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An Examination of the Potential Role of Pet Ownership, Human Social Support and Pet Attachment in the Psychological Health of Individuals Living Alone

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ABSTRACT While researchers have examined the relationship between pet ownership and psychological health among individuals in the general population, the few studies that have examined the possible psychological health benefits of pet ownership for individuals living alone have primarily been conducted among sub-groups such as seniors. Using a community sample of adults who were living alone, we hypothesized that pet ownership (pet vs. no pet), emotional attachment levels to pets, and human social support would interact to predict scores on measures of loneliness and depression. A sample of 132 Canadian dog and cat owners as well as non-owners who lived alone completed an on-line survey containing measures of human social support, emotional attachment to pets, loneliness, and depression. Results revealed that neither pet ownership nor attachment to pets predicted the loneliness or depression levels of individuals living alone. However, when we examined the interaction of pet ownership and human social support in the prediction of psychological health, simple effects revealed that dog owners with high levels of human social support were significantly less lonely than non-owners. Furthermore, when we examined the interaction of attachment and human social support in the prediction of psychological health, simple effects revealed that among pet owners with low levels of human social support, high attachment to pets predicted significantly higher scores on loneliness and depression. These findings highlight the complex nature of the relationship between pet ownership and psychological health.

Keywords: attachment, cats, depression, dogs, health, human social support, loneliness



An area that is receiving considerable attention is the relationship between pet ownership and psychological health (Roberts et al. 1996; Headey 1999; Gilbey, McNicholas and Collis 2007; Wood et al. 2007). The potential psychological health benefits that pets may confer to individuals living in one-person households is of particular interest, given that worldwide there is a growing trend toward one-person households (Euromonitor International 2008). In Canada, for example, the percentage of one-person households has increased over time from 6% in 1941 to 27% in 2006 (Milan, Vézina and Wells 2007). One-person households accounted for 26% of American households in 2005, 28% of households in Western Europe in 2006, 22% of households in Eastern Europe in 2006, and 26% of households in Australasia in 2006 (US Census Bureau 2006; Euromonitor International 2008). It is expected that the number of one-person households will continue to increase in years to come at a faster rate than other types of households (Euromonitor International 2008).

The limited number of studies that have examined the impact of pet ownership on the psychological health of individuals living alone were cross-sectional in nature and only assessed psychological health through measures of mood and loneliness. For example, a study conducted in the general population in Switzerland found that people who lived alone with a cat were less likely to report being in a bad mood than people who lived alone without a cat (Turner, Rieger and Gytax 2003). Two other studies conducted in the United States using female subgroups of university students and seniors found that female pet owners who lived alone with a pet were less lonely than females who lived alone without a pet (Goldmeier 1986; Zasloff and Kidd 1994). However, a study conducted in Australia found no evidence that seniors who lived alone with a pet were less lonely than seniors who lived alone without a pet (Wells and Rodi 2000). In a final study, conducted with American university faculty who were classified as either Alone (unmarried and not living with children) or Not Alone (married and/or living with children), Staats, Sears and Pierfelice (2006) found that faculty who were unmarried and did not have children living with them were more likely than faculty who lived with either a spouse, children, or both to report that they owned a pet because it helped them in difficult times and that they would be lonely without it. Taken together, these studies suggest that, with the possible exception of seniors, pet ownership may be beneficial for the psychological health of individuals living alone.

Pets may assume an important psychological role in the lives of individuals who live alone, particularly in terms of the level of emotional attachment between the pet owner and their pet. A number of studies have found that pet owners who lived alone were more attached to their pet than individuals who lived with others (Holcomb, Williams and Richards 1985; Gilmer and Nicholson 1996; Poresky and Daniels 1998; Stammbach and Turner 1999). It is noteworthy that one study found that the relationship between attachment and living situation only held for dogs, not cats (Zasloff and Kidd 1994). When researchers examined the relationship between attachment and psychological health for pet owners as a whole, they found mixed results. Some researchers found that the more attached pet owners were to their pet, the better their psychological health (Ory and Goldberg 1983; Garrity et al. 1989; Budge et al. 1998), while other researchers did not find evidence that such a relationship exists (Miller and Lago 1989; Stallones et al. 1990; Zasloff and Kidd 1994; Raina et al. 1999). Possible explanations for the failure to find a relationship between attachment and psychological health may be due to the possible interactive effects of other factors such as sex, age, marital status, financial status, or personality with attachment levels. Another possible explanation is that psychological health varies depending on both attachment to pets and whether an individual lives alone or with other people. The one study that examined this possibility found that attachment to pets and

living situation had interactive effects on psychological health, as assessed through a measure of positive mood (Turner, Rieger and Gytax 2003).

One way to understand the variation in attachment to pets may be to take into account co-variation in human social support. Three correlational studies, conducted in the general population, found that pet owners who lacked human social support were more attached to their pet (Johnson, Garrity and Stallones 1992; Stammbach and Turner 1999; Adamelli et al. 2005), while two other correlational studies did not reach the same conclusion (Cohen 2002; Marinelli et al. 2007). While these studies were not restricted to pet owners living alone, it is speculated that individuals living alone with low levels of human social support may be highly attached to their pet. If pet owners who live alone and lack human social support receive social support through their strong attachment to their pet, this may be beneficial for their psychological health. Two studies that examined whether psychological health varies according to levels of pet attachment and human social support provided mixed results. In the first study, Garrity et al. (1989) found that bereaved elderly pet owners who had two or less confidants and were strongly attached to their pet were less depressed compared with bereaved elderly pet owners who had two or fewer confidants and were weakly attached to their pet. However, among non-bereaved elderly, Garrity et al. (1989) found no evidence that pet attachment levels and human social support levels interacted to predict depression levels. In the second study, Budge et al. (1998) found no evidence that, among pet owners 21 to 79 years of age, psychological health depended on levels of pet attachment and human social support, which led them to suggest that this relationship may only hold for pet owners who are socially isolated. Unfortunately, neither of these studies examined whether pet attachment and social support had interactive effects on the psychological health of pet owners who lived alone.

Rationale for Present Study and Hypotheses

This study builds on previous work that examined the possible psychological health benefits of pet ownership for individuals living alone by considering the role of human social support and pet attachment. In the case of human social support, previous research comparing pet and non-pet owners suggests that, for individuals in the general population who live alone and female students who live alone, pets provide psychological health benefits, such as reducing negative moods and loneliness levels (Zasloff and Kidd 1994; Turner, Rieger and Gytax 2003). However, the studies that examined the psychological health of individuals living alone with or without a pet (Goldmeier 1986; Zasloff and Kidd 1994; Wells and Rodi 2000; Turner, Rieger and Gytax 2003) did not explicitly examine the role of human social support. This is surprising given that, for individuals living alone, pet ownership (pet vs. no pet) and levels of human social support may both affect psychological health. In fact, we argue that, for individuals living alone, levels of human social support and pet ownership may interact to predict psychological health in terms of loneliness and depression levels.

In the case of pet attachment, there was no agreement in the existing literature as to whether high levels of attachment to pets were related to psychological health (Zasloff and Kidd 1994; Budge et al. 1998). However, this relation has not been examined among individuals in the general population who live alone. It may be that, for individuals living alone, the companionship provided by their pet is advantageous for their psychological health by, for example, reducing their loneliness levels. Another limitation of previous studies is that researchers have not examined whether, among pet owners living alone, attachment levels to pets and levels of human social support have interactive effects on psychological health. Therefore, in this study we examined the possibility that attachment levels to pets and human social support levels interact to predict psychological health in terms of loneliness and depression levels.

The purpose of this study was to test the following hypotheses:

- 1) Individuals who live alone with a pet will have better psychological health (less lonely and depressed) compared with individuals who live alone without a pet.
- 2) Pet ownership (pet vs. no pet) and levels of human social support will have interactive effects on the psychological health (loneliness and depression) of individuals living alone.
- 3) Among pet owners living alone, there will be a positive relation between attachment to pets and psychological health (loneliness and depression).
- 4) Among pet owners living alone, attachment to pets and levels of human social support will have interactive effects on psychological health (loneliness and depression).

The four hypotheses were tested separately for dog and cat owners in order to determine whether, as expected, they were supported for both types of pet owners.

Methods

Participants

One hundred and thirty-two Canadian pet (dog and cat owners) and non-pet owners (defined as individuals who did not own a dog or cat) who were at least 18 years of age and living alone completed a 15 minute on-line survey of “factors affecting the well-being of individuals living alone.” The sample consisted of 66 pet owners (40 dog owners and 26 cat owners) and 66 people who did not own a dog or a cat.

Materials

The survey package contained measures of participants’ demographic characteristics (age, sex, education, income, whether they were a student and whether they were in a permanent relationship), social support, pet attachment, depression, loneliness, and open- and closed-ended questions about pet ownership.

Predictor Variables

Multidimensional Scale of Perceived Social Support (MSPSS): The 12-item social support scale developed by Zimet et al. (1988) was used to examine participants’ overall levels of perceived social support. The scale ranges from 1 (very strongly disagree) to 7 (very strongly agree) and includes items such as “I can talk about my problems with my friends.” Data were transformed using a square root transformation, to deal with moderate negative skew, and subsequently centered. According to Zimet et al. (1988), the scale is internally consistent, as assessed by Cronbach’s alpha ($\alpha = 0.88$), and has adequate test-retest reliability after 2 to 3 months ($r = 0.85$). Item analyses done in the present study revealed that Cronbach’s alpha was 0.89. According to Zimet et al. (1988), the scale has moderate construct validity, as reflected by negative correlations between the MSPSS and the depression and anxiety subscales of the Hopkins Symptom Checklist. In the present study, total scores were divided by 12 to obtain mean item scores on the MSPSS.

Lexington Attachment to Pets Scale (LAPS): The 23-item LAPS developed by Johnson, Garrity and Stallones (1992) was used to assess participants’ level of emotional attachment to their pet. The scale ranges from 0 (strongly disagree) to 3 (strongly agree) and includes items such as “Quite often, my feelings toward people are affected by the way they react to my pet.” It should be noted that attachment scores were centered. According to Johnson, Garrity and Stallones, the LAPS has high internal consistency ($\alpha = 0.93$). In the present study, item analyses conducted to examine the homogeneity of the items revealed that Cronbach’s alpha was 0.89. Evidence for the construct

validity of the LAPS is provided by its correlations with respondent characteristics, such as gender, marital status, and whether or not children are present in the home; characteristics other researchers have found are associated with pet attachment (Kidd and Kidd 1989). In the present study, total scores were divided by 23 to obtain mean item scores on the LAPS.

Criterion Variables

Center for Epidemiologic Studies-Depression Scale (CES-D): The 20-item CES-D Scale by Radloff (1977) was used to examine how frequently participants experienced symptoms of depression during the past week. The scale ranges from 0 (rarely or none of the time [less than 1 day a week]) to 3 (most or all of the time [5–7 days a week]) and includes items such as “I had trouble keeping my mind on what I was doing.” In order to deal with severe positive skew, the data were inversely transformed. The scale is internally consistent ($\alpha = 0.85$) and has modest test-retest correlations after 2 to 12 weeks; all but one test-retest correlation ranged between 0.45 to 0.70 (Radloff 1977). Item analyses in the present study revealed that Cronbach’s alpha was 0.88. The CES-D Scale demonstrates concurrent validity, as reflected by its high correlation with the Beck Depression Inventory ($r = 0.86$) (Santor et al. 1995). In the present study, total scores were divided by 20 to obtain mean item scores on the CES-D.

UCLA Loneliness Scale (Version 3): The 20-item UCLA Loneliness Scale (Version 3) by Russell (1996) was used to assess participants’ feelings of loneliness. The scale ranges from 1 (never) to 4 (always) and includes items such as “How often do you feel that you lack companionship?” Using data from studies involving college students, nurses, teachers, and the elderly, Russell demonstrated that the UCLA Loneliness Scale (Version 3) has high internal consistency, with coefficient alphas ranging from 0.89 to 0.94, and also demonstrated adequate test-retest reliability when it was re-administered after a one-year period to a sample consisting of elderly people ($r = 0.73$). In the current study, Cronbach’s alpha was 0.92. With respect to the construct validity of the scale, Russell (1996) found that, as expected, the scale positively correlates with other loneliness scales, such as the NYU Loneliness Scale and the Differential Loneliness Scale, while it negatively correlates with measures of social support, such as the Social Provisions Scale. In addition, there were significant relations between the scale and measures of personality, mood, health, and well-being. In the present study, total scores were divided by 20 to obtain mean item scores on the UCLA.

Additional Questions

An open-ended question was included in which participants were asked “What benefits have you received from the dog(s) or cat(s) that you presently own? Begin with the most important benefit.” In addition, a question was included in which pet owners were asked to rate the impact that their pet had had on their life on a 7-point scale ranging from 1 (strong negative impact) to 7 (strong positive impact).

Procedure

Participants completed the on-line survey using “Survey Monkey,” a tool designed to create and customize on-line surveys, which ensures that participants’ responses are anonymous and confidential (<http://www.surveymonkey.com/>). Participants were recruited from May to July, 2008 through snowball sampling by sending an e-mail with the survey link to family and friends, posters placed in various locations in the community (e.g., libraries, community centers and laundromats), information distributed in-person at local dog parks and pet stores, and links posted on various pet and non-pet related Internet websites. Prior to data collection, permission to conduct this survey was granted by the Carleton University Ethics Committee for Psychological Research.

Results

Demographic Characteristics of Pet Owners and Non-Owners

To examine whether pet owners and non-owners had similar demographic characteristics, chi-square and *t*-tests were conducted (Table 1). Participants in the two groups were compared with respect to their age, sex, education, income, whether they were a student and whether they were in a permanent relationship. With respect to education, participants were divided according to whether they had at least one university degree, given that researchers have found that as education levels increase, loneliness and depression levels decrease (Hanley-Dunn, Maxwell and Stanos 1985; Ross and Van Willigen 1997). Given that the average household income in 2005 for Canadians living in one-person households was \$35,372 (Statistics Canada 2006), participants were classified as having an income of less than \$40,000 or \$40,000 or more.¹ In order to ensure that the sample did not include a disproportionate number of students, participants were asked to indicate whether they were a full-time university or college student. Finally, participants were asked whether they were in a permanent relationship, given that individuals in a permanent relationship have an additional source of social support, which may be beneficial for their psychological health. Comparisons revealed that the two groups did not differ significantly on any of the demographic variables.

Hierarchical regression procedures were used to test all hypotheses, with any demographic variables that were significantly correlated with the criterion variables (loneliness and depression) entered in the first step of the regression models, in order to reduce error variance in the criterion

Table 1. Demographic characteristics of pet owners and non-owners ($n = 132$).

Demographic Variable	Pet Owners ($n = 66$)	Non-Owners ($n = 66$)
Age		
Mean (<i>SD</i>)	37.56 (14.45)	41.30 (14.36)
Range	22–68	22–78
Sex (%) ^a		
Male	32.3	21.2
Female	67.7	78.8
Education (%)		
< A University Degree	22.7	18.2
≥ One University Degree	77.3	81.8
Income (%) ^b		
< \$40,000	36.4	21.9
≥ \$40,000	63.6	78.1
Student (%)		
Yes	13.6	14.1
No	86.4	85.9
Permanent Relationship (%) ^c		
Yes	21.5	13.8
No	78.5	86.2

^aOne pet owner did not indicate their sex.

^bTwo non-owners did not indicate their income.

^cOne pet owner and one non-owner did not indicate whether they were in a permanent relationship.

variables. We hypothesized that: 1) individuals who lived alone with a pet would have better psychological health (less lonely and depressed) than individuals who lived alone without a pet, and 2) pet ownership (dog or cat vs. no pet) and levels of human social support would have interactive effects on the psychological health (loneliness and depression) of individuals who live alone.

To begin, these hypotheses were examined with respect to loneliness levels. It should be noted that two dog owners who did not answer a sufficient number of items in the loneliness scale were excluded from these analyses. As may be seen from Table 2, age was a significant predictor of the loneliness levels of individuals living alone ($\beta = 0.14, p < 0.05$). Older participants who lived alone reported higher loneliness scores. The first hypothesis, that individuals living alone who owned a pet would be less lonely than people without a pet, was not supported ($\beta = -0.03, p > 0.05$). However, as expected, based on previous research conducted in the general population (Russell 1996; Mahon, Yarcheski and Yarcheski 1998), individuals with high levels of human social support were significantly less lonely than individuals with low levels of human social support ($\beta = -0.49, p < 0.001$). Furthermore, the second hypothesis, that among individuals living alone there would be an interaction between pet ownership and human social support, was also supported ($\beta = -0.21, p < 0.05$).

Table 2. Summary of hierarchical regression analysis for variables predicting the loneliness levels of individuals who live alone with or without a pet ($n = 130$).

Variable	F_{change}	df	R^2_{change}	β
Step 1				
Age	5.02*	128	0.04	0.19*
Step 2				
Age	48.86**	126	0.42	0.13
Pet Ownership (Pet Owner = 1)				-0.04
Social Support				-0.65**
Step 3				
Age	4.18*	125	0.02	0.14*
Pet Ownership (Pet Owner = 1)				-0.03
Social Support				-0.49**
Pet Ownership \times Social Support				-0.21*

* $p < 0.05$; ** $p < 0.001$

In order to interpret the direction of the interactive effects between pet ownership and human social support, a median split analysis was conducted to divide participants into two groups, according to whether they had low or high levels of human social support. Simple effects revealed that, among individuals living alone with low levels of human social support, pet owners and non-owners did not differ significantly in their loneliness levels (2.37 vs. 2.31, $p > 0.05$). Similarly, among individuals living alone with high levels of human social support, pet owners and non-owners did not differ significantly in their loneliness levels (1.79 vs. 1.90, $p > 0.05$).

In order to test whether the first two hypotheses held for dog and cat owners, hierarchical regression analyses were conducted comparing, first, dog owners vs. non-owners and, second, cat owners vs. non-owners. In the hierarchical regression analysis including dog owners and non-owners, the first hypothesis, that dog owners who live alone would be less lonely than non-owners who live alone, was not supported ($\beta = -0.08, p > 0.05$). However, human

social support was a significant predictor of the loneliness levels of individuals living alone ($\beta = -0.51, p < 0.001$). Furthermore, the second hypothesis, that among individuals living alone there would be an interaction between dog ownership and human social support, was supported ($\beta = -0.25, p < 0.05$). Simple effects revealed that among individuals living alone with low levels of human social support, the loneliness levels of dog owners and non-owners did not differ significantly (2.54 vs. 2.33, $p > 0.05$). However, among individuals living alone with high levels of human social support, dog owners were significantly less lonely than non-owners (1.62 vs. 1.91, $p < 0.01$). These findings are displayed in Figure 1.

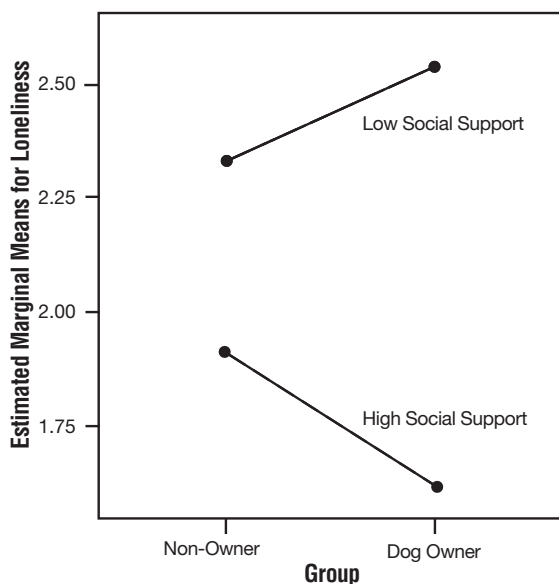


Figure 1. Mean loneliness scores for dog ownership by level of social support.

When only cat owners and non-owners were included in a hierarchical regression analysis, age was a significant predictor of the loneliness levels of individuals living alone ($\beta = 0.19, p < 0.05$). The first hypothesis, that cat owners who live alone would be less lonely than non-owners, was not supported ($\beta = 0.00, p > 0.05$). As expected, human social support was a significant predictor of the loneliness levels of individuals living alone ($\beta = -0.47, p < 0.001$). However, the second hypothesis, that loneliness would be predicted by an interaction between cat ownership and human social support, was not supported ($\beta = -0.01, p > 0.05$).

The first two hypotheses were also examined with depression used as the criterion variable to assess psychological health. As may be seen from Table 3, the first hypothesis, that among individuals living alone people who owned a pet would be less depressed than individuals without a pet, was not supported ($\beta = -0.00, p > 0.05$). Human social support also was not a significant predictor of the depression levels of individuals living alone ($\beta = -0.09, p > 0.05$), which is surprising given that previous research in the general population has found that higher levels of human social support are associated with lower levels of depression (Ross and Van Willigen 1997; Budge et al. 1998). However, the second hypothesis, that among individuals living alone there would be an interaction between pet ownership and human social support, was supported ($\beta = -0.32, p < 0.05$).

Table 3. Summary of hierarchical regression analysis for variables predicting the depression levels of individuals who live alone with or without a pet ($n = 132$).

Variable	F_{change}	df	R^2_{change}	β
Step 1				
Pet Ownership (Pet Owner = 1)	8.18**	129	0.11	0.00
Social Support				-0.34**
Step 2				
Pet Ownership (Pet Owner = 1)	6.09*	128	0.04	-0.00
Social Support				-0.09
Pet Ownership \times Social Support				-0.32*

* $p < 0.05$; ** $p < 0.001$

Simple effects revealed that among individuals living alone with low levels of human social support, the depression levels of pet owners and non-owners did not differ significantly (0.36 vs. 0.32, $p > 0.05$). Similarly, among individuals living alone with high levels of human social support, the depression levels of pet owners and non-owners did not differ significantly (0.23 vs. 0.28, $p > 0.05$).

Two hierarchical regression analyses were run separately, in order to examine whether these hypotheses held when, first, dog owners vs. non-owners were compared, and, second, when cat owners vs. non-owners were compared. In the hierarchical regression analysis related to dog ownership, the first hypothesis, that dog owners who live alone would be less depressed than non-owners who live alone, was not supported ($\beta = -0.04$, $p > 0.05$). Human social support also was not a significant predictor of the depression levels of people living alone ($\beta = -0.10$, $p > 0.05$). However, the second hypothesis, that among individuals living alone there would be an interaction between dog ownership and human social support, was supported ($\beta = -0.37$, $p < 0.01$). When simple effects were conducted, it was apparent that among individuals living alone with low levels of human social support, the depression levels of dog owners and non-owners did not differ significantly (0.39 vs. 0.32, $p > 0.05$). As well, among individuals living alone with high levels of human social support, the depression levels of dog owners and non-owners did not differ significantly (0.19 vs. 0.28, $p > 0.05$).

When only cat owners and non-owners were included in a hierarchical regression analysis, the first hypothesis, that cat owners living alone would be less depressed than non-owners, was not supported ($\beta = 0.04$, $p > 0.05$). Human social support also was not a significant predictor of the depression levels of individuals living alone ($\beta = -0.08$, $p > 0.05$). Finally, the second hypothesis, that among individuals living alone there would be an interaction between cat ownership and human social support, was not supported ($\beta = -0.09$, $p > 0.05$).

There were two further objectives in this study. We hypothesized that: 3) among pet owners living alone, there would be a positive relation between attachment to pets and psychological health (loneliness and depression), and 4) among pet owners living alone, attachment to pets and levels of human social support would have interactive effects on psychological health (loneliness and depression). Given that there were only 40 dog owners and 26 cat owners, these hypotheses were not tested for dog and cat owners separately. These hypotheses were first examined with loneliness as the criterion variable. In addition to excluding the two dog owners who did not answer a sufficient number of items in the loneliness scale, one additional case, which exerted too much influence on the regression model, was

excluded from this analysis. In the first hierarchical regression model (Table 4), the third hypothesis, that pet owners who were highly attached to their pet would be less lonely than pet owners with low levels of attachment to their pet, was not supported ($\beta = 0.02, p > 0.05$). However, human social support was a significant predictor of the loneliness levels of pet owners living alone ($\beta = -0.74, p < 0.001$). The fourth hypothesis, that among pet owners living alone there would be an interaction between attachment to pets and human social support, was not supported ($\beta = -0.12, p > 0.05$).

Table 4. Summary of hierarchical regression analysis for variables predicting the loneliness levels of individuals who live alone with a dog or cat ($n = 63$).

Variable	F_{change}	df	R^2_{change}	β
Step 1				
Attachment	44.81**	58	0.61	0.01
Social Support				-0.78**
Step 2				
Attachment	1.88	57	0.01	0.02
Social Support				-0.74**
Attachment \times Social Support				-0.12

* $p < 0.05$; ** $p < 0.001$

Although the interaction between attachment to pets and human social support was not significant in the regression model, given the small sample size used for this analysis, we still examined the simple effects. When we interpreted the interaction by conducting simple effects, we found that among pet owners living alone with low levels of human social support, pet owners who were highly attached to their pet were significantly more lonely than pet owners with low levels of attachment to their pet (2.51 vs. 2.07, $p < 0.05$). However, among pet owners living alone with high levels of human social support, pet owners with high and low levels of attachment to their pet did not differ significantly in their loneliness levels (1.77 vs. 1.81, $p > 0.05$). These findings are displayed in Figure 2.

When depression was used as the criterion variable in a hierarchical regression analysis (Table 5), the third hypothesis, that pet owners who were highly attached to their pet would be less depressed than pet owners with low levels of attachment to their pet, was not supported ($\beta = 0.05, p > 0.05$). However, human social support was a significant predictor of the depression levels of pet owners living alone ($\beta = -0.48, p < 0.001$). In addition, the fourth hypothesis, that there would be an interaction between attachment to pets and human social support, was supported ($\beta = -0.26, p < 0.05$).

Simple effects revealed that, among individuals living alone with low levels of human social support, pet owners who had high levels of attachment to their pet were significantly more depressed than pet owners who had low levels of attachment to their pet (0.43 vs. 0.27, $p < 0.01$). However, among individuals living alone with high levels of human social support, the depression levels of pet owners with high versus low levels of attachment to their pet did not differ significantly (0.19 vs. 0.28, $p > 0.05$). These findings are displayed in Figure 3 (p. 48).

Table 6 provides information about the main benefits of dog and cat ownership as reported by the participants. Both dog and cat owners identified companionship as the most important benefit. For dog owners, physical activity with the dog and love and affection were the next

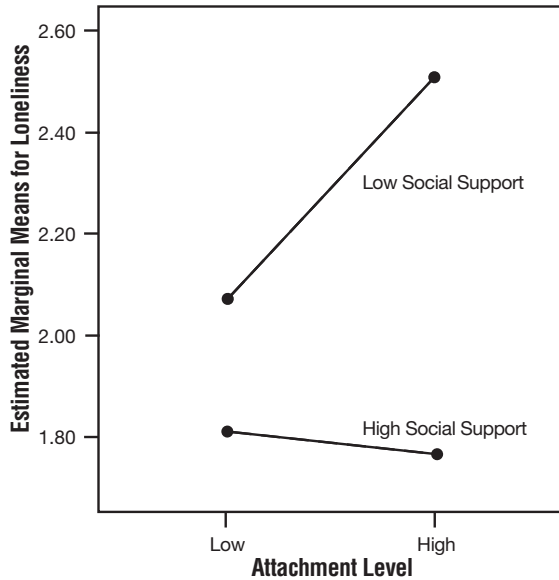


Figure 2. Mean loneliness scores for attachment to pets by level of social support.

Table 5. Summary of hierarchical regression analysis for variables predicting the depression levels of individuals who live alone with a dog or cat ($n = 66$).

Variable	F_{change}	df	R^2_{change}	β
Step 1				
Attachment	11.87**	60	0.28	0.08
Social Support				-0.52**
Step 2				
Attachment	5.94*	59	0.07	0.05
Social Support				-0.48**
Attachment \times Social Support				-0.26*

* $p < 0.05$; ** $p < 0.001$

Table 6. Main benefits of dog and cat ownership.

Main Benefits	Dog Owners ($n = 39$)	Cat Owners ($n = 25$)
Companionship	85%	68%
Physical Activity	59%	—
Love and Affection	41%	40%
Increased Social Interaction	33%	—
Responsibility for Another Living Being	31%	32%
Entertainment	21%	40%
Greeting When Return Home	8%	24%
A Comfort	—	8%

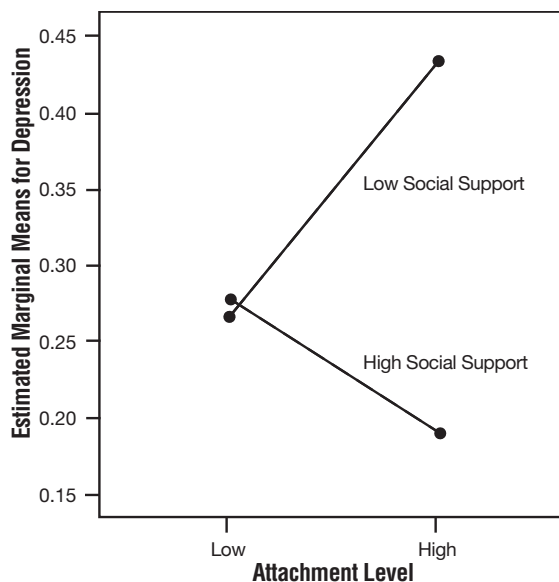


Figure 3. Mean depression scores for attachment to pets by level of social support.

most important benefits, while for cat owners, love and affection and being responsible for another living being were the next most important benefits. In response to a question about the impact of pet ownership, the overwhelming majority of dog and cat owners, 84.2% of dog owners and 80% of cat owners, indicated that their pet had had a strong positive impact.

Discussion

The purpose of this research was to explore the impact of pet ownership on the psychological health of individuals living alone, in terms of loneliness and depression levels. Contrary to expectations, pet owners and non-owners living alone did not have significantly different levels of loneliness or depression. This was particularly surprising given that the one other similar study conducted in the general population found that individuals who lived alone with a cat had better psychological health than individuals who lived alone without a cat (Turner, Rieger and Gytax 2003). However, this earlier study differed from the present study in that psychological health was assessed using a measure of mood, not specific measures of loneliness and depression. Despite these differences between the studies, our finding that there was not a direct relation between pet ownership and either loneliness or depression was unexpected, given that, in their responses to an open-ended question, both dog and cat owners indicated that the most important benefit of pet ownership was companionship. Furthermore, 82.5% of participants indicated that their pet had had a strong positive impact on their life. It should be noted that this high percentage may be the result of a demand characteristic. It is possible that, as a result of media reports on the benefits of pet ownership, the pet owners in the present study expected that owning a pet would be beneficial. However, although pets may be a source of companionship, the fact that pet owners living alone were not less lonely or depressed than individuals living alone without a pet raises the possibility that the benefits of pet ownership for dog and cat owners may only be apparent when other factors, such as levels of human social support, are considered.

When we examined the influence of human social support, results revealed that dog owners, but not cat owners, with high levels of human social support were significantly less lonely than non-owners with high levels of human social support. However, among individuals with low levels of human social support, there was no difference in the loneliness levels of dog and cat owners compared with non-owners. Furthermore, there were no differences in the depression levels of either dog or cat owners compared with non-owners, according to their level of human social support.

The findings regarding loneliness suggest that, among individuals living alone, dog ownership may be most beneficial for individuals who have sufficient human social support. While our findings only held for dog owners, the results are consistent with Wells and Rodi's (2000) qualitative findings for senior dog and cat owners, which led them to conclude that, "individuals who benefited most from pet ownership were likely to already be well-supported in their social relationships and not dependent on the pet for company or to boost self-esteem" (p. 147).

One possible explanation for the finding that dog owners with high levels of human social support were significantly less lonely than non-owners with high levels of human social support is provided by examining types of perceived social support. Schaefer, Coyne and Lazarus (1981) distinguish three types of social support: emotional support (meeting an individual's need for love), tangible support (practical assistance, such as buying groceries when an individual is ill) and informational support (helping to solve problems and provide guidance). While it is unlikely that a dog could provide either tangible or informational support, a dog could provide emotional support. Indeed, the third most frequently cited benefit of dog ownership in our study was love and affection, endorsed by 41% of the sample. Further evidence is provided by Stammbach and Turner (1999), who argued that companion animals are capable of providing emotional support to their owners, and Serpell (1986, p. 114) who stated that many pet owners feel that they can confide in their pet. Among individuals living alone with high levels of human social support, their dog may provide an additional source of emotional support that is not available to non-owners. However, among individuals with low levels of human social support, the emotional support provided by a dog may not be sufficient to compensate for insufficient human social support, which may explain why they do not differ from non-owners with low levels of human social support in terms of loneliness levels. A key question for future research is why this might be the case.

There are a number of possible explanations for the finding that dog ownership, but not cat ownership, was beneficial for the loneliness levels of individuals living alone with high levels of human social support. Dog owners differ from cat owners in that dog owners need to walk their dog. In fact, the second most commonly cited benefit of dog ownership, endorsed by 59% of the participants, was that dog owners received exercise walking their dog. Furthermore, given that researchers have found that increased levels of physical activity are associated with mental health benefits (US Department of Health and Human Services 1996; Gilmour 2007), it is probable that dog owners are receiving mental health benefits from their exercise. Researchers have also found that dogs act as social catalysts by increasing dog walkers' number of human-human social interactions (Messent 1983; McNicholas and Collis, 2000; Wells 2004), possibly because people are perceived as more likable when they are with their dog (Geries-Johnson and Kennedy 1995), and dogs provide a neutral topic for conversation and, therefore, act as social "ice-breakers" (Veevers 1985). In addition, McNicholas and Collis (2000) have suggested that these human-human interactions may increase people's social networks and subsequently confer health advantages to dog owners. Taken together, this research

suggests that, among individuals living alone, dog owners may avoid becoming lonely through meeting people and making new friends, as a result of dog walking.

The exercise and social interaction benefits from dog walking provide a possible explanation for the fact that, among individuals living alone with high levels of human social support, dog owners, but not cat owners, had lower levels of loneliness than non-owners. However, it is less clear why, if dog owners with low levels of human social support also receive these benefits, they did not have lower levels of loneliness than non-owners with low levels of human social support. Given that past research has found that people with high levels of human social support are more likely to engage in leisure-time physical exercise (Steptoe et al. 1997), it may be that dog owners with high levels of human social support are more likely to have other people with whom they can walk their dog and, therefore, they may be more likely to walk their dog compared with dog owners with low levels of human social support.

Attachment to Pets and Well-Being

We also examined whether pet owners who were highly attached to their pet were less lonely and depressed than pet owners with low levels of attachment to their pet. The direct effect of attachment was not significant. Instead, we found an intriguing moderating effect of social support. Among pet owners living alone with low levels of human social support, those who were highly attached to their pet were significantly *more* lonely and depressed than pet owners with low levels of attachment to their pet. In contrast, among pet owners with high levels of social support, loneliness and depression levels did not vary according to level of attachment to the pet. It should be noted that, although we found that among individuals with low levels of human social support, pet owners who were highly attached to their pet were more lonely and depressed than pet owners who had low levels of attachment to their pet, there may be subgroups for whom this finding does not hold. For example, Garrity et al. (1989) found that among bereaved seniors with low levels of human social support, pet owners who were highly attached to their pet were less depressed than pet owners with low levels of attachment to their pet.

Another possible interpretation of these findings is that individuals who lack human social support and become highly attached to their pet may spend more time at home caring for their pet compared with individuals who are less attached to their pet. For example, individuals with high levels of attachment may feel a stronger obligation to rush home from work or leave a social event early to care for their pet. Support for this suggestion comes from Cohen's (2002) finding that a positive correlation exists between attachment to pets and the number of hours spent with the pet. Among individuals with low levels of human social support, if they choose to spend time with their pet rather than socializing with other people, they may begin to feel somewhat socially isolated. Furthermore, if these individuals decline social invitations in order to be with their pet, they may end up in a vicious cycle, whereby the number of social invitations extended to them decreases. Given the recent research that indicates that acting extraverted, being social, is beneficial for well-being, as reflected by increased levels of positive affect (e.g., McNiel and Fleeson 2006), social isolation in favor of pet companionship may undermine psychological well-being.

Limitations of the Research

Given that in 2006 only 23% of Canadians 25 to 64 years of age had a university degree (Statistics Canada 2008b), the education level of participants in our sample, 79.5% of whom had at least one university degree, was not representative of the Canadian population. Furthermore, given that Ross and Mirowsky (1989) found a positive correlation between level

of education and human social support, differences in the social support levels of participants might have been greater had our sample not included such a high percentage of highly educated people. One possible explanation for the high percentage of educated participants is that our survey was only available on-line. According to results from the 2007 Canadian Internet Use Survey, people with higher levels of education are more likely to use the Internet (Statistics Canada 2008a). Another limitation of our study was that females accounted for 73.3% of the sample. In light of the small number of males in our study, it was not possible to examine our hypotheses separately for males and females. Flood's (2005) study, using national Australian survey data, emphasizes the need to examine gender differences, given that he found that males, but not females, who lived alone had less social support, fewer friendships and poorer psychological health compared with their counterparts who lived with other people.

The present study needs to be replicated using a larger sample in order to ensure that, given the small number of cat owners, loneliness levels and depression levels do not vary depending on cat ownership (cat vs. no cat) and human social support levels. In addition, given the small number of dog and cat owners in the sample, we did not have sufficient statistical power to examine whether the interaction between attachment and human social support held when dog and cat owners were examined separately. Zasloff and Kidd (1994) found that females living alone with a dog were more attached to their dog than females living with others; however, the opposite was true with respect to cat owners. This finding raises the possibility that it may be only dog, not cat, owners who have poorer psychological health, if they have higher levels of attachment to their pet. Further support comes from the fact that, when we compared dog and cat owners' level of attachment, we found that dog owners living alone were significantly more attached to their dog compared with cat owners living alone ($p < 0.001$).

An additional limitation is that, in the present study, non-owners were defined as individuals who did not own a dog or cat. According to Leger Marketing, 10% of all Canadians owned a pet other than a dog or cat in 2002. In the present study, it is likely that some non-owners owned pets such as ferrets, rabbits, gerbils or fish. If owning a pet other than a dog or cat affected the loneliness and depression levels of non-owners who owned pets other than dogs and cats, it is possible that comparisons between pet and non-owners were weakened by the fact that non-owners included owners of pets other than dogs and cats.

A different type of limitation results from the loneliness measure used in the present study, as researchers have noted that the UCLA Loneliness Scale may not be sensitive to the ways in which companion animals affect pet owners' loneliness levels (Gilbey, McNicholas and Collis 2006, 2007). Many of the items in Russell's (1996) loneliness scale inquire solely about human relationships (e.g., "How often do you feel there are people you can turn to" and "How often do you feel part of a group of friends"). Therefore, there is a need for a new measure of loneliness that takes into consideration the impact of pet ownership.

Given the nature of our study, it was not possible to determine whether, among individuals living alone with high levels of human social support, dog owners were less lonely than non-owners before they acquired their dog or whether acquiring a dog reduced their loneliness levels. Similarly, among pet owners living alone with low levels of human social support, it was not possible to determine whether pet owners who were highly attached to their pet were more lonely and depressed before they acquired their pet, or whether after they acquired their pet and became highly attached to it they became more lonely and depressed. A longitudinal study is needed to address these questions.

Suggestions for Future Research

Future studies need to consider the possible role of anthropomorphism in the interaction between pet attachment and human social support. Duvall Antonacopoulos and Pychyl (2008) found that dog owners with low levels of human social support were more likely to humanize their dog. Furthermore, there was a negative relation between anthropomorphism and stress, which raises the possibility that increased levels of anthropomorphism, may lead to increased levels of stress. Given that Albert and Bulcroft (1988) found a positive correlation between attachment and anthropomorphism, future research needs to examine the possibility that the psychological health of individuals living alone varies depending on pet attachment, social support, and anthropomorphism levels. As well, researchers need to consider other factors, which may also affect the psychological health of individuals living alone. For example, personality differences may interact with pet ownership and levels of human social support to predict psychological health. Furthermore, among pet owners, factors such as the temperament of the pet and perceived levels of social support from the pet may also interact with attachment levels and human social support levels to predict psychological well-being.

Another area for future research is the potential impact of pet ownership on the physical health of individuals living alone. The limited number of studies to date that examined the interactive effects, which were explored in the present study, have primarily been conducted with seniors and did not specifically consider individuals living alone (Garrity et al. 1989; Siegel 1990; Raina et al. 1999; Wells and Rodi 2000). Therefore, future research needs to examine whether pet ownership and human social support levels have interactive effects on the physical health of individuals living alone and whether among pet owners living alone physical health varies depending on both attachment to pets and human social support levels.

Conclusions

Given the growing number of single person households (Euromonitor International 2008), it is important to understand the factors affecting the psychological health of individuals living alone. Our findings emphasize the complexity of the relationship between pet ownership and psychological health and suggest that pet ownership may not be beneficial for the psychological health of all individuals living alone. From this study, it is apparent that there is a need for longitudinal studies to explore the effect of pet ownership on the psychological health of individuals living alone, while considering the influence of additional factors such as human social support and attachment to pets.

Notes

1 Participants were divided at \$40,000 rather than at \$35,000 because in the survey participants were asked to choose from the following income categories: less than \$20,000, \$20,000–39,999, \$40,000–59,999, \$60,000–79,000, and \$80,000 or more.

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