores. Pet owners and caretakers reported higher levels of psychoticism. This study did not find positive influence of pet ownership on mental health, but rather negative mental health outcomes.

Elderly people who have a cat or a dog and a cat are more likely to use ambulatory mental health services, but there was no difference in mental health status between pet owners and non-pet owners (Rijken et al 2011).

This may imply that pet ownership may be detrimental to certain age groups.

A similar survey has found place in Sweden in with an impressive amount of respondents (n=39995) (Mullerdorf et al, 2010). Pet owners experienced anxiety more frequently than non-owners. Pet owners also reported more symptoms of ill mental health which is characterized by anxiety/low spiritedness, tiredness/powerlessness, insomnia and depression. However, there was no information about the type of pet owned. Another difference between pet owners and non owners is that pet owners were often in the age range of 35-49, more often of the female sex, more often self-employed.

Pet ownership may have different influences on age, gender, marital status and social status, but this area needs more specific investigation.

The gains and the hassles of pet ownership in the age group of 50-91 years come in a broad variety. (Miller et al, 1992). Hassles were described as negative feelings toward one's pet, based on their

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behavior or other aspects. Gains are positive feelings experienced by owners based on actions of their pets. People were categorized by their scores on how uplifting or how much of a hassle they perceived their pet to be. Pet non-interactors were defined as those without pets or those who didn't experience any uplifts or hassles from their pets. Pet interactors had more daily hassles and uplifts, greater satisfaction with life and more positive expectations of life than non-pet interactors. The benefits of owning pets were reported to greatly outweigh the cost and the pet interactors experienced significantly more intense uplifts than hassles from their pet. Respondents who had higher uplifts from their pets engaged in significantly more social activities than respondents with lower uplifts. They talked more with their friends and reported doing more things with friends (Miller et al, 1992)

There was also a gender difference. Female pet owners, who are relatively young, work part time and have children at home experienced more pet hassles. The researchers titled this phenomenon: 'Lack of Free Time and Resources'. Having a higher socioeconomic status was associated with pet uplifts in female respondents. Uplifts for the female pet owner is predicted by having free time and funds for recreation, by good health, social uplifts and an absence of family hassles.

For the male respondent, uplifts from pets are predicted by hassles regarding free time and available money, social hassles and an absence of family hassles. (Miller et al, 1992)

This shows that different pre-existing factors (such as good health, financial situation etc.) are important factors if owners want to enjoy having a pet.

Chronic illness or physical disabilities

Some studies were designed to investigate the effect of a pet on the mental health of chronically ill or physically disabled people (Shinati 2010, Wells 2009). Relying on good health as a premise for pet ownership is ruled out in these population groups. These people deal with lifelong disabilities and might be more prone to depression and feelings of loneliness. Physically disabled people rely on their service dogs to alleviate them in daily life and depend on their dog for a number of daily activities. A service dog is trained to assist his/her handler with various activities of daily living, such as opening doors, picking up items and doing laundry. In most Western countries service dogs are of an immense importance for their physically disabled handlers. Over the past 15 years, generations of service dogs in Japan are being trained and joined with their respective owner (Shinati et al, 2010). While service dogs are in high demand, not every disabled person meets the requirements needed to get a service dog. When comparing the emotional and mental health of the physically disabled owners of a service dog to a physically disabled control group, significant higher scores were found with psychical functioning and the emotional role (Shinati et al, 2010). The emotional role stands for being able to cope with mental difficulties experienced in tasks and daily activities. Compared to the general Japanese population without disabilities, the physically disabled group with a service dog scored significantly higher on the mental component summary (a questionnaire which measures the mental health and agility), which means that they are mentally more equipped and mentally more healthy than the average Japanese citizen. It has to be noted that the experimental group (n=10) and the control group (n=38) are very small groups, which hinder getting significant results, and over- or underestimating the results (Shinati et al, 2010).

The study above mentioned involved only service dogs, not pets for companionship. Service dogs cannot be labeled as pet in the conventional sense (acquired for companion), but still enhanced the mental component of their handlers. It is still questionable whether the positive influence is due to the daily tasks that the service dogs perform or due to their role as companion animals. The service dogs do also function as pets since they never leave their handler's side and thus create a long-lasting bond.

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There was no significant mental health difference between people suffering from Chronic Fatigue Syndrome (CFS) with a pet and people with CFS without a pet. However, people with CFS who owned a pet believed they gained psychological health advantages from their pet ownership. The advantages were for example: provision of companionship, facilitating a better mood, helping reduce depression and increasing calmness, encouraging laughter and last but not least, motivating their owners to get up in the morning and providing a purpose in life (Wells, 2009).

Perceived psychological health advantages

There might have been no differences between the mental health of pet and non-pet owners in the study of Wells (2009), but the pet owners believed they were getting psychological health advantages.

People, especially younger children also believe that their pet is a great friend, a non-judging confidante who will never share their secrets to outsiders and will always support them (Barker et al, 1997).

Child abuse survivors rated their pet as significantly more supportive/less abusive during the years they were abused. The type of pet (dog, cat, horse e.g.) made no difference in the level of experienced supportiveness. When asked to draw themselves as the center of a circle, they placed their pets much closer to their persona than most of the humans. This concludes that during their years of child abuse, these survivors felt most support from their pets (Barker et al, 1997).

Small children rated their pets as being important presences in their lives. The children were asked to rank the most important people in their lives for different scenarios (McNicolson et al, 2001).

Rankings given to pets suggest that children can realistically discriminate between functions that pets can or cannot provide. Dogs were useful protectors in scary situations, good for sharing secrets with and as providers of comfort when ill. Cats ranked very highly for providing comfort during sickness. The children gave their pets higher priorities than non-immediate family members (aunts, grandparents), which could be interpreted as that children perceive their pets as being close family or as important as close family.

Pet ownership and mental stress

As described in the previous article, pets are perceived as being supportive non judging creatures; therefore they may help their owner relieve stress symptoms.

Hypertensive agents lower blood pressure but have little effect on hypertension caused by mental or physical stress. Allen et al (2001) evaluated the effect of pets on blood pressure in response to mental stress before and during ACE inhibitor (linsopril) therapy. The participants were hypertensive stockbrokers, a profession that is known to be highly stressful. A total of 24 stockbrokers received medical therapy and 24 received medical therapy and agreed to acquire a pet at the beginning of the treatment. Blood pressure during mental stress was taken before and six months into the treatment. In both groups resting blood pressure was reduced by linsopril, but increases in blood pressure due to mental stress were significantly lower in the group who acquired a pet. This shows that linsopril reduces resting blood pressure, but the addition of a pet also reduces high blood pressure in response to mental stress. Interestingly, people with the fewest social contacts and friends benefited the most from their pet companions.

Loneliness

People who have few or no social contacts can feel quite lonely, but having a pet in their lives may help diminish those feelings of loneliness (Aydin et al, 2012).

Socially excluded participants (which was achieved in this study by letting subjects play a game with multiple participants in which the subject was not being included as often as other participants) who had a dog at their side during the game provided higher ratings for living a satisfying life, higher self-esteem, perceived their life as meaningful, felt more socially accepted and experienced more positive emotions than the socially excluded participants without a dog at their side. However, it is difficult to

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examine these findings, because the findings are based on a game that lasted five minutes and the participants were accompanied by an unfamiliar dog. But it also shows that pet ownership is not crucial when it comes to the reduction of mental distress by an animal (in this case a dog). Even short-term contact with a dog is sufficient to reduce mental distress.

The effects of owning a pet for a short amount of time instead of the influence over thousands of years was clearly recognizable in the study of Heady et al 2008. The positive effects of pet ownership on a civilization that only permitted keeping pets over the last 2 decades versus non pet ownership is a clear indication that pet ownership does indeed have a positive effect on health

While the study by Aydin et al (2012) studied only a temporary social exclusion, the following study performed by Zasslof et al (1994) followed women who lived entirely alone.

Women living entirely alone were significantly lonelier than women living with pets only, with both other people and pets, and with other people but without pets. No associations were found between loneliness and pet attachment. Dog owners were significantly more attached to their dog when living only with the dog. Cat owners however, were less attached to their cat if they lived alone rather than with other people. These findings indicate that having a dog or a cat can help to lower feelings of loneliness, particularly for women living alone, and thus compensate for the absence of human companionship (Zasslof et al, 1994).

Another group of citizens who live a notoriously lonely life on the road are homeless adolescents. Almost a third of the homeless adolescents said that their dog provided unconditional love, helped them feel healthier and kept them warm. The care for their dogs created the need to act more responsible and make better decisions (Rew et al, 2000).

A national survey amongst Australians reported that pet owners, especially dog owners, felt lonely less often than did non-owners (Headey, 1999). More than half of the pet owners said they 'got to know people and made friends' through having pets and they felt like their pets stimulated conversation and created a friendly atmosphere. Seventy-nine percent of owners found it comforting to be with their pet "when things go wrong". More than 9 out of 10 owners said they felt very close to their pet, which is the same number many gave to indicate how very close they felt to their family. This implies that owners felt lonely less often than non-owners and owners engaged more easily in conversations due to their pets.

Social life

It had been speculated that dogs can serve as social lubricants (McNicholas et al, 2000). To support this theory an experimenter walked a dog and observed how many conversations the experimenter enrolled in, their duration, and the person who the conversation was with (friend, stranger etc.). To rule out chance encounters with other dog walkers, the experimenter avoided the more obvious dog walking areas and took the dog to work, public transportation and such. To avoid bias, a highly trained dog who solicited no attention from bystanders was chosen. The experimenter walked randomly with and without the dog. From the 206 encounters, 156 were with the dog and 50 encounters were without the dog, but the lengths of the conversations did not differ significantly with or without the dog present. The encounters with friends did not differ in both groups, but there were more encounters with acquaintances and even more encounters with strangers if the dog was present.

McNicholas et al (2000) followed with a second study in which the appearance of the experimenter and the dog were changed from smartly to sloppy. The smartly dressed owner interactions increased over 10 times with a neat looking dog and over 11 times with a rough looking dog. The scruffy dressed owner's interactions increased over 7.9 times with a neat looking dog and over 8.3 with a rough looking dog. Overall the smartly dressed persons were addressed more than the scruffy dressed persons, but without a dog the interactions were significantly much lower.

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Oxytocin

Oxytocin is a peptide hormone synthesized in the hypothalamus, and is released during lactation and parturition. During a stress response, oxytocin decreases activity of the hypothalamic–pituitary–adrenal axis. Oxytocin is also related to social affiliation behaviors and rises during social interaction and pair bonding. (Gingrich 1997, Grewen 2005) Oxytocin is therefore sometimes used as a parameter for attachment. (Nagasawa et al, 2009). The concentration of urinary oxytocin varies in dog owners, after their dogs gazed upon them. The owners who had a better relationship with their dogs received longer gazes from their dogs and had a higher concentration of urinary oxytocin compared to owners with a poorer relationship with their dog. This implies that a good relationship between an owner and their pet is manifested as a higher secretion of oxytocin, the attachment hormone (Nagasawa et al, 2009).

Aim of the study

Giving all the different outcomes over the years and in different countries, this study's aim is to investigate the influence of pet ownership on mental health and emotional wellbeing in the Netherlands. This study compares the pet owner group with the non pet owner group on different aspects, such as the use of health care, medication and assessment of one's health. Attention will be paid to the amount of correspondence between assessment of health and the use of health care and medication. The study also compares the differences on mental health between pet owners and non owners, using the MHC-SF (Mental Health Continuum-Short Form) and use of mental healthcare (visits to the psychiatrist/psychologist). The correlation between the owner-pet bond and the above mentioned aspects will be measured. If there are significant differences between the groups, the composition of the groups will be compared.

The first hypothesis of this study is that owning a dog or a cat has a positive effect on mental health and emotional wellbeing.

The second hypothesis is that a greater effect on wellbeing is positively linked to attachment to one's pet.

Because this study was conducted and divided in an mental health part and an physical health part, the results of the physical health part are incorporated in this study for the completeness, but no further comments will be made about the physical part.

Materials and methods

Questionnaire

The survey was conducted using a partly self-made questionnaire online on SurveyMonkey consisting mainly of multiple choice questions. Some answers were provided with commentary fields underneath for specific commentary and clarification.

The survey was divided in four sections. The first section collected socio-demographic information and contained questions concerning pet ownership. If respondents had a pet they were asked to specify which species they owned. Pet owners who didn't own a dog or a cat were excluded from the study. People who did not own a pet at the time of the survey, but did own a pet in the past twelve months were also excluded to rule out any residual effects from previous pet ownership. The participants with a dog and/or cat were then asked specific questions to get an estimation of the bond and affection between owner and pet. This section contained questions, such as 'I like petting and cuddling with my pet' and 'I consider my pet part of my family'. The answers were rated on a 5-point Likert scale (Göb et al 2007). The possible answers were: strongly disagree, disagree, neither agree nor disagree, agree and strongly agree.

The second part of the survey was designed to collect information about the respondents' use of healthcare in the past six months. The participants were asked to specify their visits to the general practitioner, medical specialists, homecare, company doctor, physiotherapist, psychiatrist and alternative healers. In the following questions they were asked to report their use of medication in the past six months. Medication was subdivided in three categories: prescription drugs, over the counter drugs and homeopathic drugs. Participants were asked to specify each kind of medication they took, the duration of the therapy and how many times daily the medication was taken.

Next the respondents were asked to rate their physical health on a 0 to 100 scale and to answer several questions about their physical health which were also based on the 5-point Likert scale.

In the third section people were asked whether they had a paid job and if so how many days of the past two months they had been absent due to illness and whether they experienced hindrance during the job which lowered their performance in various ways.

To compare people with a paid job to people without, questions were designed to score the amount of hindrance due to health problems during (simple) household tasks, work around the house and other activities outside of the house, such as groceries.

The final section consisted of the Mental Health Continuum-Short Form (MHC-SF) to estimate mental health and emotional wellbeing (Lamers et al 2011). The MHC-SF is an accredited short form which has proven to be an effective way of measuring mental health.

Participants

Participants were recruited using email, social media, online forums and by putting up posters on walls. Different forums were approached; specific ownership forums, lifestyle forums, man-specific forums, female-specific forums, geriatric forums and so on. The aim was a minimum of 200 participants in the pet ownership group and a minimum of 200 participants in the non ownergroup and a representative and comparable socio-demographic situation.

Data Analysis

The data was imported, stored and calculated in SPSS 20.0. The Chi square test was used for data with a normal distribution. The Mann-Whitney U test was used for data with a nominal distribution and correlations were calculated using the Spearman's Rho test. Comparisons were made between owners and non-owners, and between dog, cat and nonpet owners.

Results

Participants

Participants

Of the respondents, 554 started the questionnaire and 466 met the demands for the study. Of the remaining participants 31% were male and 69% were female. Non pet owners added up to 211 respondents and the remaining 255 respondents had at least a cat and or a dog. The distribution of living arrangements amongst male and female respondents is fairly similar in composition (table 1), this is also the case for the age distribution among both the sexes and pet owners/non pet owners (tables 2 and 3). Lastly a comparison was made between the age distribution amongst the participants and the age distribution in the Netherlands according to the Central Bureau of Statistics (table 4). The age distribution was not equal because the survey was restricted to age 18 and over. The age group 20-40 was overrepresented and the age group of 65 and older was underrepresented, which could be explained by their limited use of the internet.

Living arrangements	Male	Female	Total score
Living alone	31.7%	23.0%	25.7%
Living with roommates	20.7%	19.3%	19.7%
Living with partner	20.7%	27.0%	25.1%
Living with partner and child(ren)	22.8%	22.7%	22.7%
Single parent with child(ren)	3.4%	4.7%	4.3%
Widow/widower	0.7%	3.4%	2.6%

Table 1 - Living arrangements among participants

Age	Male	Female
≤19	5.5%	5.3%
20-29	37.9%	42.7%
30-39	15.9%	16.5%
40-49	15.2%	15.3%
50-59	15.2%	12.1%
60-69	5.5%	5.6%
≥70	4.8%	2.5%

Table 2 - Age distribution among the sexes

Age	Pet owners	Non pet owners
≤19	5.2%	5.5%
20-29	41.7%	40.8%
30-39	13.7%	18.4%
40-49	12.3%	17.6%
50-59	11.4%	14.5%
60-69	10.0%	2.0%
≥70	2.6%	0.6%

Table 3 - Age distribution among pet owners and non pet owners

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Age	This study	Dutch register
<20	5.4%	23.5%
20-40	57.5%	25.0%
40-65	30.7%	35.9%
65-80	5.6%	11.6%
>80	0.9%	4.0%

Table 4 - Age distribution in this study compared to the Dutch register of 2011 (CBS, 2011)

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Questionnaire

Doctor visits

In order to get a broad view on their use of health care, participants were asked to report their visits to the various subdivisions of medical healthcare. Pet owners on average made more visit to the general practitioner, psychiatrist, company doctor, medical specialists and alternative medicine physician than non pet owners, but only the visits to psychiatrist were significantly more frequent ($p=0.049$). Meanwhile pet owners made less use of physiotherapists and home care, although this did not differ significantly.

In general pet owners seemed to make somewhat more use of health care than those without pets, but when comparing dog owners to non pet owners a lower use of health care was found. However no significance was found.

	Pet ownership overall	Dog (n=124)	Cat (n=171)	Non pet ownership (n=211)	Sign	Test
ALLERGIES	32.5% sign: 0.618	27.4% sign: 0.620	35.7% sign: 0.275	30.3%	no	χ^2
HEALTH CARE						T-test 2tailed + levene's
-physician	2.22 ↑ sign: 0.96	2.26 ↑ sign: 0.874	2.14 ↓ sign: 0.699	2.21	no	
-specialist	2.53 ↑ sign: 0.53	2.33 ↑ sign: 0.913	2.45 ↑ sign: 0.668	2.28	no	
- psychiatrist	10.05 ↑ sign: 0.049	8.67 ↑ sign: 0.163	10.80 ↑ sign: 0.067	4.55	yes	
-home care	15.83 ↓ sign: 0.556	13.25 ↓ sign: 0.404	14.33 ↓ sign: 0.514	20.33	no	
-company doctor	2.19 ↑ sign: 0.602	2.71 ↑ sign: 0.259	2.29 ↑ sign: 0.505	1.91	no	
-physiotherapist	9.40 ↓ sign: 0.640	7.39 ↓ sign: 0.312	9.62 ↓ sign: 0.722	10.72	no	
-alternative healer	3.55 ↑ sign: 0.448	3.08 ↑ sign: 0.952	4.43 ↑ sign: 0.113	3.05	no	
TOTAL	4.81 ↑ sign:0.93	4.26 ↓ sign: 0.633	5.13 ↑ sign: 0.681	4.73	no	

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Medication

When looking at the average use of medication pet owners seem to use fewer drugs than people without pets, although pet owners showed a higher use of prescription drugs and homeopathic remedies. Dog owners showed a decreased use of prescription drugs, over-the-counter drugs and a decrease in total use of medication, while cat owners on the other hand showed a higher use of prescription drugs and an increase in total drug use compared to non pet owners. On the whole, no significant difference was found between the groups concerning medication.

	Pet ownership overall	Dog (n=124)	Cat (n=171)	Non pet ownership (n=211)	Sign	Test
MEDICATION (number)						
-prescription	0.84 ↑ sign: 0.451	0.67 ↓ sign: 0.405	0.94 ↑ sign: 0.143	0.76	no	T-test 2tail + levene's
-over the counter	0.51 ↓ sign: 0.074	0.54 ↓ sign: 0.284	0.53 ↓ sign: 0.163	0.62	no	
-homeopathic	0.18 ↑ sign: 0.694	0.17 ↑ sign: 0.846	0.18 ↑ sign: 0.743	0.16	no	
TOTAL	1.53 ↓ sign: 0.938	1.38 ↓ sign:0.247	1.64 ↑ sign:0.482	1.54	no	

Self-reported health

When asking the respondents to rate their health on a scale of 0 to 100 (0= being in very poor health and 100= being in excellent health) dog owners scored the highest of all groups, although not significantly higher. Pet owners in general, cat owners and individuals without pets all scored roughly the same (77.80, 77.32 and 77.20 respectively).

	Pet ownership overall	Dog (n=124)	Cat (n=171)	Non pet ownership (n=211)	Sign	Test
SELF REPORTED HEALTH	77.80 ↑ sign: 0.70	79.44 ↑ sign:0.223	77.32 ↑ sign:0.946	77.2	no	T-test

Physical health

Using a short questionnaire to measure physical health, respondents without pets scored lower, but not significantly lower, compared to pet owners in general and dog owners. However the participants without pets rated their health higher than people with cats as pets, but again this was not significant.

	Pet ownership overall	Dog (n=124)	Cat (n=171)	Non pet ownership (n=211)	Sign	Test
PHYSICAL HEALTH	239.69 ↑ sign: 0.273	180.10 ↑ sign: 0.078	188.80 ↓ sign: 0.594	All : 226.02 Dog: 160.89 Cat : 194.83	no	Mann-Whitney U Test

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Mental Health

Pet owners scored significantly higher on the emotional part of mental health (P=0.016). However, on the social, psychological and mental part they scored lower, but not significantly. Dog owners scored a little higher on the emotional part than both cat owners and non pet owners, but scored lower on the social, psychical and mental parts.

	Pet ownership overall (n=255)	Dog (n=124)	Cat (n=171)	Non pet ownership (n=211)	Sign	Test
MHC-SF -emo	4.05 sign: 0.012	4.10 sign: 0.019	4.06 sign:0.016	3.78	yes	MHC-SF -emo
-soc	11.28 sign: 0.085	11.21 sign: 0.119	11.28 sign: 0.121	12.14	no	-soc
-psy	19.76 sign: 0.317	19.77 sign: 0.439	19.87 sign: 0.478	20.34	no	-psy
-ment	42.62 sign: 0.324	42.50 sign: 0.366	42.82 sign: 0.468	43.78	no	-ment

Leave of absence due to illness

Leave of absence was calculated as a percentage of the contract days to rule out over- or underestimation. Pet owners scored lower than non pet owners on the percentage of days they took off from work, but not significantly. Cat owners however, took more days off due to illness compared to dog owners and non pet owners, but also not significantly.

When looking at the days taken off from work from a quantitative point of view, pet owners scored lower than non pet owners, but again not significantly. Of all groups, dog owners took the least days off work.

	PET OWNERSHIP			NON PET OWNERSHIP (n=211)	sign	TEST
	Overall (n=255)	Dog (n=124)	Cat (n=171)			
LEAVE OF ABSENCE -% days	12.3317 ↓ sign: 0.858	10.9375 ↓ sign: 0.693	13.1563 ↑ sign: 0.987	13.0794	no	T-test
-# days	4.04 ↓ sign: 0.296	3.38 ↓ sign: 0.462	4.30 ↓ sign: 0.400	14.311	no	

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Experienced hindrance

Participants were asked to report the amount of days they went to work while suffering from health problems and to rate the amount of hindrance they experienced on these days. Pet owners experienced less hindrance on their job than non pet owners, but not significantly less. Overall, dog owners experienced less health difficulties than cat owners or non pet owners. The number of days the hindrance was experienced was lower in pet owners, but also not significantly. Again, dog owners experienced the fewest days with hindrance.

When multiplying ‘the percentage of work days with experienced health problems’ by ‘the amount of hindrance experienced’, pet owners scored lower than non pet owners, while dog owners scored the lowest of all. However, once again both these differences were not significant.

To estimate the amount of hindrance experienced in people without a paid job, questions regarding (simple) household tasks and other activities, such as groceries were part of the questionnaire. Pet owners experienced more hindrance during household task and daily outdoor activities than non pet owners, but not significantly. Work around the house offered less hindrance to pet owners in general than non pet owners but this didn’t differ significantly, however cat owners experienced more hinder

	PET OWNERSHIP			NON PET OWNERSHIP (n=211)	sign	TEST
	Overall (n=255)	Dog (n=124)	Cat (n=171)			
HINDERANCE -work						T-test
• %days	25.0521 ↓	19.6667 ↓	26.6171 ↓	27.8114	no	
• amount	sign: 0.775	sign: 0.562	sign: 0.914	15.0714	no	
• %days x amount	14.0645 ↓ sign: 0.426	14.4167 ↓ sign: 0.720	14.0833 ↓ sign: 0.474	553.3312	no	
	362.6935 ↓ sign: 0.461	290.1667 ↓ sign: 0.525	376.5675 ↓ sign: 0.553			
Household tasks (scores)	205.29 ↑ sign: 0.130	145.39 ↑ sign: 0.398	177.52 ↑ sign: 0.056	All : 192.77 Dog : 139.43 Cat : 162.79	no	Mann-Whitney U Test
Out of the house	211.55 ↑ sign: 0.312	152.77 ↑ sign: 0.320	177.84 ↑ sign: 0.316	All : 203.84 Dog: 146.15 Cat : 170.89	no	
Around the house	170.72 ↓ sign: 0.809	119.69 ↓ sign: 0.738	142.40 ↑ sign: 0.911	All : 172.52 Dog: 121.82 Cat: 141.64	no	

than non pet owners.

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BMI (Body Mass Index)

The BMI is a measure for the human body shape based on an individual's weight and length. In the questionnaire, each respondent was asked to specify their weight and their length. This was used to calculate the BMI for every individual participant.

A higher percentage of non pet owners was underweight compared to pet owners, but cat owners were more frequently underweight than dog owners or people without pets. Non pet owners had the highest percentage of people with a healthy BMI, while cat owners showed the lowest percentage. In the overweight category individuals without pets had the lowest percentage and cat owners the highest. The obese category follows the same trend, with non pet owners scoring the lowest and cat owners the highest. On the whole, the mean scores are roughly the same and do not differ significantly, neither do any of the other abovementioned differences in percentages

	PET OWNERSHIP			NON PET OWNERSHIP (n=211)	sign	TEST
	Overall (n=255)	Dog (n=124)	Cat (n=171)			
BMI						
- underweight	3.5% ↓	2.4% ↓	4.1% ↑	3.8%		χ ²
- healthy weight	53.3% ↓	56.5% ↓	52.0% ↓	60.2%		
- overweight	32.2% ↑	29.8% ↑	32.2% ↑	28.0%		
- obesitas	11.0% ↑	11.3% ↑	11.7% ↑	8.1%		
-mean	24.713 sign: 0.230	24.632 sign: 0.389	24.818 sign: 0.193	24.241	no	

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Correlation between self-assessed health and use of medication.

The correlation between self-assessed health and the use of medication was negatively correlated. A higher score on self-assessed health means a decrease in the use of medication. This correlation is significant for prescription drugs, over the counter drugs and total drug use, but not for homeopathic remedies.

Correlation	Prescription drugs	Over the counter drugs	Homeopathic drugs	Total
Self-assessed health	-0.193	-0.149	-0.090	-0.260
Significance	0.000	0.01	0.052	0.000

Table 3: correlation between self-assessed health and use of medication

Correlation between hindrance at work and hindrance during daily activities.

This test was done specifically to test if the questions about hindrance during daily activities were correlated to hindrance during work. Experienced hindrance at work is significantly correlated to experienced hindrance during daily activities. These findings suggest that the questions regarding hindrance at work are reliable when using the experienced hindrance during daily activities as a comparison to experienced hindrance at work.

		Correlations			
		HINDERPERC	Household hinder	Out of the house hinder	Around the house hinder
HINDERPERC	Pearson Correlation	1	,306*	,286*	,396**
	Sig. (2-tailed)		,022	,032	,003
	N	56	56	56	56
Household hinder	Pearson Correlation	,306*	1	,767**	,672**
	Sig. (2-tailed)	,022		,000	,000
	N	56	467	467	467
Out of the house hinder	Pearson Correlation	,286*	,767**	1	,656**
	Sig. (2-tailed)	,032	,000		,000
	N	56	467	467	467
Around the house hinder	Pearson Correlation	,396**	,672**	,656**	1
	Sig. (2-tailed)	,003	,000	,000	
	N	56	467	467	467

Table 4: correlation hindrance

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

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

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Coherence

Coherence of the 'assessment of the bond' questions

Cronbach's Alpha is a coefficient of reliability which is commonly used as a measure of the internal consistency or reliability of test scores. An Alpha of 0 means absolutely no coherence and an Alpha of 1 means perfect overlap of the questions (Peterson, 1994)

The 'assessment of the bond' questions were purposefully designed for this study and Cronbach's Alpha was calculated to validate the reliability and coherence of the questions. The calculated value was 0.733, which is a fairly high score and therefore indicates a considerable coherence. The second table shows the recalculated Cronbach's Alpha, should one of the questions be deleted. An increase in Cronbach's Alpha means that the deleted question did not match the other question and that the coherence is less with the other questions. Deletion of question number 3 would have resulted in a somewhat higher Cronbach's Alpha, but the increase was considered too small to reject the question.

Cronbach's Alpha	Number of items
,733	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I like petting/cuddling with my pet	20,45	7,801	,469	,705
My pet gives me support if I am upset.	21,04	5,924	,673	,628
Making contact with other people is made easier by my pet.	22,06	6,793	,288	,775
I consider my pet as part of the family	20,85	6,276	,605	,653
I do not love my pet	20,25	8,135	,440	,716
I rather spent my time doing other things than spending it with my pet	20,91	6,581	,511	,683

Table 2: coherence

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Effects of (degree of) human-pet bonding

As has been mentioned before, the questions regarding the bond between owner and pet had a high Cronbach's Alpha. Therefore all aforementioned factors were tested in correlation to the degree of bonding between pet and owners.

Doctor visits

People who felt more closely attached to their pet showed less frequent use of psychiatrists, home care, company doctors and physiotherapists. This also applied when looking solely at cat owners, except for the decreased use of company doctors. In addition cat owners seemed to make fewer visits to medical specialists. For dog owners an increase in pet-owner bonding resulted in a decrease in home care use, company doctor visits and use of alternative medicine physicians. When looking at the total use of health care a positive correlation was found for all three groups. However, none of these correlations were significant.

	Owners bond with pet (based on the 'assessment of the bond questions')			sign
	Pets overall	Dog	Cat	
HEALTH CARE				
-physician	0.123 sign: 0.163	0.009 sign: 0.945	0.106 sign: 0.308	no
-specialist	0.080 sign: 0.552	0.174 sign: 0.358	-0.102 sign: 0.532	no
- psychiatrist	-0.079 sign: 0.749	0.344 sign: 0.365	-0.303 sign: 0.241	no
-home care	-0.348 sign: 0.499	-0.800 sign: 0.200	-0.866 sign: 0.333	no
-company doctor	-0.792 sign: 0.790	-0.183 sign: 0.696	0.040 sign: 0.891	no
-physiotherapist	-0.100 sign: 0.527	0.257 sign: 0.303	-0.305 sign: 0.108	no
-alternative healer	0.063 sign: 0.780	-0.027 sign: 0.935	0.125 sign: 0.669	no
TOTAL	0.089 sign: 0.158	0.032 sign: 0.720	0.105 sign: 0.170	no

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Medication

An increase in bonding revealed a significant, positive correlation with total drug use in both cat owners and pet owners in general. The use of prescription drugs was positively correlated for all of the three groups, but was only significant for the group of pet owners taken as a whole. In dog owners closer attachment to their pets resulted in a decrease in use of over-the-counter medication, homeopathic remedies and total drug use, although these findings weren't significantly correlated.

	Owners bond with pet (based on the 'assessment of the bond questions')			sign
	Pets overall	Dog	Cat	
MEDICATION (number)				
-prescription	0.135 sign: 0.031	0.074 sign: 0.409	0.143 sign: 0.062	yes ↑
-over the counter	0.051 sign: 0.413	-0.015 sign: 0.870	0.075 sign: 0.329	no
-homeopathic	-0.495 sign: 0.433	-0.204 sign: 0.203	0.018 sign: 0.815	no
TOTAL	0.130 sign: 0.038	-0.107 sign: 0.085	0.175 sign: 0.022	yes ↑

Self-reported health

Cat owners and pet owners in general displayed a slightly lower self-rated health when they were more closely attached to their pet, while dog owners on the other hand showed a slight increase. Nevertheless none of these correlations was significant.

	Owners bond with pet (based on the 'assessment of the bond questions')			sign
	Pets overall	Dog	Cat	
SELF REPORTED HEALTH	-0.065 sign: 0.299	0.005 sign: 0.956	-0.144 sign: 0.137	no

Physical health

Although no significant correlation was found, all three groups showed a decrease in physical health when pet-owner bond increased.

	Owners bond with pet (based on the 'assessment of the bond questions')			sign
	Pets overall	Dog	Cat	
PHYSICAL HEALTH	-0.103 sign: 0.102	-0.044 sign: 0.626	-0.142 sign: 0.105	no

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Mental health

A higher bond with one's pet resulted in a slight decrease of emotional and social well-being for both dog and cat owners. Furthermore an increase in the owner-pet bond resulted in a decrease of psychological well-being in pet owners, but at the same time in a slight increase in psychological health in dog owners. Overall, mental health appears to be negatively correlated to an increase in the pet-owner bond, while it seems to be positively related to a higher bond in dog owners. However, none of the results were significant.

	Owners bond with pet (based on the 'assessment of the bond questions')			sign
	Pets overall	Dog	Cat	
MHC-SF				
-emo	-0.109 sign: 0.083	-0.095 sign: 0.292	-0.093 sign: 0.226	no
-soc	-0.046 sign: 0.464	-0.043 sign: 0.630	-0.052 sign: 0.494	no
-psy	-0.011 sign: 0.857	0.055 sign: 0.546	-0.015 sign: 0.841	no
-ment	-0.041 0.510	0.001 sign: 0.995	-0.052 sign: 0.500	no

Leave of absence due to sickness

A higher bond with one's pet was negatively correlated to the percentage of days of sick leave. This was not the case for dog owners, who had a positive correlation between bond and sick days. None of these results were significant.

	Owners bond with pet (based on the 'assessment of the bond questions')			sign
	Pets overall	Dog	Cat	
LEAVE OF ABSENCE				
-% DAYS	-0.042 sign: 0.840	0.215 sign: 0.610	-0.109 sign: 0.646	no

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Experienced hindrance

The percentage of days, the amount of hindrance, and the percentage of days multiplied by the amount of hindrance were all positively correlated for pet ownership in general and cat ownership, but negatively correlated for dog ownership, but none significantly.

Hindrance during household tasks was positively correlated with an increase in the bond. This correlation was significant in overall pet ownership and cat ownership, but not in dog ownership. The same goes for activities out of the house. An increase in the attachment bond in overall pet ownership and cat ownership was significantly related with increased experienced hindrance during activities out of the house. The increase in the owner-dog bond was also positively related to the amount of hindrance experienced, but not significantly so. Hindrance during tasks around the house was positively correlated to the bond in all three categories, but only significantly so in overall pet ownership and cat ownership.

	Owners bond with pet (based on the 'assessment of the bond questions')			sign
	Pets overall	Dog	Cat	
HINDER				
-work				
• %days	0.119 sign: 0.548	-0.388 sign: 0.268	0.238 sign: 0.299	no
• amount	0.027 sign: 0.886	-0.023 sign: 0.943	0.032 sign: 0.882	no
• %days x amount	0.117 sign: 0.554	-0.350 sign: 0.321	0.246 sign: 0.282	no
Household tasks (scores)	0.191 sign: 0.005	0.120 sign: 0.236	0.234 sign: 0.003	yes ↑
Out of the house	0.167 sign: 0.012	0.147 sign: 0.133	0.179 sign: 0.025	yes ↑
Around the house	0.165 sign: 0.021	0.106 sign: 0.309	0.188 sign: 0.029	yes ↑

Discussion and conclusion

Material and method.

The study did meet the required number of participants, at least 200 participants for each group (pet owners: n=255; non-pet owners: n=211).

The age distribution among males and females was very similar, as was the age distribution among pet owners and non-pet owners. The living arrangements among males and females did not differ significantly either.

However, the age distribution from this study does not resemble the age distribution in the Netherlands as reported by the Central Bureau of Statistics. The decision was made to examine the effect of pet ownership on adults exclusively and therefore an age limit of 18 years and older was set when asking for respondents. The age group of people younger than 20 years accounts for a high percentage of the Dutch population (23.5%). This gap was filled by using a larger group in the 20-40 years category (this study: 57.5% versus 25% of the Dutch population).

At the same time it was rather challenging to contact and acquire a sufficient number of older people, because not many elderly are active on modern social media, such as online forums. The forums, in which old people did gather, had almost without exceptions strict regulations regarding the use of hyperlinks or other 'free advertising' on their sites. This was also true for a lot of highly attended forums. The sample for this study was quite small (n=466) and the group consisted mainly of self-chosen participants. A point of critique could be that the investigated respondents are mostly gathered through convenience sampling. A major portion of the participants was acquired by sending out e-mail and contacting people through social networks, which means that people who don't make use of modern social networks are less likely to be part of the study. Furthermore, by using the internet as one of the main tools to contact potential respondents, it is likely this study targeted and collected a specific crowd of people. It could be possible that those who filled out the questionnaire are people who spend a lot of time at home on the internet, for instance because they are socially isolated and/or are in poorer health.

Beside the internet, various other methods were used to gather respondents. For example, in hospitals, universities, student's flats and supermarkets, posters were hung up from which people could tear off a piece of paper containing the hyperlink of the survey. In theory supermarkets could have been a good source for gathering participants, however they often limited advertising to a small standardized card, thus disabling those easy to take home pieces of paper. Because of this, shoppers would have to copy the hyperlink manually, raising the threshold to participate in the study.

The section about mental health made use of an accredited short form (MSC-SF, Lamers et al 2011) which is proven to be an effective way of measuring mental health.

Questions about physical health were divided in self-assessed health, use of health care, use of medication, sick leave from work and hindrance during work and daily activities.

Participants were asked to rate their own health, which gives a good indication about how they perceive their own health and wellbeing, independent of their use of medication or health care. Pet owners in general rated themselves higher than those without pets, while in contrast pet owners seemed to use more prescription drugs and make more visits to the general practitioner and medical specialists than non-pet owners. Although these differences were not significant, this could imply that despite worse health scores, they still felt fitter than non-pet owners.

By asking participants to report their use of medication and health care in a quantitative manner, it was simple to compare the responses on amount and gravity.

The 'assessment of the bond' questions had a fairly high Cronbach's Alpha which indicates a considerable coherence and reliability. Only one question led to an increase of Cronbach's Alpha if deleted, but this increase was not considered to be high enough to reject the question. Because of this high coherence, the correlation between bond and various aspects was calculated to evaluate the effect of the bond on these variables. This gave an extra dimension to the study.

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In retrospect, the questionnaire could have been more extensive. Socio-economic questions, such as income and education, were not included in the survey. These questions would have provided additional data regarding the participants, but the answers to these questions might have been considered too private to share by some participants. Measuring socioeconomic status to pet attachment could have led to a different outcome on the attachment scale, because pet attachment is particularly important among divorced owners, owners who never married, widowed owners, childless couples, newlyweds and empty nesters (Albert and Bulcroft, 1988). Socioeconomic status also predicts the perceived hassles and uplifts from owning a pet (Miller et al, 1992) and information about income could have predicted good health (Gunasekare et al, 2012).

Already several participants expressed their reluctance to fill in their weight and length and some even discontinued the questionnaire because they refused to fill in this information. So hypothetically, the addition of these questions could have caused more participants to quit the questionnaire prematurely, even though it was repeatedly noted that the questionnaire was strictly anonymous. Other participants expressed their need for an opportunity to report their chronic illness. Adding the option of reporting chronic illness could have been an interesting option, which could have been examined separately and might explained some of the findings or could have led to similar results as in previous studies: better mental health (Shinati et al 2010) or the perception of being in better mental health (Wells, 2009).

The measurement of physical health could have been expanded with several questions. Currently the survey only contains questions about the use of health care and medication, hindrance, sickness/sick leave and self-rated health, but not about other aspects which may contribute to health status. Respondents could have been asked about the occurrence of bad sleep and questions regarding physical fitness that could have been added to the survey. Inquiring about sports and other forms of workout regimes could have given extra information about the amount of physical exercise people performed.

As is the case in most previous studies, the cross-sectional design of this study only allows detection of differences between people with and without pets, whereas a longitudinal study would have been able to investigate possible causal links between health and pet ownership. Because of the timeframe that was set for this study, it was impossible to organize follow-ups with sufficient time in-between the measuring points.

Questions about how long the pet has been in the owner's possession and whether it is the participants first pet might have been able to clarify some findings.

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Outcome on mental health and wellbeing

Pet owners scored significantly higher on visits to the psychiatrist ($P=0.49$), but interestingly, scored higher on emotional wellbeing. Measuring mental health by visits to the psychiatrist/psychologist would imply that pet owners experience worse mental health, but the scores on the MHC-SF indicate that from their point of view of life they feel emotionally healthier. This is an interesting finding that would require more research.

A higher attachment to one's pet resulted in a slight decrease of emotional and social well-being for both dog and cat owners. Furthermore an increase in the owner-pet bond resulted in a decrease of psychological well-being in pet owners, but at the same time in a slight increase in psychological health in dog owners. Mental health was only positively related to an increase in attachment in dogs, but not significantly so. A higher attachment means less frequent use of mental healthcare in pet owners, but the correlation was not significant.

One observation that particularly stood out was the fact that cat owners almost consistently scored poorer/lower than dog owners and non-pet owners. The question is: do cats make their owners less healthy? Or are people who are less healthy more inclined to choose a cat as companion? Cats, as compared to dogs, are not very high maintenance animals and make good pets for disabled or bedridden people.

Our findings that cat owners make more use of mental healthcare are consistent with the findings of Rijken et al (2011). The only difference is that in that they found no difference in mental health status whilst these results showed that pet owners have a significant higher emotional mental health. The use of mental health care may be explained by the fact that in one study elderly pet owners reported more depressive symptoms and higher levels of psychoticism (Parslow et al, 2005) and in a different study pet owners experienced more anxiety/low-spiritness, insomnia and depression (Mullerdorf et al, 2010).

The notion that pets are perceived as being supportive was confirmed by this research, even though the previous studies focused solely on children or perceptions during childhood (Barker et al, 1997; McNicholson et al 2001).

Not only did the pet-owners in a different study feel less lonely, they provided higher ratings for living a satisfying life, higher self-esteem, perceived their lives as meaningful, felt more socially accepted and experienced more positive emotions with a dog by their side (Aydin et al). These findings have some overlap with our results, mainly the emotional mental health results.

Our participants said that making contact with other people is made easier by their pets, their pets gave them support if they're upset and that they consider their pet part of the family, which is supported by the findings of Heady (1999).

The notion that making contact with other people is made easier by their pet was also concluded in the study of McNicholas et al (2000), Woods et al (2005) and Miller et al (1992).

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