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The pet connection: Pets as a conduit for social capital?

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Abstract

There is growing interest across a range of disciplines in the relationship between pets and health, with a range of therapeutic, physiological, psychological and psychosocial benefits now documented. While much of the literature has focused on the individual benefits of pet ownership, this study considered the potential health benefits that might accrue to the broader community, as encapsulated in the construct of social capital. A random survey of 339 adult residents from Perth, Western Australia were selected from three suburbs and interviewed by telephone. Pet ownership was found to be positively associated with some forms of social contact and interaction, and with perceptions of neighbourhood friendliness. After adjustment for demographic variables, pet owners scored higher on social capital and civic engagement scales. The results suggest that pet ownership provides potential opportunities for interactions between neighbours and that further research in this area is warranted. Social capital is another potential mechanism by which pets exert an influence on human health.

Keywords: Pets; Social capital; Health; Community; Sense of community; Australia

Introduction

Australians share their homes with nearly 30 million dogs, fish, cats and other pets (PIAS, 2002). In Australia, 64% of households are home to at least one pet (PIAS, 2002). Similar patterns of cohabitation are found in the UK (Brodie & Biley, 1999), the US (APPMA, 2003), and no doubt, many other countries. Pets are a great leveller, transcending racial, cultural, age, gender and socio-economic boundaries.

In a world of growing global uncertainty (Giles-Corti, et al., 2004; Sember, 2004) and violence (World Health Organisation, 2002), and a trend towards increased prevalence of single occupant homes (Australian Bureau of Statistics, 2002), household pets will potentially play an increasingly important role in many people's lives, providing company and respite from the outside world. Moreover, as observed by Cusack (1988), pets live in the moment, and interacting with pets reminds owners of the joys and idiosyncrasies of living in the present, as well as prompting their owners to think beyond themselves.

There is growing interest across a range of disciplines, in the relationship between pets and human health. Interest to date has primarily focused on the links between pets and a variety of physiological and psychological indicators of individual health and well-being. The purpose of this paper was to explore the relationship between pets and elements of social capital; a community level construct that is increasingly being linked to health. Social capital has been conceptualised as the features of social life—networks, norms and social trust—that enable participants to act together more effectively to pursue shared objectives (Putnam, 1996), or, to facilitate coordination and cooperation for mutual benefit (Cox, 1995). There are many definitional and

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theoretical variations (Wall, Ferrazzi, & Schryer, 1998; Woolcock, 1998) on this theme, but networks, norms and trust, and some notion of mutual goals, actions or benefits appear to be core social capital ingredients.

Do pets contribute to better health?

The benefits of pets and pet–people interactions have long been the subject of anecdotes (Dembicki & Anderson, 1996) and intuitive belief (Brasic, 1998). Empirical research on the potential health benefits of pets has, however, accumulated over the last few decades. While some studies have failed to demonstrate a link, or have been hindered by methodological problems, the general weight of evidence suggests that pets enhance human health and wellbeing in a number of ways (Beck & Meyers, 1996; Brodie & Biley, 1999; Vines, 1993). The literature on the health benefits of pets can be divided into four primary streams: therapeutic, psychological, physiological and psychosocial. Growing understanding of the social determinants of health (Marmot & Wilkinson, 1999) however, suggests that the boundaries traditionally drawn between physical, psychological and social influences on health are somewhat artificial, and in practice, these factors overlap in various complex ways. Thus while this paper primarily focuses on the psychosocial benefits of pets, it is useful to view these in the context of other possible health benefits.

Specific therapeutic use of pets

Pet-facilitated therapy (or animal assisted therapy) refers to the introduction of an animal to a person's immediate surroundings with therapeutic intent (Brodie & Biley, 1999). Health conditions to which it has been applied include psychiatric illness (Barak, Savorai, Mavashev, & Beni, 2001); alzheimer's disease (Churchill, Safaoui, McCabe, & Baun, 1999); AIDS (Siegel, Angulo, Detels, Wesch, & Mullen, 1999); and ambulatory disability (Allen & Blascovich, 1996). Settings in which pet-facilitated therapy has been used include residential care (Banks, Gonser, & Banks, 2001); prisons (Edney, 1992), hospitals (Cole & Gawlinski, 1995), and psychiatric institutions (Holcomb & Meacham, 1989), and there is growing interest in the psychosocial benefits of accommodating pets within workplaces (Wells & Perrine, 2001). Particular subsets of the population are often the focus, including the elderly (Barak et al., 2001; Dembicki & Anderson, 1996); people with disabilities (Allen & Blascovich, 1996); children (Endenburg & Baarda, 1995) and adolescents (Banman, 1995). In general, pet-facilitated therapy has been shown to be effective with a range of target populations and settings across a variety of health conditions.

Psychological and mental health benefits associated with pets

The nexus between people and pets has been the subject of a number of studies examining both mental health outcomes (such as depression) and mental health determinants (such as social support). Human–pet interactions can play a beneficial role in relation to depression (Bolin, 1987; Siegel, 1990) and stress (Allen, Blascovich, & Mendes, 2002; Baun, Oetting, & Bergstrom, 1991) as well as to determinants of these conditions, including loneliness (Banks et al., 2001), bereavement (Adkins & Rajecki, 1999; Bolin, 1987), and social isolation (Kidd & Kidd, 1994). The literature has also explored protective effects of pet ownership on mental health, including social support (Allen, 1997; Garrity & Stallones, 1998), companionship (Siegel, 1993), improved self-care (Dembicki & Anderson, 1996); self-esteem (Allen & Blascovich, 1996), and community integration (Allen & Blascovich, 1996). Pets can also facilitate the development of attachment (Brodie & Biley, 1999), particularly in the lives of children (Melson, Schwarz, & Beck, 1997).

Physical health benefits associated with pets

There is increasing interest in pet ownership as a protective factor against cardiovascular disease, with evidence that owning a pet can positively affect physiological risk factors, such as blood pressure (Allen, 2001; Anderson, Reid, & Jennings, 1992); behavioural risk factors, such as physical activity (Bauman, Schroeder, Furber, & Dobson, 2001); and psychological risk factors, such as anxiety and social isolation (Patronek & Glickman, 1993). While a recent Australian study reported an inverse relationship between pet ownership, blood pressure and other cardiovascular risk factors (Parslow & Jorm, 2003) it was surmised that this could be attributed to other hypertensive risk factors indirectly related to pet ownership. This finding highlights the importance of, and the need for, well-designed population studies. While beyond the scope of this paper, others have examined the physiological mechanisms through which the effects of pets on cardiovascular health occur (Friedmann, 1995; Jennings, Reid, Christy, Jennings, Anderson, & Dart, 1998).

Physical activity is an important protective factor for cardiovascular disease, as well as a range of other health conditions. Several studies have reported higher levels of recreational walking amongst dog owners compared with non-dog owners (Anderson et al., 1992; Bauman et al., 2001), or increased walking following the acquisition of a dog (Serpell, 1991). Given current public health concerns about physical inactivity and obesity, dog walking is being advocated as a marketable strategy that will benefit both dogs and their owners (Bauman et al.,

2001). There are also potential economic benefits, with estimated health-care savings of $175 million annually if all Australian dog owners walked their dog for 30 min each day (Bauman et al., 2001).

Although the literature to date has focused on the links between pets and physiological cardiovascular risk factors, psychosocial factors such as social support can influence both the onset and outcomes of cardiovascular disease, and pets have been associated with improved cardiovascular rehabilitation (Herrald, Tomaka, & Medina, 2002) and survival rates after hospitalisation for coronary disease (Friedmann & Thomas, 1995). The National Heart Foundation of Australia has recently recognised the role of mental health indicators such as depression, lack of social support and social isolation, as independent risk factors for cardiovascular disease (Bunker et al., 2003).

In addition to the potential amelioration of cardiovascular risk factors, pet ownership has also been linked to improved general health (Serpell, 1991), and fewer doctor visits (Heady, Grabka, Kelley, Reddy, & Tseng, 2002; McHarg, Baldock, Heady, & Robinson, 1995; Siegel, 1993). Such pet-related health benefits potentially translate into significant public health expenditure savings, with Heady et al. (2002) estimating that annual national health expenditure in Australia would increase by $3.86 billion (7.19%) if pet owners visited a doctor as often as non-pet owners.

Psychosocial benefits associated with pets

Much of the literature relevant to pets and health focuses on the direct physical or psychological benefits for individuals in contact with pets, or on the mediating role of pets in relation to other known individual risk or protective factors, such as stress or anxiety. There has been less consideration to date, of community benefits that might accrue from pet ownership, although the role of pets as a social lubricant has been identified in a number of studies (McNicholas & Collis, 2000; Messent, 1983; Robins, Sanders, & Cahill, 1991).

Of particular relevance to this paper, are the studies of human–dog interactions in public places and parks. Dogs can promote interaction and conversation between strangers (Messent, 1983) and facilitate the establishment of trust between people who are newly acquainted (Robins et al., 1991). Dog walkers are more likely to experience social contact and conversation than people walking alone (McNicholas & Collis, 2000; Messent, 1983), and dogs can serve as a topic of casual conversation for walkers, even when not with their owner (Rogers, Hart, & Boltz, 1993). Robins, Sanders, and Cahill, (1991) go so far as to describe dogs as an antidote for the human anonymity of contemporary society's public places.

There is some evidence to suggest that parks provide greater opportunity for dog-facilitated social contact than merely 'walking the streets' (Messent, 1983). This has implications for the inclusion of parks in neighbourhood design, as well as for laws and policies governing the presence of dogs in parks and open spaces. The negative community consequences of dogs often dominate public discourse (e.g. noise, litter, biting) (Anderson, 1996), but these consequences need to be weighed up against the benefits of pet ownership, including the social contact generated by dogs for their owners (Harlock Jackson, Blackshaw, & Marriott, 1995; Messent, 1983). Moreover, Bauman et al. (2001), calculate that the community borne costs of dog ownership (e.g. health care costs relating to dog bites) are vastly outweighed by the potential health care savings.

Facilitation of social contact is the main community level benefit attributed to pets in research to date. One early study reported that pet owners scored higher on an interpersonal trust scale (Hyde, Kurdek, & Larson, 1983), but did not extrapolate the potential community benefits of trust that are encapsulated in current social capital discourse. Qualitative research undertaken in conjunction with this study suggests that pets can precipitate the exchange of favours between neighbours, and that such favours can be particularly symbolic of trust because of the love and attachment vested by people in their pets (Wood, 2000).

It has been suggested that pets may enhance health by serving as a catalyst for social networks, which is another of the constructs central to social capital. For example, in an Australian survey, 58% of pet owners indicated that they had got to know people and made friends through having pets (McHarg et al., 1995). By contrast, a recent U.K. study found that pet ownership did not have a significant effect on the size or composition of participants' social networks, and that casual interactions facilitated by dogs do not necessarily enhance social networks or support (Collis, McNicholas, & Harker, 2003). From a sense of community perspective however, such casual social contact and interactions may still be relevant.

What type of pets can benefit health?

Much of the literature refers to pets generically, and it seems that many of the attachment, companion and therapy-related benefits of pet ownership can be provided by a variety of pet types, including dogs (Carmack, 1991; Churchill et al., 1999), cats (Castelli, Hart, & Zasloff, 2001), birds (Jessen, Cardiello, & Baun, 1996) and horses (Edney, 1992). Favourable physiological responses in the form of reduced blood pressure have been observed in relation to dogs (Baun, Bergstrom, Langston, & Thoma, 1984), fish in aquariums (Katcher, Segal, & Beck, 1984) and even pet snakes (Eddy, 1996).

The physical activity benefits of pet ownership are primarily related to dogs, by virtue of a dog's own needs and desires for walking. Dogs also have the greatest capacity to facilitate social interaction and contact, as they are the type of pet most likely to venture with their owners into the broader community. One study found however, that small animals such as rabbits and turtles can also lead to conversation between strangers when taken to a park (Hunt, Hart, & Gomulkiewicz, 1992). In terms of reciprocity between neighbours, favours involving feeding or minding can apply to the full spectrum of pets, ranging from goldfish and guinea pigs, through to cats, dogs and horses.

Social capital and pets?

While there is a burgeoning body of literature and research relating to social capital, and specifically, to social capital and health, the possible connection with pets has not yet been made. It is not, however, an implausible connection, as social capital has now been studied in relation to issues as diverse as sexually transmitted disease (Holtgrave & Crosby, 2003), farming (Sharp & Smith, 2003), smoking (Lindstrom, 2003) and financial lending (Ferrary, 2002). Nevertheless, social capital is a complex construct, and the relationship with pets is unlikely to be direct. Rather, pet ownership may mediate some of the elements of social capital, or may be linked to other social and environmental factors that potentially impact on the formation of social capital in local communities.

In framing this study, it was hypothesised that pets may be relevant to the notion of social capital in the following ways:

- As facilitators of social contact and interaction, including with neighbours and strangers. This in turn may contribute to sense of community which has many conceptual parallels to social capital;
- As catalysts for the exchange of favours between neighbours, contributing to the building of reciprocity and networks;
- As motivators for walking and use of local parks and open spaces (dogs), which in turn facilitates exchanges of greetings and contact between people who may not otherwise interact with each other;
- As facilitators of community participation in organised and casual activities that either directly or indirectly involve pets such as dog walking or meeting at the local park regularly; and
- As a protective factor for mental health, which in turn may influence attitudes towards, and participation in, the local community and relationships with people in the community.

Methods

Study design

Based on qualitative research (Wood, 2000) and a literature review, a random cross-sectional telephone survey of adults aged 18 years and over ($n = 339$) was undertaken in April 2002. The survey was granted ethics approval by the Human Research Ethics Committee of The University of Western Australia, and the interviews were conducted by the University's Survey Research Centre. All respondents consented to participate in the study before any questions were asked or data recorded.

The study sample was drawn from three Perth suburbs of comparable socio-economic status. Eligibility for the study included being 18 years of age or older, and living in the current suburb for at least 12 months. A telephone survey sampling method was used that balances the chances of selecting a mix of gender and age-groups (Lavrakas, 1993). Nevertheless, women were over-represented with only 40% of the study sample being male. Overall, 17.4% of respondents were aged 18–29 years, 21.1% 30–39 years; 29.2% 40–49 years; 13.9% 50–59 years and 17.4% 60 years and older. The response rate for the survey was 34.3%.

Survey instrument

The survey instrument included items that measured social capital, sense of community, self-reported mental health and perceptions and attitudes towards the physical environments of communities. Table 1 summarises the items used in the analysis for this paper. An established sense of community scale was included in the survey; the Buckner Neighborhood Cohesion Index (NCI) (Buckner, 1988). This scale has been used elsewhere as an indicative measure of social capital (Macintyre & Ellaway, 2000). The scale comprises 18 items that ask people various questions about living in their suburb, including items relating to sense of belonging, interactions with others, and area satisfaction. An alternative Social Capital Scale (SCS) was also developed using factor analysis (Wood, 2005) to form a composite of civic engagement, community concern, reciprocity, friendliness, support and network items. One of the research questions underpinning the larger study of which this pet study is a part, related to investigating the extent to which the NCI and the SCS might be measuring a similar construct (Wood, 2005).

A series of questions relating to pets were developed and included in the survey, to enable exploration of associations between pets, social capital, sense of community and health. Demographic variables included home ownership, children (under 18 years living at home), employment, income, education, age, and gender.

Table 1
Survey instrument: item sources and wording

Item(s)	Item wording	Measurement scale	Item origin
Pet ownership,	Do you own a pet?	1 = Yes, 0 = No	Original item
Type of pet	What type of pet do you own dog, cat, bird, other (specify)	5 categories: dog, cat, bird, fish, other	Adapted from McHarg et al. (1995)
Self-rated health (1 item)	In general, would you say that your health is: excellent, very good, good, fair, poor?	5 point: 1 = excellent, 5 = poor	(Daly, Saunders, & Roberts, 2001)
Mental health condition diagnosed by doctor (4 items)	In the past twelve months, have you been told by a doctor that you have any of the following conditions?: anxiety; depression; a stress related problem; other (specify)?	1 = Yes, 0 = No	(Daly et al., 2001)
Kessler psychological distress scale (10 items, combined to provide Kessler score, scored 10–48)	I am going to read out some statements now, and ask you how much you have felt like this in the last four weeks: tired out for no good reason; nervous; so nervous that nothing could calm you down*; hopeless; restless or fidgety; so restless you could not sit still*; depressed; that everything was an effort; so sad that nothing could cheer you up; worthless?	5 point: 1 = all the time, 5 = none of the time	(Kessler, et al., 2002)
Loneliness and support (3 items, combined to form *support scale*, scored 3–15)	I am going to read three statements about how you might feel, and ask how often you felt like this in the last 12 months: felt lonely; found it hard to get to know people; wished that you had more help or support from other people?	5 point: 1 = never, 5 = always	Original items
Networks for support (1 item, scored 0–5 and used in social capital scale)	If you had a serious personal crisis or problem, how many people who live within this suburb (if any) do you feel that you could turn to for comfort and support?	0 = none, 1 = 1−3, 2 = 4−6, 3 = 7−10, 4 = 11−14, 5 = 15+	Original items
Got to know people through pet	Have you got to know people in your suburb as a result of your pet (for example, through walking your pet, obedience training class)?	1 = Yes, 2 = No	Adapted from McHarg et al. (1995)
Talk to others when walk dog	Do you talk to other pet owners when walking your dog?	1 = Yes, 2 = No	Original item
Dog encouraged walking	Does owning a dog encourage you to go for more walks in your suburb than your would normally do?	1 = Yes, 2 = No	Original item
Friendliness (3 items combined to form *friendliness scale*, scored 3–15)	To what extent do you agree or disagree with the following: people who live here usually say hello to each other if out walking or in their gardens; neighbours are often seen chatting to each other; a stranger moving into this suburb would be made to feel welcome?	5 point: 1 = strongly disagree, 5 = strongly agree	Original items
Participation in community/ social activities involving pet	Do you take part in any community or social activities that involve your pet?	1 = Yes, 0 = No	Original item
Influence of dog on feelings of safety (2 items)	Does owning a dog help you feel safer when: you are out walking; in your own home?	1 = Yes, 2 = No	Original item
General willingness of people to help each other out	In general, would you say that most of the time people are willing to help each other out?	5 point: 1 = strongly disagree, 5 = strongly agree	Modified from Kawachi et al. (1997)
Favours done for (7 items) or by neighbour (7 items) over last 12 months (combined to form *reciprocity scale*, scored 0–14)	Activities that you might have done for a neighbour or had a neighbour do for you over the last year: looked after house or garden or collected mail while away; minded, fed or walked pet; lent household or garden items or tools; listened to problems;	1 = Yes, 0 = No	Modified from Modra, Baum, Cooke, Murray, Bush, and Cox (1998)

Table 1 (*continued*)

Item(s)	Item wording	Measurement scale	Item origin
	helped with odd jobs; provided a lift or transport to shops or school; cared for, or minded, a child or other family member?		
General trustworthiness of people (3 items, combined to form *trust scale*, scored 3–15)	Generally, to what extent do you agree/disagree that you can trust: most people living in your section of your street or block; most people living in your suburb; most people generally?	5 point: 1 = strongly disagree, 5 = strongly agree	Modified from Harvard University (2000), Kawachi et al. (1997)
Civic engagement/action (10 items, combined to form *civic engagement scale*, scored 0–10)	Involvement in following in suburb in past year: attended a local council meeting; voted in local council election; written or spoken to Council about a local issue; contacted your local state or federal member of parliament; signed a petition; attended a protest or local action meeting; written a letter to the editor of a newspaper about a local issue; picked up other people's rubbish in a public place; reported or done something about graffiti or vandalism; made a donation (e.g. of food, money, blood or other)?	1 = Yes, 0 = No, summed to form score	Modified from Harvard University (2000), Modra et al. (1998)
Activities undertaken in own suburb (7 items)	How often, if at all, do you do the following within this suburb: shop; bank; eat out or attend entertainment; undertake physical activity (e.g. play sport, walking, gym); use health services (e.g. doctor, dentist); socialise with friends; send kids to local school (if you have children)?	5 point: 1 = Never, 5 + always	Original items
Buckner Neighborhood Cohesion Index (NCI) (18 items combined to provide NCI score, scored 18–90)	Published scale	5 point: 1 = strongly disagree, 5 = strongly agree	(Buckner, 1988)
Social capital scale (scored 12–89)	Formed through factor analysis: composite of trust, concern, reciprocity, civic engagement and friendliness scales plus networks item		Composite of modified and original items

*Only asked if response to preceding question was not 'none of the time'.

The items used in the study were subjected to test re-test reliability. In general, the items were found to have moderate to excellent test re-test reliability. Scales developed for the overall study obtained intra-class correlation coefficients (ICCs) ranging between 0.74 and 0.92. Dichotomous variables not combined into scales had kappa values ranging between 0.4 and 0.8, indicating a moderate (0.4–0.6) to substantial (0.6–0.8) level of agreement (Landis & Koch, 1977).

Data analyses

SPSS (version 12.1) was used for all data analysis. Factor analysis was used to assess the construct validity of scales, and reliability tests were undertaken to assess the internal consistency of the scales and the stability of the items over time (Wood, 2005). In the analysis examining associations between variables, Independent *t*-tests were used for continuous data, and χ^2 for categorical data.

Multivariate analysis was undertaken using ordinal logistic regression (proportional odds model) in order to assess the potential influence of pets as an independent (predictor) variable on dependent (outcome) variables relating to social capital, and to ascertain an estimate of effect (odds ratio). Ordinal regression enabled use of outcome variables that were not normally distributed (Byles et al., 2004) and which were not dichotomous. The scores for continuous outcome measures were divided into frequency tertiles for the purposes of the ordinal regression, resulting in response categories for each scale of low, medium and high. The assumptions

for ordinal logistic regression (Kleinbaum & Klein, 2002) were satisfied. Logistic regression was used for binary outcome measures. Both the ordinal and binary logistic regression enabled adjustment for demographic and confounding factors.

Results

Pet ownership

Of the 339 survey respondents, 59.0% owned one or more pets. This is comparable to other Australian data indicating pet ownership rates of around 64% (PIAS, 2002). In the total sample, 37.2% of respondents reported owning a dog, 28.3% a cat, 12.4% a bird, and 9.1% another type of pet. Among pet owners, 63.0% owned dogs. There were some differences in the age distribution of pet and non-pet owners ($p<0.001$), with 58.5% of pet owners aged between 30 and 50 years (compared with 41.0% of non-pet owners) and 10.0% of pet owners aged 60 years and over (compared with 28.1% of non-pet owners). This corresponded to family related demographics which indicated that 53.0% of pet owners had children under 18 years, compared with 21.6% of non-pet owners ($p<0.001$).

Pets and health

The survey included a number of self-rated measures of health, with a particular focus on mental health. Several items also asked about diagnosed mental health problems. Table 2 includes data on self-rated general health for pet and non-pet owners. Pet owners were significantly ($p = 0.019$) more likely to report excellent or very good health (64.5%) compared with non-pet owners (51.8%) in the single factor model, but this effect attenuated after adjustment for age ($p = 0.057$).

When asked about mental health problems diagnosed by a doctor in the past 12 months, pet owners were less likely to report a diagnosis of depression or anxiety (see Table 2) but these differences were not statistically significant. There was no significant difference between pet owners and non-pet owners on the Kessler psychological distress scale which measured anxiety and depression over the 4 week period preceding the survey.

The survey included a number of questions about loneliness and social support because of their relevance to mental health. After adjusting for age, significantly fewer pet owners reported being lonely than non-pet owners, with 70.5% of pet owners indicating that they 'rarely or never' felt lonely, compared with 58.3% of

Table 2
Health and social capital related outcomes by pet ownership

Health and social capital outcomes	Pet owners ($n = 200$) (%)	Non-pet owners ($n = 139$) (%)	p-Value from logistic regression adjusted for age*
Self-rated health			
Excellent or very good	64.5	51.8	0.057
Diagnosed mental health problem			
Anxiety	5.5	8.6	0.298
Depression	8.5	10.8	0.443
Loneliness			
Rarely or never feel lonely	70.5	58.3	0.013
Social support			
Rarely or never feel support is available	61.5	61.2	0.605
Get to know people			
Rarely or never find it hard	74.5	62.6	0.011
Perceived friendliness of suburb	89.5	79.1	0.007
General willingness of people to help each other out	85.0	79.1	0.155
Generalised trust	78.4	72.7	0.136
Strongly agree/agree that most people can be trusted			
Activities undertaken in own suburb			
Volunteer/unpaid work			
School, related activity	20.0	11.5	0.049
Coach or instructor, sport or recreational activity	25.5	13.7	0.023
Participant, sport or recreational activity	8.5	2.9	0.067
	29.0	15.8	0.011

*Using $\chi 2$ test.

non-pet owners ($p = 0.013$). Similarly, 74.5% of pet owners reported 'rarely or never' finding it hard to get to know people, compared with 62.6% of non-pet owners ($p = 0.011$). There was no statistical difference between pet and non-pet owners in the perceived availability of social support, although pet owners on average indicated a higher number of people that they could turn to in a crisis or for support within their suburb, compared to non-pet owners ($p = 0.014$).

Social engagement associated with pet ownership

There were a number of questions that specifically sought to explore the social dimension of pet ownership. Among pet owners, 40.5% indicated that they had got to know other people in their suburb through their pet. As anticipated, dog ownership was more likely to facilitate getting to know other people locally, than ownership of other types of pets. Among dog owners, 50.0% reported getting to know people in their suburb as a result of their dog. Among the 79.0% of dog owners who indicated that they walk their dog, 83.8% reported that they talked to other pet owners when walking their dog, and 75.8% reported that owning a dog encouraged them to go for more walks in their suburb than they would otherwise do. Overall, 8.0% of all pet owners, and 11.9% of dog owners indicated that they took part in community or social activities involving their pet.

A broader question asked all survey respondents the extent to which they felt that people in their suburb generally say hello to each other if out walking or in their gardens. Overall, 89.5% of pet owners agreed or strongly agreed with this sentiment, compared with 79.1% of non-pet owners ($p = 0.007$).

Reciprocity

All respondents were asked a series of questions about the exchange of favours with neighbours (Tables 3 and 4). These questions related to the notion of reciprocity, which is regarded as a core elements of social capital, and included a question about minding, feeding or walking a pet for a neighbour.

In general, more pet owners than non-pet owners reported giving and receiving neighbourly favours, although not all of the differences were statistically significant after adjustment for age. Significantly more pet owners than non-pet owners reported giving and receiving a favour in relation to a pet ($p < 0.001$) or child (giving $p = 0.022$ and receiving $p = 0.011$). Similarly, significantly more pet owners had loaned household items or tools ($p = 0.033$).

A combined reciprocity scale was formed as a measure of the total number of types of favours given to (0–7), or received from (0–7), neighbours in the last year. On this overall reciprocity scale, pet owners had a mean score of 7.13 compared with a mean score of 5.90 among non-pet owners after adjusting for age ($p = 0.011$) (see Table 5). As the overall reciprocity score is based on the number of favours engaged in, and only two of the favours related to pets, this difference was not explained by pet-specific favours alone. After adjusting for age, sex and education, pet ownership remained positively related to overall reciprocity (OR 1.66; 95% CI 1.09–2.54; $p = 0.019$). However, the association with pet ownership attenuated after adjusting for children living at home (OR 1.41; 95% CI 0.92–2.19; $p = 0.118$) (see Table 6).

Consistent with the measures of actual reciprocity, pet owners were more likely to strongly agree or agree with a statement pertaining to the general willingness of people to help each other out (85.0% of pet owners compared with 79.1% of non-pet owners) although this result did not reach statistical significance.

Generalised perceptions of trust

Generalised perceptions of trust have been reported as a potential indicator of social capital (Kawachi, Kennedy, Lochner, & Prothrowstith, 1997). Pet owners were slightly more likely to agree that most people can

Table 3
Favours undertaken for a neighbour by pet ownership

Favour/activity undertaken in the last year	Pet owners ($n = 200$) (%)	Non-pet owners ($n = 139$) (%)	Total ($n = 339$) (%)	p-Value adjusted for age*
Looked after house or garden while away	63.0	61.2	62.2	0.530
Minded, fed or walked pet	27.5	11.5	20.9	0.001
Lent household items or tools	68.5	58.3	64.3	0.067
Listened to problems	75.0	71.2	73.5	0.225
Helped with odd jobs	59.5	54.7	57.5	0.356
Provided lift or transport to shops or school	47.0	46.8	46.9	0.899
Cared for or minded child or other family member	37.0	24.5	31.9	0.022

*Logistic regression.

Table 4
Favours neighbours undertook for respondents by pet ownership

Favour/activity undertaken in the last year	Pet owners ($n = 200$) (%)	Non-pet owners ($n = 139$) (%)	Total ($n = 339$) (%)	p-Value adjusted for age*
Looked after house or garden while away	59.5	56.8	58.4	0.510
Minded, fed or walked pet	34.0	0.5	22.1	0.000
Lent household items or tools	56.5	43.2	51.0	0.033
Listened to problems	60.0	55.4	58.1	0.323
Helped with odd jobs	56.5	53.2	55.2	0.586
Provided lift or transport to shops or school	41.5	34.5	38.6	0.165
Cared for or minded child or other family member	27.0	13.2	21.5	0.011

*Logistic regression.

Table 5
Mean scores for measures of social capital and its components by pet ownership

Scale	Pet owners	Non-pet owners	p-Value adjusted for age*
Buckner NCI	65.97	63.69	0.054
Social capital scale	58.40	55.10	0.002
Reciprocity	7.13	5.90	0.011
Trust scale	10.40	10.17	0.261
Civic engagement	3.84	3.33	0.024

*Logistic regression.

be trusted generally (78.4% of pet owners compared with 72.7% of non-pet owners) (OR 1.23; 95% CI 0.79–1.92), but this result was not statistically significant ($p = 0.136$) (see Table 5).

Civic engagement

Civic engagement is generally recognised as another core feature of social capital. As well as contributing to the building of trust and networks, it is the capacity of individuals to be concerned and active within the community that creates the 'capital' that others can benefit from.

A civic engagement scale was developed using factor analysis, based on responses to questions about 10 possible actions taken on local issues. As shown in Table 5, pet owners had a higher mean score on the civic engagement scale compared with non-pet owners ($p = 0.024$). After adjusting for age, sex, education and children, pet owners were 57% more likely to be civically engaged than non-pet owners (OR 1.57; 95% CI 1.01–2.43; $p = 0.044$) (Table 6).

Other individual items asked about involvement in specific activities within the local suburb that related to civic engagement. After adjusting for age, pet owners were significantly more likely than non-pet owners to be involved in volunteer work, school-related activities, or in sport and recreational clubs and activities (Table 2). However, after further adjusting for sex, education and children, none of the associations between pet ownership and local suburb involvement were statistically significant. Thus the relationship between engagement in local activities and pet ownership appeared to be confounded by having children under 18 years living at home.

Sense of community and social capital

Sense of community or social capital as measured by the Buckner NCI was significantly higher among pet owners compared with non-pet owners. Specifically, pet owners had a mean score of 65.97 (9.59 SD) on the NCI while non-pet owners had a mean score of 63.69 (8.94 SD) ($p = 0.028$) (see Table 5). Pet owners were 55% more likely to score higher on the NCI, compared with non-pet owners (OR 1.55; 95% CI 1.05–2.35) in a single factor model. However, this was no longer significant after adjustment for age, sex, education and children (see Table 6). As with reciprocity, children living at home confounded the relationship between pet ownership and sense of community. While there was a correlation between pets and children ($r = 0.315$), a test for interaction indicated that both having children living at home and pet ownership were independently related to the NCI.

On the alternate social capital scale (SCS), pet owners had a higher mean score (58.4, SD 8.76) compared with non-pet owners (55.1, SD 9.04) after adjusting for age, children, gender and education ($p = 0.021$). In the ordinal regression model, pet owners were 74% more likely to have a high SCS score compared with non-pet owners after adjustment for age, sex, education and children (OR 1.74; 95% CI 1.02–2.95; $p = 0.041$) (Table 6).

Table 6
Ordinal odds ratios (unadjusted and adjusted) associating measures and dimensions of social capital with pet ownership

Scale	Odds ratio (95% confidence interval)*			
	Pet ownership	*p*-Value	Pet ownership adjusted for age, sex, education and children	*p*-Value
Buckner NCI	1.55 (1.04–2.31)	0.032	1.27 (0.82–1.95)	0.287
Social capital scale	1.84 (1.14–2.99)	0.013	1.74 (1.02–2.95)	0.041
Reciprocity	1.78 (1.19–2.66)	0.005	1.41 (0.92–2.19)	0.118
Civic engagement	1.57 (1.05–2.35)	0.028	1.57 (1.01–2.43)	0.044
Trust	1.25 (1.20–1.87)	0.288	1.23 (0.79–1.92)	0.350
Support	1.45 (0.97–2.17)	0.069	1.67 (1.08–2.59)	0.022

*Ordinal regression.

Discussion

While the causal pathways surrounding the development and maintenance of social capital are complex and relatively unconfirmed to date, the results from this study suggest the merits of further exploring the inclusion of pet ownership in the mix of factors that may facilitate social capital.

Consistent with the findings of several other studies (McNicholas & Collis, 2000; Messent, 1983; Robins et al., 1991), we found that pets are positively associated with some forms of social contact and interaction, both with other pet owners, neighbours, and the broader local community. In particular, pet owners were more likely than non-pet owners to perceive friendly exchanges of informal greetings within their suburb. Among dog owners, more than half indicated that they had got to know people within their suburb as a result of their pet, and more than four fifths talk to other pet owners when walking their dog. As friendliness with relative strangers has been alluded to as a positive community marker in both sense of community and crime prevention literature, further elucidation of the role of pets in lubricating social interactions is warranted. Extrapolating from our research to health promotion practice, there are clear synergies between interventions promoting dog walking as a conduit for human physical activity, and the potential role of dogs as facilitators of social and community interaction.

We found that pet owners were significantly less likely to report finding it hard to get to know people generally, compared with non-pet owners. Recently Collis et al. (2003) found however that casual acquaintances formed through pets may not translate into meaningful social networks or social support. Thus this distinction is worthy of further research in relation to the possible links between pets and the social support and network elements of social capital.

Our data indicated some association between pet ownership and the exchange of favours between neighbours, which contributes to the reciprocity and network dimensions of social capital. While questions relating to reciprocity are found in many social capital instruments, the specific impetus for such exchanges are not usually considered. The fact that pet owners scored higher on average on an overall reciprocity scale, is not fully accounted for by the exchange of pet related favours, suggesting that pets may serve as a catalyst for broader reciprocal relationships between neighbours. Further research is required to test this specific hypothesis.

While not specifically explored in this study, the exchange of pet-related favours may also exemplify the social capital notion of trust. There is after all, less emotional investment in borrowing a cup of sugar, compared with entrusting one's much loved pet to the care of a neighbour. In fact for many people, pets are akin to children in terms of the attachments and emotions they engender (Cusack, 1988). The notion of pet or child minding favours as a barometer of trust between neighbours warrants further exploration. We did not however, find a significant association in this study between pet ownership and generalised trust.

There is evidence from our study to suggest that pets (particularly dogs) can provide additional opportunities or motivation for walking within one's suburb of residence, participating in community events, and for the use of community facilities such as parks and open spaces. While there has been some research interest in the capacity of pets to encourage walking and use of parks and open spaces for physical activity (Bauman et al., 2001), the broader community benefits of having more people 'out and about', participating in local activities, using recreational areas and interacting with one another, has been unexplored in specific relation to pets. Both social capital and sense of community measures offer a means of capturing some of these community level benefits of neigbourhood participation and intra-community interactions between residents.

Our research sought to explore the relationship between pet ownership and a number of health outcome measures. Although pet ownership was associated with higher levels of self-reported general health in the single factor model, age and children appeared to be confounding factors. Other studies with larger sample sizes have however found evidence of a relationship between pet ownership and some health indicators (Heady et al., 2002; McHarg et al., 1995; Siegel, 1993). Just as the causal pathways between social capital and specific health outcomes are unlikely to be direct (McKenzie, Whitley, & Weich, 2002), the links between pets, social capital and health are likely to be similarly complex, and further research into the nexus (direct and indirect) between psychosocial determinants of health and pets is required.

As part of our broader research interest in the relationship between social capital and mental health, we also examined the association between pets and several mental health measures. While our unadjusted data indicated some association between pet ownership and lower levels of doctor identified mental health conditions, the differences were not significantly different. Studies with a more specific mental health focus have however demonstrated a link between human–pet interactions and depression (Bolin, 1987; Garrity, Stallones, Marx, & Johnson, 1989; Siegel et al., 1999). The notion of pets as companions has been upheld in a number of studies of the relationship between pets and loneliness (Banks et al., 2001; Kidd & Kidd, 1994), and our data similarly found a positive association between pet ownership and lower levels of self-reported loneliness.

In addition to findings directly attributable to pet ownership, our analysis also identified some important differences between pet and non-pet owners. In particular, pet owners had elevated perceptions of community friendliness and social support. Pet owners scored significantly higher on an overall social capital scale after controlling for various demographics.

Feelings of safety and perceptions of crime can have a significant spill-over affect on social capital and sense of community. For example, if people are fearful they may be less likely to go out of their home, to use local facilities, or attend clubs or functions, particularly at night. In our study, a significant number of pet owners attributed feeling safer in their home and when out walking, to their pet. While not explored in our study, it is plausible that for some, the visible presence of dogs being walked, the accompanying social exchanges, and the impetus dogs provide for people to be out walking, contributes to increased feelings of collective safety and perceptions of sense of community. These 'spill-over' effects of dog ownership on the broader community warrant further research attention in our view.

Clearly not everyone wants to, or is able to own a pet, and so many of the potential health benefits of pet ownership are not transferable across an entire population. But this study suggests that some collective benefits may accrue to communities through the presence of pets, that extend beyond pet owners themselves. While further research is required to test this hypothesis, it is possible that this effect occurs at two levels. Directly, pets may serve as a catalyst for social contact and interaction, friendship and trust formation, reciprocity and favour exchange, as well as for walking and the fostering of a 'visible people presence' in the community. More indirectly, the study found some evidence to suggest that pet owners are more likely to be interested in local issues and to engage in civic activities. It is these types of community level benefits that are encapsulated in the notion of social capital, a form of capital that can benefit even those who have not invested in it personally (Kawachi et al., 1997).

Study limitations

As this was primarily a survey of social capital, the number of pet-related questions was limited by the breadth of the overall study. Further refinement of some of the questions relevant to pets could also be made. For example, the recent work of Collis and colleagues (2003) suggests that the casual social contacts and friendships established through pets may not translate into relationships that provide social support, but the wording of questions in this survey did not enable this distinction to be explored.

The study was limited to three select suburbs within the city of Perth, Western Australia, and as with all such restricted samples, the generalisability is acknowledged. Although the age distribution within the study population and the WA population was comparable for most age cohorts, 18–29 year olds were under-represented in the study sample and 40–49 year olds were over-represented, and these differences may also affect generalisability. While the response rate of 34.3% is also a study limitation, such a response rate is not uncommon in other telephone questionnaires of a similar completion time (in this case, 25–35 min) (Brownson et al., 2004).

Although the sample size was not large ($n = 339$), it was designed to have sufficient power for the purposes of this exploratory research. Moreover, it is pertinent to note that many of the studies cited in the pets and health literature, have had even smaller sample sizes. The sample size limitations of our study may nonetheless explain in part the attenuation of associations between some variables once adjustments for demographics were made, and the influence of confounding factors is acknowledged as a major limitation of the study. The preliminary findings and underpinning theoretical framework suggest that studies with a larger sample size

may establish statistical significance for some of the differences observed. Such adjustments for demographics have not always been considered in the literature published in relation to pets and health to date. Appropriate adjustment, particularly for children living at home, is therefore recommended for future research.

The analysis in the study focused on differences between pet and non-pet owners, and other survey questions and research designs would be needed to assess potential pet influences on people generally (whether or not they specifically own a pet) or to distil a clearer picture of the mechanisms by which pets might exert an influence on either owners or the broader community. Selecting a sample with fewer differences between pet and non-pet owners, or comparing the responses of pet-owners with those who would like to, or have in the past, owned a pet are other ways to overcome some of the methodological limitations of this study.

As with all cross-sectional surveys, this study is limited in the conclusions it can draw in relation to causality. Notwithstanding such methodological limitations, the associations identified between pets and various dimensions of social capital and sense of community are consistent with the hypotheses derived from the review of literature described earlier in this paper.

Conclusions

While there is an accumulating body of evidence drawing links between pets and health, the findings have not always been consistent, and researchers are still seeking to delineate the underlying mechanisms through which pets exert an influence on human health. Both the psychological and physiological mechanisms identified in studies to date, have primarily focused on the benefits accruing to individuals from one-to-one type interactions with pets. This study has taken an alternative view, exploring the potential for pets to influence community level factors associated with health, such as social capital and sense of community. While the nexus between pets and health is less direct when viewed through this lens, it is a view that resonates strongly with growing interest in the social and collective determinants of health.

This study represents exploratory empirical research into an area unconsidered in both the social capital and pets and health literature to date. Although the study has its limitations, there is preliminary evidence to suggest a potential relationship between pets and social capital, and between pets and some community level influences on health that merit further investigation. Given the prevalence of pet ownership in many nations, and continuing conjecture around both the unpacking and building of social capital, this is an area that is of potential relevance to both public health researchers and practitioners. In the Australian context at least, there is also parallel mounting interest in veterinary, animal management and local government spheres in the social and community impacts of pets, and the possible nexus between pets and social capital and health resonates with this.

The design of future research should be informed by the methodological and sample size limitations reported in this study, as well as by the suggestions for future research identified in the discussion section. Such methodological considerations may also be of relevance to those interested in exploring other potential social or community benefits of pet ownership.

Current public health priorities in developed countries include physical inactivity, obesity, and mental health, and pets can potentially mediate health improvements in each of these areas. But overlaying these specific health issue priorities, are global concerns about social determinants of health, psychosocial risk factors, and the erosion of social capital. The results of this study suggest that here too, pets have the potential to make a difference.

Sustainability is another 21st century buzz word, and many public health interventions struggle to sustain their presence and impact in the community. In this regard, pets represent an under-utilised opportunity, as they are often a long term, integrated and much loved component of people's lives. Many of the potential physical, psychological and psychosocial benefits associated with pets have the capacity to be self-sustaining (at least for the duration of the life of the pet). And with pet ownership rates of more than 50% in many countries, the window of opportunity is wide.

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References

Adkins, S., & Rajecki, D. (1999). Pets 'roles in parents' bereavement. *Anthrozoos*, *12*(1), 33–42.

Allen, D. (1997). Effects of dogs on human health. *Journal of the American Veterinary Medical Association*, *210*, 1136–1139.

Allen, K. (2001). Dog ownership and control of borderline hypertension: A controlled randomized trial. *22nd Annual*

Scientific Sessions of the Society of Behavioural Medicine, Seattle.

Allen, K., & Blascovich, J. (1996). The value of service dogs for people with severe ambulatory disabilities. A randomized controlled trial. *Journal of the American Medical Association*, *275*(13), 1001–1006.

Allen, K., Blascovich, J., & Mendes, W. (2002). Cardiovascular reactivity and the presence of pets, friends and spouses: The truth about cats and dogs. *Psychosomatic Medicine*, *64*(5), 727–739.

Anderson, W. (1996). The benefits of pet ownership. *Medical Journal of Australia*, *164*, 441–442.

Anderson, W., Reid, C., & Jennings, G. (1992). Pet ownership and risk factors for cardiovascular disease. *Medical Journal of Australia*, *157*(5), 298–301.

APPMA (2003). 2003/2004 *National pet owners survey*. Greenwich: American Pet Products Manufacturers Association.

Australian Bureau of Statistics (2002). *Census of population and housing: Selected social and housing characteristics, Australia* (catalogue 2015.0). Canberra: ABS.

Banks, M., Gonser, P., & Banks, W. (2001). Animal assisted therapy in the treatment of loneliness in long-term care facility residents. *The Gerontologist*, *201*.

Banman, J. (1995). Animal-assisted therapy with adolescents in a psychiatric facility. *Journal of Pastoral Care*, *49*(3), 274–278.

Barak, Y., Savorai, O., Mavashev, S., & Beni, A. (2001). Animal-assisted therapy for elderly schizophrenic patients: A one-year controlled trial. *American Journal of Geriatric Psychiatry*, *9*(4), 439–442.

Bauman, A., Schroeder, J., Furber, S., & Dobson, A. (2001). The epidemiology of dog walking: An unmet need for human and canine health. *Medical Journal of Australia*, *175*, 632–634.

Baun, M., Bergstrom, N., Langston, N., & Thoma, L. (1984). Physiological effects of human/companion animal bonding. *Nursing Research*, *33*(3), 126–129.

Baun, M., Oetting, K., & Bergstrom, N. (1991). Health benefits of companion animals in relation to the physiologic indices of relaxation. *Holistic Nursing Practice*, *5*(2), 16–23.

Beck, A., & Meyers, N. (1996). Health enhancement and companion animal ownership. *Annual Review of Public Health*, *17*, 247–257.

Bolin, S. (1987). The effects of companion animals during conjugal bereavement. *Anthrozoos*, *1*(1), 26–35.

Brasic, J. (1998). Pets and health. *Psychological Reports*, *83*(3 Part 1), 1011–1024.

Brodie, S. J., & Biley, F. C. (1999). An exploration of the potential benefits of pet-facilitated therapy. *Journal of Clinical Nursing*, *8*(4), 329–337.

Brownson, R., Chang, J., Eyler, A., Ainsworth, B., Kirtland, K., Saelens, B., & Sallis, J. (2004). Measuring the environment for friendliness toward physical activity: A comparison of the reliability of 3 questionnaires. *American Journal of Public Health*, *94*(3), 473–483.

Buckner, J. (1988). The development of an instrument to measure neighborhood cohesion. *American Journal of Community Psychology*, *16*(6), 771–791.

Bunker, S., Colquhoun, D., Esler, M., Hickie, I., Hunt, D., Jelinek, V., et al. (2003). "Stress" and coronary heart disease: Psychosocial risk factors. *Medical Journal of Australia*, *178*(17 March), 272–276.

Byles, J., Tavener, M., O'Connell, R., Nair, B., Higginbotham, N., Jackson, C., et al. (2004). Randomised controlled trial of health assessments for older Australian veterans and war widows. *Medical Journal of Australia*, *181*(4), 186–190.

Carmack, B. (1991). The role of companion animals for persons with AIDS/HIV. *Holistic Nursing Practice*, *5*(2), 24–31.

Castelli, P., Hart, L., & Zasloff, R. (2001). Companion cats and the social support systems of men with AIDS. *Psychological Reports*, *89*(1), 177–187.

Churchill, M., Safaoui, J., McCabe, B., & Baun, M. M. (1999). Using a therapy dog to alleviate the agitation and desocialization of people with alzheimer's disease. *Journal of Psychosocial Nursing & Mental Health Services*, *37*(4), 16–22.

Cole, K., & Gawlinski, A. (1995). Animal assisted therapy in the intensive care unit. *Research Utilisation*, *30*(3), 529–536.

Collis, G., McNicholas, J., & Harker, R. (2003). *Could enhanced social networks explain the association between pet ownership and health*? unpublished paper, Department of Psychology, University of Warwick.

Cox, E. (1995). *A truly civil society: 1995 Boyer lectures*. Sydney: Australian Broadcasting Corporation.

Cusack, O. (1988). *Pets and mental health*. New York: Haworth Press.

Daly, A., Saunders, D., & Roberts, L. (2001). *Collaborative health and wellbeing survey (2000)*. Perth: Health Department of Western Australia.

Dembicki, D., & Anderson, J. (1996). Pet ownership may be a factor in improved health of the elderly. *Journal of Nutrition for the Elderly*, *15*(3), 15–31.

Eddy, T. (1996). RM and Beaux: Reductions in cardiac activity in response to a pet snake. *Journal of Nervous & Mental Disease*, *184*, 573–575.

Edney, A. (1992). Companion animals and human health. *Veterinary Record*, *130*(14), 285–287.

Endenburg, N., & Baarda, B. (1995). The role of pets in enhancing human well-being. Effects on child development. In I. Robinson (Ed.), *The Waltham book of human animal interaction: Benefits and responsibilities of pet ownership*. Oxford: Pergamon Press.

Ferrary, M. (2002). Trust and social capital in the regulation of lending activities. *Journal of Socio-Economics*, *31*(6), 673–699.

Friedmann, E. (1995). The role of pets in enhancing human well-being: Physiological effects. In I. Robinson (Ed.), *The Waltham book of human–animal interaction: Benefits and responsibilities of Pet Ownership* (pp. 33–53). Oxford; Pergamon Press.

Friedmann, E., & Thomas, S. (1995). Pet ownership social support and one-year survival after acute myocardial infarction in the Cardiac Arrhythmia Suppression Trial (CAST). *American Journal of Cardiology*, *76*(17), 1213–1217.

Garrity, T., & Stallones, L. (1998). Effects of pet contact on human well-being. In C. Wilson, & D. Turner (Eds.), *Companion animals in human health* (pp. 3–22). Thousand Oaks, CA: SAGE Publications.

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

Giles-Corti, B., Wood, L., Donovan, R., Rosenberg, M., Saunders, J., & Mills, C. (2004). Opportunities and challenges

for promoting health in a changing world. *Health Promotion Journal of Australia*, *15*(1), 17–23.

Harlock Jackson, Blackshaw, J., & Marriott, J. (1995). *Public open space and dogs*. Victoria: Prepared for the Petcare Information and Advisory Service.

Harvard University, Kennedy School of Government (2000). *The social capital community benchmark saguaro seminar*. Civic engagement in America, Harvard University.

Heady, B., Grabka, M., Kelley, J., Reddy, P., & Tseng, Y. (2002). Pet ownership is good for your health and saves public expenditure too: Australian and German longitudinal evidence. *Australian Social Monitor*, *5*(4), 93–99.

Herrald, M., Tomaka, J., & Medina, A. (2002). Pet ownership predicts adherence to cardiovascular rehabilitation. *Journal of Applied Social Psychology*, *32*(6), 1107–1123.

Holcomb, R., & Meacham, M. (1989). Effectiveness of an animal-assisted therapy program in an inpatient psychiatric unit. *Anthrozoos*, *2*, 259–264.

Holtgrave, D., & Crosby, R. (2003). Social capital, poverty, and income inequality as predictors of gonorrhoea, syphilis, chlamydia and aids case rates in the United States. *Sexually Transmitted Infections*, *79*(1), 62–64.

Hunt, S., Hart, L., & Gomulkiewicz, R. (1992). Role of small animals in social interactions between strangers. *Journal of Social Psychology*, *132*, 245–256.

Hyde, K., Kurdek, L., & Larson, P. (1983). Relationships between pet ownership and self-esteem, social sensitivity, and interpersonal trust. *Psychological Reports*.

Jennings, G., Reid, C., Christy, D., Jennings, J., Anderson, W., & Dart, A. (1998). Animals and cardiovascular health. In C. Wilson, & D. Turner (Eds.), *Companion animals in human health*. Philadelphia: University of Pennsylvania Press.

Jessen, J., Cardiello, F., & Baun, M. (1996). Avian companionship in alleviation of depression, loneliness, and low morale of older adults in skilled rehabilitation units. *Psychological Reports*, *78*(1), 339–348.

Katcher, A., Segal, H., & Beck, A. (1984). Contemplation of an aquarium for the reduction of anxiety. In R. Anderson, B. Hart, & L. Hart (Eds.), *The pet connection: Its influence on our health and quality of life*. St Paul MN: Globe Publishing Co.

Kawachi, I., Kennedy, B., Lochner, K., & Prothrowstith, D. (1997). Social capital, income inequality, and mortality. *American Journal of Public Health*, *87*(9), 1491–1498.

Kessler, R., Andrews, G., Colpe, L., Hiripi, E., Mroczek, D., Normand, S., et al. (2002). Short screening scales to monitor population prevalence and trends in nonspecific psychological distress. *Psychological Medicine*, *32*(6), 959–976.

Kidd, A., & Kidd, R. (1994). Benefits and liabilities of pets for the homeless. *Psychological Reports*, *74*, 715–722.

Kleinbaum, D., & Klein, M. (2002). *Logistic regression: A self-learning text*. New York: Springer.

Landis, J., & Koch, G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, *33*, 159–174.

Lavrakas, P. (1993). *Telephone survey methods: Sampling, selection and supervision*. Newbury Park: Sage Publications.

Lindstrom, M. (2003). Social capital and the miniturization of community among daily and intermittent smokers: A population-based study. *Preventive Medicine*, *36*(2), 177–184.

Macintyre, S., & Ellaway, A. (2000). Neighbourhood cohesion and health in socially contrasting neighbourhoods: Implications for the social exclusion and public health agendas. *Health Bulletin*, *58*(6), 450–456.

Marmot, M., & Wilkinson, R. (1999). *Social determinants of health*. Oxford: Oxford University Press.

McHarg, M., Baldock, C., Heady, B., & Robinson, A. (1995). *National people and pets survey*. Sydney: Urban Animal Management Coalition.

McKenzie, K., Whitley, R., & Weich, S. (2002). Social capital and mental health. *British Journal of Psychiatry*, *181*, 280–283.

McNicholas, J., & Collis, G. (2000). Dogs as catalysts for social interactions: Robustness of the effect. *British Journal of Psychology*, *91*(1), 61–70.

Melson, G., Schwarz, R., & Beck, A. (1997). Importance of companion animals in children's lives—implications for veterinary practice. *Journal of the American Veterinary Medical Association*, *211*(12), 1512–1518.

Messent, P. (1983). Social facilitation of contact with other people by pet dogs. In A. Katcher, & A. Beck (Eds.), *New perspectives on our lives with companion animals* (pp. 37–46). Philadelphia: University of Pennsylvania Press.

Modra, C., Baum, F., Cooke, R., Murray, C., Bush, R., & Cox, E. (1998). Exploring social capital—levels of participation, trust and health in a suburban region of Adelaide, South Australia. *30th Annual Public Health Association Conference*. Hobart.

Parslow, R., & Jorm, A. (2003). Pet ownership and risk factors for cardiovascular disease: Another look. *Medical Journal of Australia*, *179*(3), 466–468.

Patronek, G. J., & Glickman, L. T. (1993). Pet ownership protects against the risks and consequences of coronary heart disease. *Medical Hypotheses*, *40*(4), 245–249.

PIAS. (2002). *Pet ownership in Australia*. Melbourne: Petcare Information and Advisory Service.

Putnam, R. (1996). The strange disappearance of civic America. *The American Prospect*, *7*, 1–18.

Robins, D., Sanders, C., & Cahill, S. (1991). Dogs and their people: pet-facilitated interaction in a public setting. *Journal of Contemporary Ethnography*, *20*(1), 3–25.

Rogers, J., Hart, L. A., & Boltz, R. P. (1993). The role of pet dogs in casual conversations of elderly adults. *The Journal of Social Psychology*, *133*, 265–277.

Sember, R. (2004). To think peace in a time of war. *American Journal of Public Health*, *94*(1), 10.

Serpell, J. (1991). Beneficial effects of pet ownership on some aspects of human health and behaviour. *Journal of the Royal Society of Medicine*, *84*(12), 717–720.

Sharp, J., & Smith, M. (2003). Social capital and farming at the rural–urban interface: The importance of nonfarmer and farmer relations. *Agricultural systems*, *76*(3), 913–927.

Siegel, J. M. (1990). Stressful life events and use of physician services among the elderly: The moderating role of pet ownership. *Journal of Personality & Social Psychology*, *58*(6), 1081–1086.

Siegel, J. (1993). Companion animals: In sickness and in health. *Journal of Social Issues*, *49*(1), 157–167.

Siegel, J., Angulo, F., Detels, R., Wesch, J., & Mullen, A. (1999). AIDS diagnosis and depression in the multicenter AIDS cohort study: The ameliorating impact of pet ownership. *AIDS Care*, *11*(2), 157–170.

Vines, G. (1993). Secret power of pets. *New Scientist*, *1894*, 30–34.

Wall, E., Ferrazzi, G., & Schryer, F. (1998). Getting the goods on social capital. *Rural Sociology*, *63*(2), 301–322.

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

Wood, L. (2000). *Social capital, physical environments and health: Study funded by Healthway starter grant*. Perth: The University of Western Australia.

Wood, L. (2005). *Social capital, mental health and the environments in which people live* (Ph.D.). Perth: School of Population Health, The University of Western Australia.

Woolcock, M. (1998). Social capital and economic development: Towards a theoretical synthesis and policy framework. *Theory and Society*, *27*, 151–208.

World Health Organisation. (2002). *World report on violence and health*. Geneva: WHO.