



The Role of Pets in Human Healthy Active Aging



Enter

Written by:
Kathy Kruger and
Dr. Sandra McCune, Mars Petcare

Foreword by Prof. Barbara Resnick,
University of Maryland

With thanks to Dr. Ian McDonough,
University of Alabama, for his review of the content

Content developed and reviewed in collaboration
with The Gerontological Society of America

Contact:
Mars Petcare UK
Mill Street, Melton Mowbray
LE13 1BB
United Kingdom
email: contactwaltham@effem.com

Publisher:
Sleek Creative Ltd
www.sleekcreative.co.uk

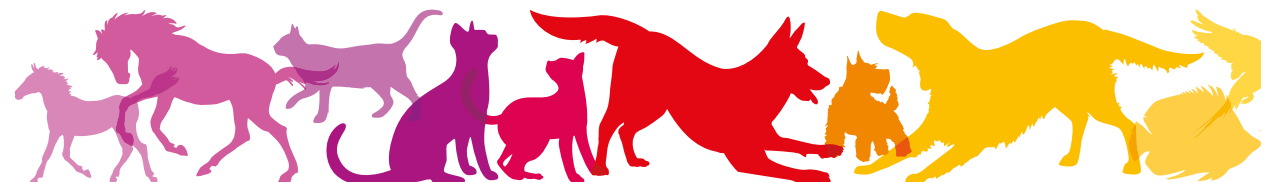
DISCLAIMER
This book was written to inform the reader and is not a medical or
veterinary guide. It should not be used as an alternative to seeking
veterinary consultation or intervention where necessary.

PROPRIETARY AND CONFIDENTIAL FOR MARS INC. AND WITH THE
AGREEMENT THAT IT IS NOT TO BE OTHERWISE USED OR REPRODUCED
WITHOUT THE PRIOR WRITTEN CONSENT OF MARS, INC. COPYRIGHT® 2018,

MARS, INC. ALL RIGHTS INCLUDING TRADE SECRET RIGHTS RESERVED.

TABLE OF CONTENTS

Foreword	3	<i>Disease Transmission</i>	23
Introduction	9	<i>Sacrificing for the Sake of the Pet</i>	24
The Roles of Pets in Physical, Emotional, and Social Well-being	11	<i>Housing</i>	24
Physical Health	12	<i>Pet Loss and Bereavement</i>	24
<i>Heart & Cardiovascular Health</i>	12	Pet Health and Welfare Considerations	26
<i>Physical Activity & Mobility</i>	14	<i>Space and Exercise Requirements</i>	26
<i>Stress Reduction</i>	15	<i>Pet Health Care</i>	26
Emotional and Social Well-Being	17	<i>Finances</i>	26
<i>Social Support and Social Facilitation</i>	17	Making HAI Possible for Older Adults	27
<i>Having a Sense of Purpose</i>	18	Finances and Housing	28
<i>Feelings of Safety & Security</i>	18	<i>Finances</i>	28
<i>Depression and Bereavement</i>	18	<i>Housing</i>	28
<i>Social Capital and Community Engagement</i>	19	Fears of Outliving or Being Unable to Care for Pets	29
Economic Impact of Pets	20	When Pet Ownership Is Not Possible	30
Pet Ownership in Older Adulthood: Risks, Challenges, and Considerations	21	Animal-Assisted Interventions	32
Human Health and Safety Considerations	22	Depression	33
<i>Falls</i>	22	Cognitive Impairment	34
<i>Bites</i>	23	HAI in Long-Term Care Facilities	35
		The Promise of Research	39
		References	41

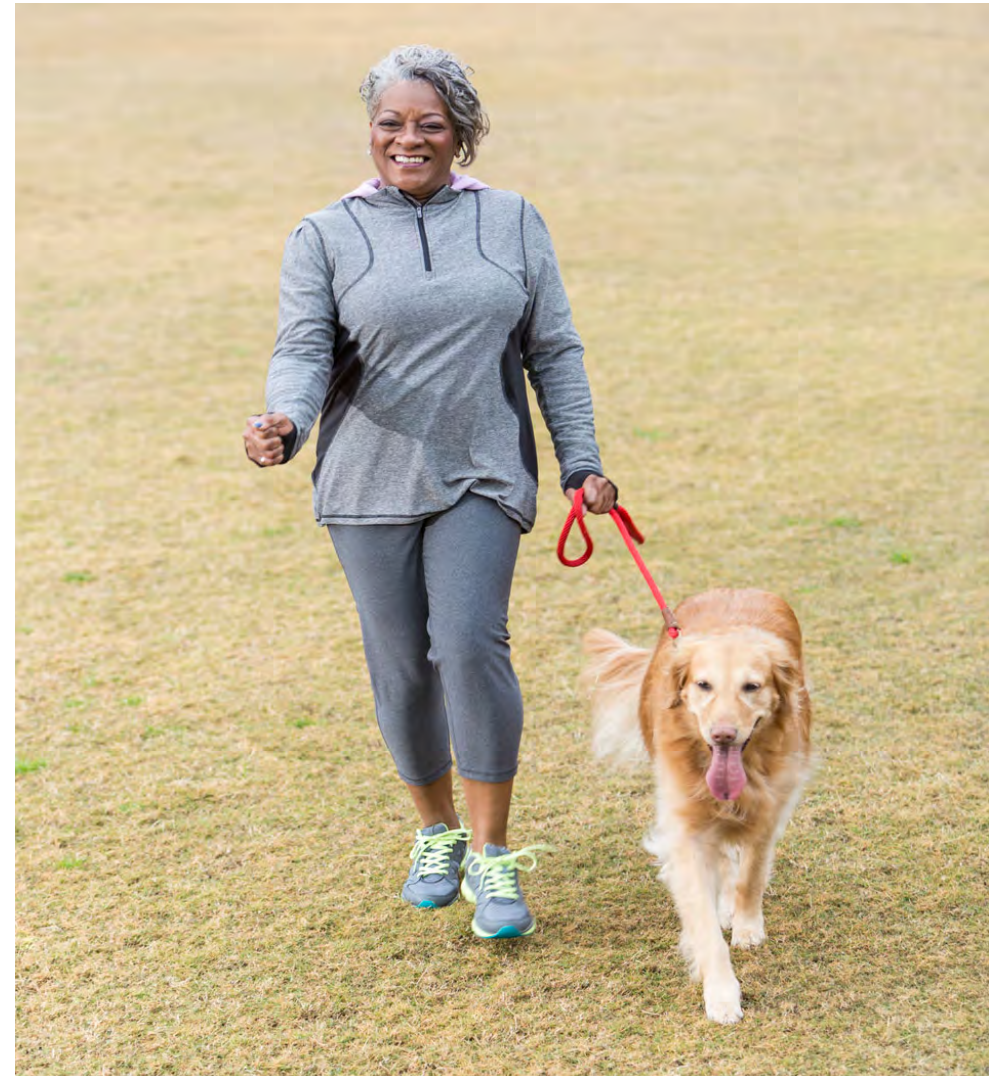




Foreword

By Professor Barbara Resnick,
University of Maryland School of Nursing,
Baltimore, MD, USA.

Increasingly in geriatrics and gerontology we are focused on using and providing behavioral interventions to optimize older adults' physical and psychological health and quality of life. The human-animal bond, defined as 'a mutually beneficial and dynamic relationship between people and animals that is influenced by behaviors essential to the health and well-being of both'^[1], is foundational to important human-animal interaction (HAI) with known positive benefits to older adults. With regard to physical health, there is repeated evidence that pet ownership, with the majority of the findings focused on pet ownership of a dog, results in increased time spent in physical activity including increased time in moderate level physical activity. In addition, pet ownership has been reported to be associated with better cardiovascular health including reduced hypertension and improved survival rates following cardiac events. Similarly, pet ownership has been noted to decrease stress among older adults. Some studies of pet owners have found an association with health benefits with regard to boosting immunities and resistance to disease. More research is needed to better understand the potential disease risks of pets to older adults as well as health benefits. Pet owners also tend to require fewer visits to primary care providers which may also be due to better overall health.



In addition to physical health, the benefits of pet ownership to psychological health and well-being are also experienced by older adults. The interaction with the pet provides companionship for older individuals but equally important are the relationships that individuals experience by virtue of pet ownership. Walking a dog in the neighborhood, for example, often results in meeting others doing likewise and engaging in relationships or interactions with these individuals on a daily basis. Dog ownership and walking facilitates a sense of community and safety within the neighborhood which is particularly important for older adults who may otherwise become isolated. Working in a continuing care retirement community I have heard from many residents that having a dog has been a great way for them to get to know other residents as the dog serves as an “ice breaker” to talk with and meet others.



From a psychological perspective dog ownership also provides older adults with a sense of purpose in life. There is a reason to get up in the morning as there is someone that they need to provide care for. This sense of purpose may be what helps decrease depression for older adults who are pet owners. The pet also provides structure for the day. Pet care can even be tied to personal care activities such as needing to dress, to walk the dog or linking medication administration to feeding their pet.

For older adults, particularly for women and for those living alone, pets can facilitate a sense of safety in and outside of the home. This has important implications for helping older adults to remain in home settings as they age.

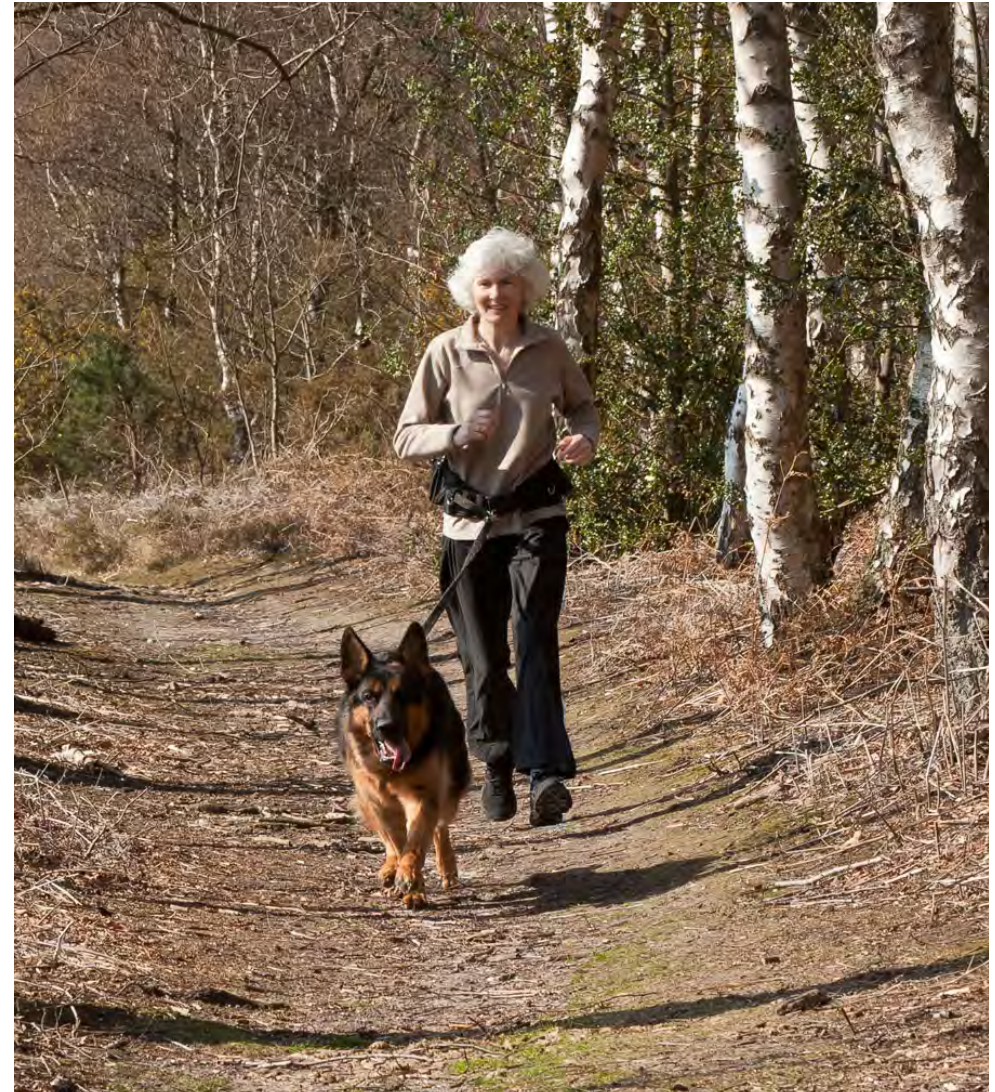
Given the benefits of HAI, it is critically important that we work in the field of aging to facilitate older adults' ability to have a pet and/or experience the pleasures associated with interacting with animals.

Nursing homes have had visiting pets since the 1980s, with an increasing percentage of facilities having formal programs arranged to facilitate these experiences for older adults. This is likewise noted in assisted living settings. Further there is increased recognition for the therapeutic value of HAI through animal assisted interventions. It is critically important we make these programs available and accessible to



those who might benefit. Some older adults living in the community may wish to have exposure to animals but may no longer want the responsibility of having a pet of their own or may not be able to provide the care needed for that pet. They should be matched with alternatives to assure HAI. Opportunities include such things as volunteering in pet shelters or pet care facilities, providing respite care for pet owners, sharing a pet with a family member or fostering a pet for brief periods.

Despite all the benefits associated with HAI, there are associated risks that also should be recognized and managed. One of the most common risks associated with having a pet is falls. Falls associated with pet ownership or interactions occur due to tripping over the pet, tripping or getting tangled in leashes or falling when walking the pet due to such things as uneven sidewalks or trying to manage getting in and out of doorways with the pet. There is also the risk of getting bitten or scratched by a pet or acquiring a disease spread by pets, particularly for the older immunocompromised individual. The risk of future pet bereavement for the older individual following the death of a pet is also a concern as is the financial impact of pet ownership for some. Lastly, there is the risk of pet safety if the older adult becomes unable to care appropriately for the pet.



This booklet provides a concise and comprehensive review of the benefits and risks associated with HAI and ways to optimize HAI for all older adults. The empirical support for HAI is growing and we thank WALTHAM, part of Mars Petcare, for facilitating the funding opportunities through partnerships with the National Institutes of Health and The Gerontological Society of America. We need to continue to explore the benefits of HAI for older adults, consider how to deliver animal-assisted interventions that deliver the most efficacious results, gain an appreciation of who is most likely to benefit, and consider and test ways to disseminate and implement HAI across a variety of clinical settings.

Barbara Resnick, Past President of The Gerontological Society of America



Introduction

Populations are aging in nearly all countries of the world. Globally, the number of older persons is expected to more than double by the year 2050⁽²⁾. Furthermore, the older population itself is aging, with the oldest segment growing faster than the younger segment due to increasing life expectancy⁽³⁾. Worldwide, the population aged 80 and older is projected to more than triple by 2050⁽³⁾.

Given population projections, and the increased prevalence of non-communicable diseases and disability that accompany an aging population, it is important to identify cost-effective, non-pharmacological, easily implemented approaches to maximize not only the years that we live, but the health, quality, and independence of those years. This has led to the development of concepts such as 'successful aging'⁽⁴⁾ (sometimes referred to as 'healthy aging' or 'active aging'), which emphasize the role of lifestyle choices in mitigating the effects of aging, and the importance of older adults remaining engaged in social, economic, cultural, spiritual, and civic affairs⁽⁵⁾.



In the United States (US), an estimated 37% of those between the ages of 50-67 share their lives with pets with this figure declining sharply to 9% for those aged 68 and over⁽⁶⁾. A body of research has emerged suggesting that pet ownership — or more broadly, human-animal interaction (HAI) — may offer a range of potential benefits that can support older adults in retaining their physical and mental health, independence, social connectedness and engagement, and may even reduce some symptoms of dementia⁽⁷⁾. The remainder of this booklet seeks to examine some of the research on pet ownership and HAI in older adulthood, and highlight the ways in which relationships with animals may provide avenues to successful aging.





The Roles of Pets in Physical, Emotional, and Social Well-being

The Roles of Pets in Physical, Emotional, and Social Well-being

Physical Health



Heart & Cardiovascular Health

In 1980, results of groundbreaking research on the health benefits of pets were published. In this study, Dr. Erika Friedmann found that pet ownership made a significant difference in the survival rate for heart attacks — 94% of the heart patients with pets survived serious heart attacks for at least a year, compared to 72% without pets⁽⁸⁾. The significance of these findings — that pets might actually enhance survival — attracted substantial attention from the medical and scientific communities, and paved the way for HAI as a legitimate field of study.



The Roles of Pets in Physical, Emotional, and Social Well-being

Physical Health (cont.)



Heart & Cardiovascular Health (cont.)

Dr. Friedmann's early and subsequent works continue to inform the field of HAI research, and have led to many other studies of the cardiovascular benefits of pet ownership. Some of the studies have shown that pet ownership not only reduces some of the risk factors for cardiovascular disease, but may also help to slow the progression of existing disease, and may enhance survival in cardiac patients. For example, studies have demonstrated that pet owners have lower systolic blood pressure, plasma triglycerides, and cholesterol⁽⁹⁾, and healthier physiologic responses to stress^(10,11). For older adults with existing hypertension, the presence of a dog has been associated with lower systolic and diastolic blood pressure during normal day-to-day activities, suggesting that dog ownership may help to slow the progression of hypertension⁽¹²⁾. Pet ownership has also been associated with enhanced cardiovascular disease survival. An Australian study found that owning a pet at any point during one's lifetime (i.e., previous or current pet ownership) was associated with a 22 and 26% reduction, respectively, in mortality due to cardiovascular disease⁽¹³⁾. Pet owners may also be more likely to adhere to cardiac rehabilitation programs⁽¹⁴⁾, which may help to explain pet owners' enhanced survival after cardiac events.

While not all studies have produced positive findings⁽¹⁵⁾, evidence for the cardiovascular benefits of pet ownership has reached a level of maturity such that the American Heart Association — the United States' oldest and largest voluntary organization dedicated to fighting heart disease and stroke — issued the following statements:

- Pet ownership, particularly dog ownership, is probably associated with decreased cardiovascular disease (CVD) risk.
- Pet ownership, particularly dog ownership, may have some causal role in reducing CVD risk⁽¹⁶⁾.

Repeated positive findings have given the scientific and medical communities increased confidence in the cardiovascular benefits that pet ownership can provide, but the question of causality remains. Are the benefits due to increased physical activity (e.g., dog walking)? Is it the social support that pets can provide? Do people who are already healthier and more active choose to own pets? Is it some combination of these and/or different elements?

The Roles of Pets in Physical, Emotional, and Social Well-being

Physical Health (cont.)



Physical Activity & Mobility

It is well-known that regular physical activity reduces the risk of cardiovascular disease, hypertension, and a variety of other diseases⁽¹⁷⁾, and a number of studies have found that older adult dog owners engage in more walking and physical activity than non-owners, and are more likely to achieve recommended levels of physical activity. For example, researchers in the United Kingdom (UK) found that older adult dog owners averaged 22 additional minutes of walking per day (approximately 2,760 steps), and were more likely to meet the physical activity guidelines of 150 minutes of moderate intensity activity per week⁽¹⁸⁾. Similarly, a study from Japan found that older adult dog walkers reported more minutes per week of moderate — to vigorous — intensity physical activity (MVPA), total physical activity, and were more likely to be sufficiently active than non-dog owners, and owners who did not walk their dog⁽¹⁹⁾. Further work from the UK found that not even bad weather prevents older adults from walking their dogs. Even on days with lower temperatures, greater precipitation, and fewer hours of sunlight, older adults who walked their dogs regularly recorded 20% more physical activity than non-dog owners, and were sedentary for approximately 30 fewer minutes per day⁽²⁰⁾.



The Roles of Pets in Physical, Emotional, and Social Well-being

Physical Health (cont.)



Maintaining health and physical mobility is an important component of preserving independence, and in a longitudinal study of 2533 older adults (aged 71-82 years), dog owners were more than twice as likely to maintain their mobility over a 3 year period than non-dog owners, and they were more likely to walk faster and meet the recommended guidelines for physical activity⁽²¹⁾. Pet owners over age 65 are also more likely to maintain their activities of daily living, such as climbing stairs, preparing meals, and bathing independently⁽²²⁾. Dogs, in particular, appear to help keep people active and provide a reason to get up in the morning.

A recent population-based study examining the impact of dog walking on the health of older adults used data from the US Health and Retirement Study (HRS), which included an HAI module that Mars Petcare helped to create⁽²³⁾. The HRS is a nationally-representative, longitudinal study of the health and economic well-being of adults age 50 and older in the US. Results indicated that dog walking was associated with lower body mass index, fewer limitations in activities of daily living, fewer doctor visits, and more frequent moderate and vigorous exercise. Those reporting a stronger bond with their dog were more likely to engage in dog walking⁽²³⁾.

Stress Reduction

Increased physical activity would be a simple explanation for the cardiovascular benefits of pet-keeping if we were only considering dog owners (and if everyone who had a dog walked it), but some studies have found that cardiovascular and other health benefits accrue to cat owners as well⁽²⁴⁾, although the results related to cat ownership have been more mixed⁽¹²⁾. Loneliness and social isolation have a profound impact on human health and psychological well-being, and some have theorized that the companionship provided by pets may confer health and psychological benefits by reducing stress, providing direct social support, and helping pet owners to stay socially engaged.

The Roles of Pets in Physical, Emotional, and Social Well-being

Physical Health (cont.)



Chronic stress increases the body's release of the stress hormone, cortisol, which in turn suppresses immune function. Social support has been shown to act as a buffer against the stresses of everyday life⁽²⁵⁾, and research has demonstrated that people who share their homes with pets have healthier physiologic responses to stress, including lower baseline heart rate and blood pressure, and less cardiovascular reactivity to, and faster recovery from, mild stressors^(10,11). Even in the face of significant stressors — such as the loss of a spouse or close friend — pet ownership appears to mitigate the negative health consequences of stress. In a study of physician visits among Medicare recipients in California, experiencing multiple negative life events resulted in a higher number of doctor visits for those without pets, but this same increase was not seen in pet owners, particularly dog owners⁽²⁶⁾.



The Roles of Pets in Physical, Emotional, and Social Well-being

Emotional and Social Well-Being



Social Support and Social Facilitation

As one ages, social networks may become smaller and the social support provided by pets may be of particular importance for older adults. A study using data from the English Longitudinal Study of Ageing (ELSA), which surveyed individuals aged 52 and over, found that more than one third (34%) of all respondents reported being lonely often or some of the time, and this figure increased to nearly half (46%) for those over the age of 80⁽²⁷⁾. Living alone, having infrequent social contact, and having few social network connections are all markers of social isolation⁽²⁸⁾. Loneliness in older adulthood has been associated with depression⁽²⁹⁾, lower overall life satisfaction⁽²⁷⁾, and with reductions in mobility and activities of daily living^(27,30). In a recent meta-analysis of 70 studies, the likelihood of death was 26% higher for those reporting loneliness, 29% higher for those experiencing social isolation, and 32% higher for those living alone⁽²⁸⁾. Studies examining the role of pets in reducing loneliness in older adults have produced mixed findings, with some demonstrating an association between pet ownership and lower levels of loneliness⁽³¹⁾ and others finding no significant effect⁽³²⁾. The authors of a recent systematic review on the topic concluded that methodological weaknesses in existing research may account for this lack of clarity, and that the “anecdotal and qualitative evidence is somewhat too compelling for the theory that companion animal ownership can alleviate loneliness to be completely wrong”⁽³³⁾. Randomized controlled trials are needed to more definitively establish the relationship between pet ownership and loneliness.

Caring for spouses, friends, dependent children, and/or aging parents can help us to feel needed and can enhance our feelings of self-worth. As these opportunities to provide nurturance diminish in old age, so too can the feeling that we are valued and competent. Living in an ‘empty nest’ or living alone can bring feelings of loneliness and vulnerability; and the loss of friends, family, or partners can lead to depression. Pets may provide older adults with opportunities to feel needed and provide nurturance, can enhance perceptions of safety, and may also provide a buffer against the development of depression.

The Roles of Pets in Physical, Emotional, and Social Well-being

Emotional and Social Well-Being (cont.)



Having a Sense of Purpose

Having a low sense of purpose in life has been associated with a substantially increased risk of death in older adults⁽³⁴⁾. Because pets are completely dependent on their owners, having a pet in the home can foster a sense of usefulness, and provide a framework for daily routines. Pets require meals, attention, and grooming, all of which infuse the day with structure and meaningful activities⁽³⁵⁾. The routine of caring for a pet can also provide cues for self-care activities⁽³⁵⁾, such as pairing one's own medication schedule with a pet's mealtime.

Feelings of Safety & Security

Pets can also enhance feelings of being protected and safe, both inside and outside the home. Dogs, in particular, appear to heighten feelings of safety, with one study finding that dog owners were more likely than owners of other species to report that their pets made them feel secure⁽²⁶⁾. In a UK study, dogs were viewed as providers of safety, security, and protection, with older adult pet owners perceiving themselves to be safer when out walking accompanied by a dog and also when at home⁽³⁶⁾. The feeling of security that dogs can provide may be especially important for women, with one study finding that women were more than twice as likely as men to feel safer when out walking with a dog in their neighborhood⁽³⁷⁾.

Depression and Bereavement

Depression is a major contributor to death and disability in older adults, with one study finding that depression contributed as much to mortality as heart attacks or diabetes⁽³⁸⁾. Although research on the ability of pet ownership to prevent, alleviate, or moderate the effects of depression have produced inconsistent findings⁽³⁹⁾, a study by Friedmann & Son⁽⁴⁰⁾ found that pet ownership was not only associated with decreased mortality in patients who had suffered heart attacks (pet owners were 67% less likely to die than those without pets), but that having a pet tended to moderate the effect of depression on mortality.

The Roles of Pets in Physical, Emotional, and Social Well-being

Emotional and Social Well-Being (cont.)



Stressful life events such as bereavement, which occur more frequently in older age, can also lead to depression and deterioration in physical health. Pet ownership may buffer the impact of these stressors on the health of older adults. A strong attachment to a pet has been associated with significantly less depression in recently bereaved older adults⁽⁴¹⁾, and close relationships with pets appear to be especially important for those living alone⁽⁴²⁾, or with relatively few confidants available⁽⁴¹⁾.

Social Capital and Community Engagement

The ability of animals to act as catalysts for positive social interaction has been demonstrated across many different contexts; pets have the ability to create connections that transcend real or perceived demographic and socioeconomic differences^(43,44,45).

Social capital has been described as the 'glue' that holds societies together⁽⁴⁶⁾ as cited in Wood *et al.*⁽⁴⁷⁾, and it is generated from many types of transactions and interactions (e.g., working together on community issues; volunteering; exchanging favors; or sharing skills and information)⁽⁴⁸⁾, as cited in Wood *et al.*⁽⁴⁷⁾. Researchers working in the US and Australia have found that pets are a significant force in the creation of neighborhood cohesion. When compared to those without pets, pet owners score significantly higher on social capital (factors such as: general helpfulness, trust, reciprocity, civic engagement, and neighborhood networks)⁽⁴⁷⁾. Pet owners are also significantly more likely to get to know people in their neighborhood, and 'meeting through pets' is one of the top five ways respondents credit with getting to know their neighbors. Dog owners, in particular, are five times more likely to get to know their neighbors than owners of other types of pets, and twice as likely to forge friendships with people they meet through their pet⁽⁴⁹⁾.

The Roles of Pets in Physical, Emotional, and Social Well-being

Economic Impact of Pets



Given the many human health benefits that have been ascribed to animal companionship, and studies demonstrating that pet owners may have a reduced need for certain medications⁽⁵⁰⁾ and make fewer visits to the doctor^(23,26,50), some researchers have attempted to estimate the national health care cost savings that can be attributed to pet ownership.

Here's what they found:

Country	Year(s)	Estimated Savings	Currency	Citation
Australia	1999-2000	3.86 billion	Australian dollars	(51)
Germany	2000	5.59 billion	Euros	(51)
United Kingdom	2013	2.45 billion	Pound sterling	(52)
United States	Not specified	11.8 billion	US dollars	(53)

While these figures are impressive, health care expenditure is not the only category in which companion animals exert an impact on national budgets. To generate a true societal cost/benefit analysis of pet ownership, it is also necessary to consider revenue generated by pet related products and services, as well as the costs associated with pet ownership, such as payments associated with treating animal-related bite and fall injuries^(52,54).

While pets provide substantial societal benefits, a truly balanced economic assessment must also consider the costs associated with pets that are borne by individuals, private organizations, or local governments. For example, the cost of insurance claims related to animal-related injuries⁽⁵⁴⁾, sheltering homeless animals⁽⁵²⁾, and animal welfare law enforcement must all be taken into account.

Pet Ownership in Older Adulthood: Risks, Challenges, and Considerations



Pet Ownership in Older Adulthood: Risks, Challenges, and Considerations

Human Health and Safety Considerations



Although the benefits of pet ownership and HAI can be substantial to people in all stages of life, there are also numerous risks and challenges to be considered, some of which are unique to the life circumstances of older adults. This section outlines some of these risks, challenges, and considerations.

The commonly-cited physical hazards associated with pet ownership (i.e., falls, bites, and disease transmission) can affect people of any age, but may be of greater concern to older adults due to existing physical limitations or health problems. Beyond these risks are more complex concerns that relate to the strong bonds formed between people and their pets, such as when an owner is willing to jeopardize his or her own health and welfare to provide care for a pet, or the grief experienced when a pet dies or must be rehomed.

Falls

In 2010, the first national estimates of fall injuries related to dogs and cats were published in the US⁽⁵⁶⁾. Of these, 88% involved dogs and 11.7% involved cats. Women were more than twice as likely to be injured. The majority of injuries for both men and women were classified as fractures, contusions, or abrasions, and about half of all injuries involved the extremities. Although injuries were most frequent among children and middle-aged adults, the highest fracture rates were found among people aged 75 years and over⁽⁵⁶⁾. Given the recent surge of interest in the health benefits of dog walking for older adults, the risk of fall injuries associated with dog walking must also be considered⁽⁵⁷⁾.

Pet Ownership in Older Adulthood: Risks, Challenges, and Considerations

Human Health and Safety Considerations (cont.)

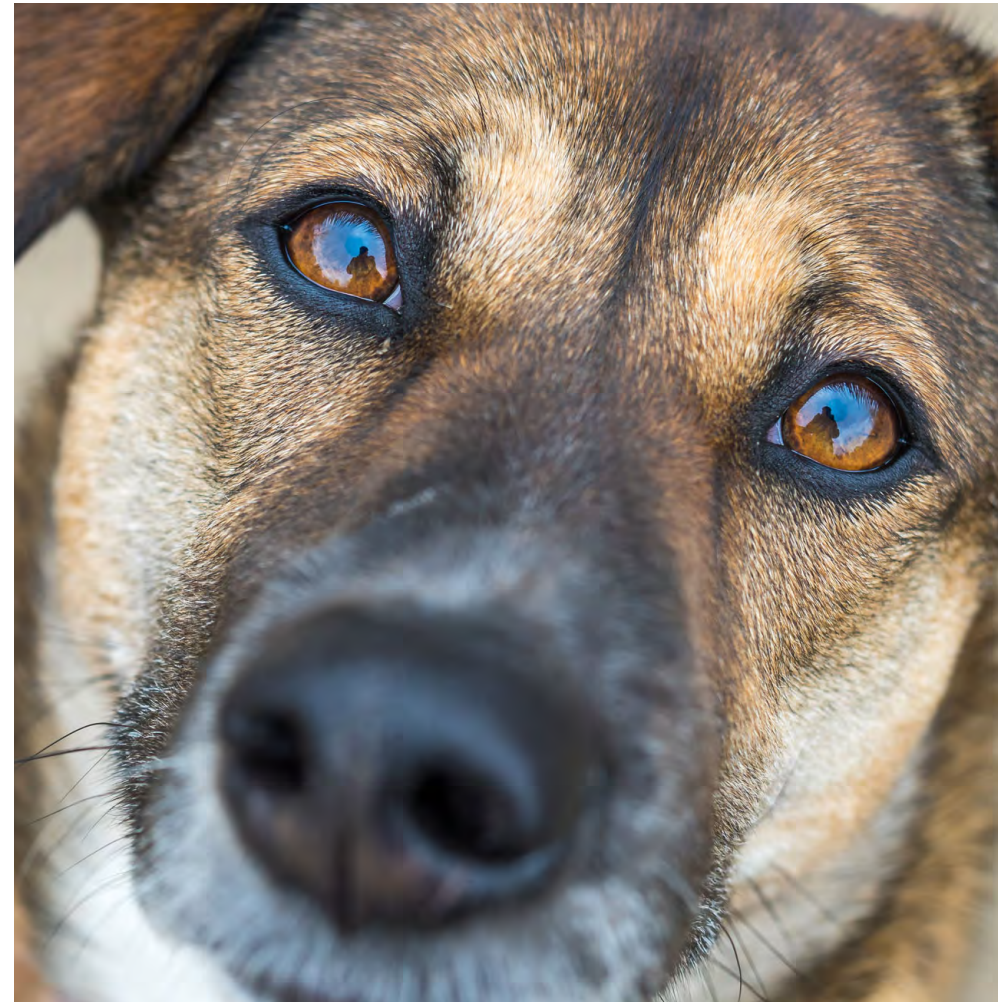


Bites

In the US, it is estimated that between 3 and 6 million people are bitten by animals each year, with the majority of bites requiring medical attention being received from dogs (80-90%) and cats (5-15%)⁽⁵⁸⁾. Infections resulting from animal bites are a concern, and sepsis can be a serious complication⁽⁵⁹⁾. Although bite-related injuries tend to decrease with age, they must still be weighed against the potential benefits of pet ownership and HAI.

Disease Transmission

Zoonoses are diseases that are transmitted from animals to humans, and they can be caused by viruses, bacteria, parasites, and fungi⁽⁵⁹⁾. Although dogs and cats can carry diseases and parasites and pass them to people⁽⁶⁰⁾ such as ringworm, Salmonella infection and toxoplasmosis, the risk of getting sick from touching or keeping pets is quite small, except for certain populations who are more susceptible due to compromised immune systems or other conditions^(61, 62). Older adults, depending on health status, may or may not have increased susceptibility.



Pet Ownership in Older Adulthood: Risks, Challenges, and Considerations

Human Health and Safety Considerations (cont.)



Sacrificing for the Sake of the Pet

Some pet owners may place the welfare of their pet above their own. Financially fragile pet owners may prioritize spending money on their pet's care, even if that means ignoring some of their own needs⁽⁶³⁾. Older pet owners may also avoid doctor visits, or delay important medical treatment, due to fears that a hospital admission will leave their pet without care^(64, 65).

Housing

Pets can be an important determinant of housing⁽⁶⁶⁾, and some older adults with pets may remain in a home that is no longer suitable for their needs due to the presence of pets (e.g., keeping a house with a yard for the dog)⁽⁶⁶⁾, or may delay a necessary transition to assisted-living out of concern for pets⁽⁶⁷⁾.

Pet Loss and Bereavement

When a pet dies, older adults may experience more distress than younger pet owners⁽⁶⁸⁾, particularly if the pet was linked to a deceased spouse or former lifestyle⁽⁶⁹⁾. The experience of pet loss can be so painful that many previous owners cite grief over a pet's death as the reason for not currently keeping pets⁽⁷⁰⁾. But death is just one form of loss, and having to give up a pet due to illness or relocation to an assisted-living facility, a concept that McNicholas calls "enforced pet loss," can also result in grief and feelings of remorse^(69,71).

Pet Ownership in Older Adulthood: Risks, Challenges, and Considerations

Human Health and Safety Considerations (cont.)



The best relationship between a person of any age and a pet is one where both parties mutually benefit. An older person adopting a dog or cat also provides a service as there are many pets in animal shelters that need a home or may be euthanized. However, it is important that the health and welfare needs of a pet are carefully considered, and whether or not they can be met by a prospective older owner, before they make this important decision.

Aging brings about physical changes in both humans and animals, and older adults faced with physical, sensory, or cognitive limitations may struggle to provide adequate care for their pets. In a study of adult protective services (APS) supervisors, more than 92% of respondents reported that workers had encountered animal neglect coexisting with a client's inability to care for him or herself⁽⁷²⁾. If the animal itself is suffering from health problems or age-related declines, the challenges to provide care may be even greater. What follows are some areas of consideration for older adults who currently own pets, their families and caregivers, and those thinking about adopting a new animal companion.



Pet Ownership in Older Adulthood: Risks, Challenges, and Considerations

Pet Health and Welfare Considerations



Space and Exercise Requirements

If mobility or balance issues are a concern, or a person plans to downsize to an apartment or condominium, a pet that requires a lot of space and exercise or frequent walks to relieve itself, may not be the best choice. Older adults may also want to consider adopting adult pets but even mature pets will have a requirement for exercise and owner time if healthy body weight and good welfare are to be protected⁽⁶³⁾. Some programs will waive the adoption fee for older adults who adopt older pets⁽⁷³⁾. In cases where dogs are not the preferred or most practical option, cats and even small birds can be excellent companions, require less space, and can be more easily cared for by owners with some physical limitations⁽⁷⁴⁾.

Pet Health Care

Routine pet care, such as giving pills, cleaning ears, and administering eye drops, can be a challenge for pet owners of any age, but can be even more difficult for someone with physical limitations⁽⁷⁵⁾. As pets age, they may develop health problems that necessitate frequent trips to the veterinarian, or may require substantial physical assistance from owners. For example, some aging pets may have trouble ascending or descending stairs. If a pet must descend steps to get outside and relieve itself, and the owner is not physically capable of lifting the pet, this can quickly develop into a dangerous situation.

Finances

Pet care can be expensive, and one must consider not only the basics, such as food, toys, routine veterinary care, and grooming, but whether there is money in the budget for unexpected costs, such as an injury or illness that requires extensive veterinary treatment. Pet health insurance is a growing field, and for those on fixed incomes, a predictable monthly premium may be easier to manage than large, unexpected veterinary bills.



Making HAI Possible for Older Adults

Making HAI Possible for Older Adults

Finances & Housing

The following section offers some strategies for overcoming barriers to pet ownership and HAI.

Finances

One of the primary barriers that adults of all ages cite for not owning pets is cost⁽⁷⁰⁾, and this may particularly be the case for older adults. To address this, specialty programs have arisen, such as Meals on Wheels, that work to keep pets with their aging owners by providing pet food and supplies, grooming, veterinary care, and boarding expenses⁽⁷⁶⁾.

Housing

The most commonly cited reason for rehoming pets is that they are not permitted in the place of residence⁽⁷⁰⁾. In the US, in the case of public or publicly-subsidized housing, as long as the resident is able to care for the pet, federal law mandates that public housing for older adults must permit pets (though this law does not apply to healthcare facilities such as nursing homes, nor to privately-owned housing and facilities)^(71, 77). Although privately-owned properties are not required to permit pets, an increasing number are allowing and encouraging pet ownership, though many have restrictions on the number and size of pets⁽⁷⁸⁾, which may still mean difficult decisions for owners with multiple or larger pets.



Making HAI Possible for Older Adults

Fears of Outliving or Being Unable to Care for Pets



Older adults often forego pet ownership due to fears about outliving their pets, and worries about what will happen to their pet if they become disabled or otherwise unable to provide care⁽⁷⁹⁾. Many breeders, shelters, and rescues require that pets be returned to them if the owner is no longer able or willing to provide care, and obtaining a pet from an individual or organization that stipulates this as a requirement may provide some peace of mind. Specialty programs have also emerged in response to these common fears. Programs now exist that allow owners to pre-register their pets, and if the owner dies, the organization will collect the pets and attempt to find them new homes⁽⁸⁰⁾. Although these requirements and programs are admirable, and much-needed, the thought of beloved pets spending time in kennels and shelters, and being placed in homes of unknown quality, may not provide sufficient comfort for many pet owners.

An alternative approach that may be more appealing is the creation of a 'pet trust' or pet protection agreement. It is a myth that including instructions about one's pet in a will is sufficient to ensure their ongoing care⁽⁸¹⁾. Wills are designed to disburse property, but they are not useful in situations where a pet owner is still alive and cannot provide care, and they may not ensure that funds earmarked for the pet will actually be spent in the way the owner intended⁽⁸¹⁾. Pet trusts and pet protection agreements control how funds are disbursed, and allow provisions related to incapacity; for example, it can be specified that owner and pet must stay together if a move to a long-term care facility becomes necessary⁽⁸¹⁾. Pet trusts and pet protection agreements provide additional benefits that cannot be achieved with a will, and may help to assuage owners' fears about what will happen to their pets if they are no longer able to provide care. While the creation of a pet trust requires the services of an attorney and can be expensive to establish, pet protection agreements were designed to be an affordable alternative that can be created without a lawyer⁽⁸¹⁾.

Making HAI Possible for Older Adults When Pet Ownership Is Not Possible



Full-time pet ownership may not be possible or appealing for everyone, but for older adults who enjoy spending time with animals, more options are becoming available. Fostering pets, or caring for pets that belong to others, such as those belonging to neighbors, deployed members of the military, or other family members, are all possibilities. Local animal shelters and rescues may also offer volunteer opportunities. Programs such as Dog Dates⁽⁸²⁾ can pair older adults who would like to spend time walking a dog with dogs who would benefit from benefit from the exercise.



Making HAI Possible for Older Adults When Pet Ownership Is Not Possible (cont.)

For those without physical limitations that would enjoy the challenges of a new puppy, 'puppy raising' may be something to consider. Organizations that train guide and service dogs often place puppies in temporary homes with volunteers until they are old enough to begin their formal training (usually about a year). These programs offer the fun (and interrupted sleep) of raising a puppy, but without the long-term concerns associated with dog ownership.

As we will discuss in the next section, animal visitation and 'therapy dog' programs have also become popular with hospitals, senior centers, assisted-living facilities, and nursing homes. Although the availability of these programs varies, they are another option to consider.





Animal-Assisted Interventions

For those who like spending time with animals, programs and treatments that incorporate animals may be an enjoyable form of recreation, or a desirable addition to standard treatments. A wide variety of animal-assisted interventions exist, with many focusing on the needs of older adults who are living independently, and also those residing in assisted-living and long-term care. More formal animal-assisted therapy (AAT) programs have specific treatment goals, and must be delivered by a licensed/trained health or human service provider; whereas animal-assisted activities (AAAs) are less formal, are often staffed by volunteers and do not have specific treatment goals (i.e., they are more recreational in nature). This section will use the term animal-assisted interventions (AAls) as a general term that includes both AAT and AAA programs. The field of AAls is large and extremely diverse. This section will cover just a fraction of the existing research.

Depression

Most pet owners can relate to the experience of having a pet 'brighten their day' when they were feeling down. This has led many researchers to hypothesize that AAls may be useful in preventing or treating depression. Two meta-analyses appear to support this hypothesis. The first⁽⁸³⁾, included four studies of nursing home residents, and one study of psychiatric hospital residents. The authors concluded that participation in AAAs and AAT produced significant improvements in depression⁽⁸³⁾. The second⁽⁸⁴⁾, analyzed studies of older adults, as well as studies of patients with psychiatric disorders. Nine of the included studies had depression as a measured outcome. These authors found an association between AAls and reductions of depressive symptoms, and estimated that the effects were moderate in size⁽⁸⁴⁾.

Animal-Assisted Interventions

Cognitive Impairment



While independent pet ownership may not be possible for many individuals diagnosed with cognitive impairment, AAIs targeting this population have provided some promising results, particularly in the areas of reducing agitated behaviors, increasing social interaction, and increasing nutritional intake.

In a matched case-control study of elderly nursing home residents with dementia, levels of agitation/aggression and depression remained stable in patients who received weekly sessions of animal-assisted therapy, but increased significantly in those who received treatment as usual⁽⁸⁵⁾. In a pilot study of 15 nursing home residents with dementia, three weeks of daily animal-assisted therapy sessions resulted in significant decreases in agitated behaviors, and significant increases in social interaction⁽⁸⁶⁾.

People in the later stages of dementia can experience a variety of difficulties related to eating and drinking. They may experience loss of appetite, pain, or difficulty chewing and swallowing⁽⁸⁷⁾. Introducing an aquarium containing fish resulted in statistically significant increases in nutritional intake (21.1%, $p < 0.001$) and weight gain (1.65 lbs, $p < 0.001$) in residents of specialized Alzheimer's care units in the Midwestern United States⁽⁸⁸⁾.



HAI in Long-Term Care Facilities

According to the 2010 U.S. Census, 3.1% of those aged 65 and over (approximately 1.3 million people) lived in skilled nursing facilities⁽⁸⁹⁾. Estimates suggest that nearly 70% of older adults in the US will need an average of three years of long-term care, and nearly 40% will require one year of institutional care⁽⁹⁰⁾. Given these estimates, along with the popularity of pet-keeping, and the potential benefits of HAI for older adults, it is important to find safe and effective ways to ensure that those who derive benefits from HAI continue to have opportunities to enjoy the company of animals in the context of care facilities.

The importance of companion animal contact in long-term care facilities has been a focus of HAI researchers since the earliest days of the field⁽⁹¹⁾. A 1981 survey conducted in Minnesota, US, found that almost 77% of nursing homes had visits from pets owned by friends, family, and staff; 62% had more formal animal visitation programs; 33% had resident animals; and almost 14% had some form of animal therapy program⁽⁹²⁾. Similar results were found in a more recent survey of long-term care facilities in Illinois, US, with almost 90% of facilities allowing non-scheduled visits from pets brought by friends or family members; 51% having more formal animal visitation programs; 62% having resident animals (mostly fish and birds); and 15% having a formal animal therapy program⁽⁹³⁾. Furthermore, 95% of facilities reported favorable attitudes toward having animal programs in health care facilities, with 77% indicating that residents had requested animal programs, and 78% reporting that friends or relatives of residents had requested animal programs⁽⁹³⁾. These figures make it clear that the importance of HAI for those in long-term care has substantial popular acceptance, and that both informal and formal programs have been implemented with vigor since at least the 1980s.



HAI in Long-Term Care Facilities (cont.)

There is little doubt that HAI programs for older adults in care facilities have widespread appeal, and that such programs frequently receive positive media attention, but what is less clear is whether enough is being done to ensure the safety and welfare of both human and animal participants. A survey of nursing homes in The Netherlands found that most of the participating facilities offered AAIs within a recreational program, but did not have protocols for animal welfare, hygiene, and safety, nor did they employ specific selection criteria for participating animals⁽⁹⁴⁾. In a US study, out of 44 eldercare facilities that permitted animal visits, 18 required only a minimal written health report for the animal⁽⁹⁵⁾, and 100% of the surveyed organizations fell short on at least one aspect of the Society for Healthcare Epidemiology of America's (SHEA) guidelines for animals in healthcare facilities⁽⁹⁶⁾. In the early years of animal visitation programs, published health and safety protocols did not exist and facilities were left to craft their own policies. Today, a variety of credible guidelines have been published^(96,97,98,99), and incorporating these into new and established programs will be key to ensuring the long-term success and safety of animal visitation and resident animal programs.





The Promise of Research

An area that has shown great promise for HAI research is the study of the hormonal effects of HAI on both people and animals. Researchers have been particularly interested in the 'bonding hormone' oxytocin, and the 'stress hormone' cortisol⁽¹⁰⁰⁾. By measuring these hormones, researchers have found that oxytocin increases in humans during positive interactions with dogs⁽¹⁰¹⁾, and also in dogs in response to human interaction^(101,102). Studies looking at cortisol have demonstrated that the mere presence of a dog can lessen humans' responses to stressors⁽¹⁰³⁾, and that interacting with humans can also reduce stress in dogs⁽¹⁰⁴⁾.

New technological advances are helping scientists to answer previously unanswerable research questions. Technologies like wearable activity trackers are making it possible to objectively assess the pets' role in promoting physical activity, and studies using these devices have produced positive findings for older adults^(18,20)

While there is already a substantial body of evidence demonstrating the power of pets in the lives of older adults, strengthening the scientific evidence base will help to ensure that organizational leaders and policymakers understand the importance of HAI in older adulthood, which will pave the way for animals to be considered in laws, policies, and services that impact older adults' ability to enjoy lifelong animal companionship.



References

1. American Veterinary Medical Association (n.d.) Human-Animal Bond. Retrieved from <https://www.avma.org/kb/resources/reference/human-animal-bond/pages/human-animal-bond-avma.aspx>
2. UN. (2013). World Population Ageing 2013. (ST/ESA/SER.A/348). United Nations. <http://www.un.org/en/sections/issues-depth/ageing/>
3. He, W., Goodkind D, and Kowa, P. An Aging World: 2015. United States Census Bureau. Retrieved from <https://www.census.gov/content/dam/Census/library/publications/2016/demo/p95-16-1.pdf>
4. Rowe, J. W., & Kahn, R. L. (1987). Human Aging: Usual and Successful. *Science*, 237(4811), 143-149.
5. WHO. (n.d.). What is 'active ageing'? Retrieved from http://www.who.int/ageing/active_ageing/en/
6. APPA. (2015). 2015-2016 APPA National Pet Owners Survey: American Pet Products Association.
7. McCabe, B. W., Baun, M.M., Speich, D., & Agrawal, S., (2002). Resident Dog in the Alzheimer's Special Care Unit. *West J Nurs Res* October 2002 24: 684-696.
8. Friedmann, E., Katcher, A. H., Lynch, J. J., & Thomas, S. A. (1980). Animal companions and one-year survival of patients after discharge from a coronary care unit. *Public Health Reports*, 95(4), 307-312.
9. Anderson, W., Reid, C., & Jennings, G. (1992). Pet ownership and risk factors for cardiovascular disease. *The Medical Journal of Australia*, 157(5), 298-301.
10. Allen, K., Blascovich, J., & Mendes, W. B. (2002). Cardiovascular reactivity and the presence of pets, friends, and spouses: The truth about cats and dogs. *Psychosomatic Medicine*, 64, 727-739.

11. Allen, K., Shykoff, B. E., & Joseph L. Izzo, J. (2001). Pet ownership, but not ACE inhibitor therapy, blunts home blood pressure responses to mental stress. *Hypertension*, 38, 815-820. Friedmann, E., Thomas, S. A., Son, H., Chapa, D., & McCune, S. (2013). Pet's presence and owner's blood pressures during the daily lives of pet owners with pre-to mild hypertension. *Anthrozoos: A Multidisciplinary Journal of The Interactions of People & Animals*, 26(4), 535-550.
12. Friedmann, E., Thomas, S. A., Son, H., Chapa, D., & McCune, S. (2013). Pet's presence and owner's blood pressures during the daily lives of pet owners with pre-to mild hypertension. *Anthrozoos: A Multidisciplinary Journal of The Interactions of People & Animals*, 26(4), 535-550.
13. Chowdhury, E. K., Nelson, M. R., Jennings, G. L., Wing, L. M., & Reid, C. M. (2017). Pet ownership and survival in the elderly hypertensive population. *J Hypertens*, 35(4), 769-775. doi:10.1097/HJH.0000000000001214
14. Herrald, M. M., Tomaka, J., & Medina, A. Y. (2002). Pet Ownership Predicts Adherence to Cardiovascular Rehabilitation. *Journal of Applied Social Psychology*, 32(6), 1107-1123.
15. Wright, J. D., Kritz-Silverstein, D., Morton, D. J., Wingard, D. L., & Barrett-Connor, E. (2007). Pet ownership and blood pressure in old age. *Epidemiology*, 18(5), 613-618. doi:10.1097/EDE.0b013e3181271398
16. Levine, G. N., Allen, K., Braun, L. T., Christian, H. E., Friedmann, E., Taubert, K. A., . . . Lange, R. A. (2013). Pet ownership and cardiovascular risk: A scientific statement from the American Heart Association. *Circulation*, 127(23), 2353-2363.
17. US Department of Health and Human Services. (1996). Physical activity and health: a report of the Surgeon General. Retrieved from [https://books.google.com/books?id=WZZPc1FmL7QC&lpg=PA3&ots=5WFI-_Rc1m&dq=physical activity and health a report of the surgeon general&lr&pg=PA277 - v=onepage&q=physical%20activity%20and%20health%20a%20report%20of%20the%20surgeon%20general&f=false](https://books.google.com/books?id=WZZPc1FmL7QC&lpg=PA3&ots=5WFI-_Rc1m&dq=physical%20activity%20and%20health%20a%20report%20of%20the%20surgeon%20general&lr&pg=PA277-v=onepage&q=physical%20activity%20and%20health%20a%20report%20of%20the%20surgeon%20general&f=false)
18. Dall, P. M., Ellis, S. L. H., Ellis, B. M., Grant, P. M., Colyer, A., Gee, N. R., . . . Mills, D. S. (2017). The influence of dog ownership on objective measures of free-living physical activity and sedentary behaviour in community-dwelling older adults: a longitudinal case-controlled study. *BMC public health*, 17(1), 496. doi:10.1186/s12889-017-4422-5

19. Shibata, A., Oka, K., Inoue, S., Christian, H., Kitabatake, Y., & Shimomitsu, T. (2012). Physical activity of Japanese older adults who own and walk dogs. *Am J Prev Med*, 43(4), 429-433. doi:10.1016/j.amepre.2012.06.019
20. Wu, Y. T., Luben, R., & Jones, A. (2017). Dog ownership supports the maintenance of physical activity during poor weather in older English adults: cross-sectional results from the EPIC Norfolk cohort. *J Epidemiol Community Health*. doi:10.1136/jech-2017-208987
21. Thorpe, R. J., Simonsick, E. M., Brach, J. S., Ayonayon, H., Satterfield, S., Harris, T. B., . . . Kritchevsky, S. B. (2006). Dog ownership, walking behavior, and maintained mobility in late life. *Journal of the American Geriatrics Society*, 54(9), 1419-1424.
22. Raina, P., Waltner-Toews, D., Bonnett, B., Woodward, C., & Abernathy, T. (1999). Influence of Companion Animals on the Physical and Psychological Health of Older People: An Analysis of a One-Year Longitudinal Study. *Journal of the American Geriatrics Society*, 47(3), 323-329.
23. Curl, A. L., Bibbo, J., & Johnson, R. A. (2016). Dog Walking, the Human-Animal Bond and Older Adults' Physical Health. *Gerontologist*. doi:10.1093/geront/gnw051
24. Qureshi, A. I., Memon, M. Z., Vazquez, G., & Suri, M. F. K. (2009). Cat ownership and the Risk of Fatal Cardiovascular Diseases. Results from the Second National Health and Nutrition Examination Study Mortality Follow-up Study. *Journal of vascular and interventional neurology*, 2(1), 132.
25. Kikusui, T., Winslow, J. T., & Mori, Y. (2006). Social buffering: Relief from stress and anxiety. *Philosophical Transactions of The Royal Society B (Biological Sciences)*, 361(1476), 2215-2228.
26. Siegel, J. M. (1990). Stressful life events and use of physician services among the elderly: The moderating role of pet ownership. *Journal of Personality and Social Psychology*, 58(6), 1081-1086.
27. Beaumont, J. (2013, 11 April). Measuring national well-being: Older people and loneliness, 2013. Retrieved from http://webarchive.nationalarchives.gov.uk/20160108052015/http://www.ons.gov.uk/ons/dcp171766_304939.pdf

28. Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspect Psychol Sci*, 10(2), 227-237. doi:10.1177/1745691614568352
29. Peplau, L. A. (1985). Loneliness research: Basic concepts and findings. . In I. G. Sarason & B. R. Sarason (Eds.), *Social support: Theory, research and applications* (pp. 269-286). Netherlands: Springer.
30. Perissinotto, C. M., Stijacic Cenzer, I., & Covinsky, K. E. (2012). Loneliness in older persons: a predictor of functional decline and death. *Arch Intern Med*, 172(14), 1078-1083. doi:10.1001/archinternmed.2012.1993
31. Stanley, I. H., Conwell, Y., Bowen, C., & Van Orden, K. A. (2014). Pet ownership may attenuate loneliness among older adult primary care patients who live alone. *Aging & Mental Health*, 18(3), 394-399. doi:10.1080/13607863.2013.837147
32. Steed, L., Boldy, D., Grenade, L., & Iredell, H. (2007). The demographics of loneliness among older people in Perth, Western Australia. *Australasian Journal on Ageing*, 26(2), 81-86. doi:10.1111/j.1741-6612.2007.00221.x
33. Gilbey, A., & Tani, K. (2015). Companion animals and loneliness: A systematic review of quantitative studies. *Anthrozoos*, 28(2), 181-197. doi: <https://www.tandfonline.com/doi/abs/10.1080/08927936.2015.11435396>
34. Boyle, P. A., Barnes, L. L., Buchman, A. S., & Bennett, D. A. (2009). Purpose in life is associated with mortality among community-dwelling older persons. *Psychosom Med*, 71(5), 574-579. doi:10.1097/PSY.0b013e3181a5a7c0
35. Rosenkoetter, M. M. (1991). Health promotion: The influence of pets on life patterns in the home. *Holistic Nursing Practice*, 5(2), 42-51.
36. Knight, S., & Edwards, V. (2008). In the Company of Wolves The Physical, Social, and Psychological Benefits of Dog Ownership. *Journal of Aging and Health*, 20(4), 437-455.
37. Christian, H., Wood, L., Nathan, A., Kawachi, I., Houghton, S., Martin, K., & McCune, S. (2016). The association between dog walking, physical activity and owner's perceptions of safety: cross-sectional evidence from the US and Australia. *BMC public health*, 16(1), 1010. doi:10.1186/s12889-016-3659-8

38. Gallo, J. J., Bogner, H. R., Morales, K. H., Post, E. P., Have, T. T., & Bruce, M. L. (2005). Depression, Cardiovascular Disease, Diabetes, and Two-Year Mortality Among Older, Primary-Care Patients. *The American Journal of Geriatric Psychiatry*, 13(9), 748-755. doi:10.1097/00019442-200509000-00002
39. Needell, N., & Mehta-Naik, N. (2016). Is Pet Ownership Helpful in Reducing the Risk and Severity of Geriatric Depression? *Geriatrics*, 1(4), 24. doi:10.3390/geriatrics1040024
40. Friedmann, E., Thomas, S. A., & Son, H. (2011). Pets, depression and long-term survival in community living patients following myocardial infarction. *Anthrozoos*, 24(3), 273-285.
41. Garrity, T. F., Stallones, L., Marx, M. B., & Johnson, T. P. (1989). Pet ownership and attachment as supportive factors in the health of the elderly. *Anthrozoos*, 3(1), 35-44.
42. Goldmeier, J. (1986). Pets or People: Another Research Note. *The Gerontologist*, 26(2), 203-206. doi:10.1093/geront/26.2.203
43. Eddy, J., Hart, L., & Boltz, R. (1988). The effects of service dogs on social acknowledgments of people in wheelchairs. *Journal of Psychology*, 122(1), 39-45.
44. McNicholas, J., & Collis, G. M. (2000). Dogs as catalysts for social interactions: Robustness of the effect. *British Journal of Psychology*, 91, 61-70.
45. Wood, L. J., Giles-Corti, B., Bulsara, M. K., & Bosch, D. A. (2007). More than a furry companion: The ripple effect of companion animals on neighbourhood interactions and sense of community. *Society and Animals*, 15(1), 46-56.
46. Lang, R. E., & Hornburg, S. P. (1998). What is social capital and why is it important to public policy? *Housing Policy Debate*, 9(1), 1-16.
47. Wood, L., Martin, K., Christian, H., Houghton, S., Kawachi, I., Vallesi, S., & McCune, S. (2017). Social capital and pet ownership – A tale of four cities. *SSM - Population Health*, 3, 442-447. doi:10.1016/j.ssmph.2017.05.002

48. Halpern, D. (2005). Social capital. UK: Polity Press.
49. Wood, L., Martin, K., Christian, H., Nathan, A., Lauritsen, C., Houghton, S., . . . McCune, S. (2015). The Pet Factor - Companion animals as a conduit for getting to know people, friendship formation and social support. *PloSOne*, 10(4), e0122085. doi:10.1371/journal.pone.0122085
50. Headey, B. (1999). Health benefits and health cost savings due to pets: preliminary estimates from an Australian national survey. *Social Indicators Research*, 47(2), 233-243.
51. Headey, B., Grabka, M., Kelley, J., Reddy, P., & Tseng, Y.-P. (2002). Pet ownership is good for your health and saves public expenditure too: Australian and German longitudinal evidence. *Australian Social Monitor*, 5(4), 93.
52. Hall, S., Dolling, L., Bristow, K., Fuller, T., & Mills, D. S. (2017). Companion animal economics: The economic impact of companion animals in the UK. Oxfordshire, UK: CABI.
53. Clower, T. L., & Neaves, T. T. (2015). The health care cost savings of pet ownership. Retrieved from https://habri.org/docs/HABRI_Report_-_Healthcare_Cost_Savings_from_Pet_Ownership_.pdf
54. Herzog, H. (2016, 4 January). Three Reasons Why Pets Don't Lower Health Care Costs. *Psychology Today*. Retrieved from <https://www.psychologytoday.com/blog/animals-and-us/201601/three-reasons-why-pets-dont-lower-health-care-costs>
55. Herzog, H. (2011). The impact of pets on human health and psychological well-being: Fact, fiction, or hypothesis? *Current Directions in Psychological Science*, 20(4), 236-239.
56. Stevens, J. A., Teh, S. L., & Haileyesus, T. (2010). Dogs and cats as environmental fall hazards. *Journal of Safety Research*, 41, 69-73.
57. Cosco, T. D., & Storey, B. L. (2017). Physical activity, dog ownership and falls among older adults: a breed apart. *J Epidemiol Community Health*. doi:10.1136/jech-2017-209841

58. Griego, R. D., Rosen, T., Orengo, I. F., & Wolf, J. E. (1995). Dog, cat, and human bites: A review. *Journal of the American Academy of Dermatology*, 33(6), 1019-1029.
59. Haverkos, L., Hurley, K., McCune, S., & McCardle, P. (2011). Public Health Implications of Pets: Our Own Animals and Those of Others. In P. McCardle, S. McCune, J. A. Griffin, L. Esposito, & L. Freund (Eds.), *Animals in Our Lives: Human-Animal Interaction in Family, Community, and Therapeutic Settings* (pp. 55-82). Baltimore, MD: Paul H. Brookes Publishing Company.
60. Ghasemzadeh, I., & Namazi, S. (2015). Review of bacterial and viral zoonotic infections transmitted by dogs . *Journal of Medicine and Life*, 8(Spec Iss 4), 1-5.
61. CDC. (2016a, 13 May). Diseases from Cats. Healthy Pets Healthy People. Retrieved from <https://www.cdc.gov/healthypets/pets/cats.html>
62. CDC. (2016b, 14 July). Diseases from Dogs. Healthy Pets Healthy People. Retrieved from <https://www.cdc.gov/healthypets/pets/dogs.html>
63. Abrahms, S. (2015). Helping senior parents care for their pets. A Place for Mom: Senior Living Blog. Retrieved from <http://www.aplaceformom.com/blog/3-31-15-helping-senior-parents-care-for-pets/>
64. Friedmann, E., Katcher, A. H., & Meislich, D. (1983). When pet owners are hospitalized: Significance of companion animals during hospitalization. In A. H. Katcher & A. M. Beck (Eds.), *New perspectives on our lives with companion animals*. (pp. 346-350). Philadelphia: University of Pennsylvania Press.
65. McNicholas, J., Gilbey, A., Rennie, A., Ahmedzai, S., Dono, J.-A., & Ormerod, E. (2005). Pet Ownership And Human Health: A Brief Review Of Evidence And Issues. *BMJ: British Medical Journal*, 331(7527), 1252-1254.
66. Smith, D. W., Seibert, C. S., Jackson III, F. W., & Snell, J. (1992). Pet ownership by elderly people: Two new issues. *The International Journal of Aging and Human Development*, 34(3), 175-184.

67. Stevenson, S. (2015). Are you putting off a move to assisted living? A Place for Mom: Senior Living Blog. Retrieved from <http://www.aplaceformom.com/blog/5-6-15-reasons-families-delay-moving>
68. Quackenbush, J. E. (1984). Pet bereavement in older owners. In R. K. Anderson, B. L. Hart, & L. A. Hart (Eds.), *The Pet Connection: Its Influence on Our Health and Quality of Life* (pp. 292-299). Minneapolis, Minnesota: University of Minnesota.
69. McNicholas, J., & Collis, G. M. (1995). The End of a Relationship: Coping with Pet Loss. In I. Robinson (Ed.), *The Waltham Book of Human-Animal Interaction: Benefits and Responsibilities of Pet Ownership* (pp. 127-143). Oxford, UK: Pergamon.
70. AHA. (2012). Keeping pets (dogs and cats) in homes: A three-phase retention study -- Phase I: Reasons for not owning a dog or cat. Retrieved from <https://www.americanhumane.org/app/uploads/2016/08/aha-petsmart-retention-study-phase-1.pdf>
71. Duno, S. (2013, 2 April). Pets & seniors: Avoiding painful separation. Retrieved from <http://www.aplaceformom.com/senior-care-resources/articles/pet-separation>
72. Lockwood, R. (2002). Making the connection between animal cruelty and animal abuse and neglect of vulnerable adults. *The Latham Letter*. Retrieved from <http://nationallinkcoalition.org/wp-content/uploads/2013/01/ElderAbuse-Lockwood-.pdf>
73. Humane Rescue Alliance. (2017). Adoption FAQ. Retrieved from <http://www.humanerescuealliance.org/adoption-faq>
74. Ryder, E. L. (1985). Pets and the elderly. A social work perspective. *The Veterinary Clinics of North America. Small Animal Practice*, 15(2), 333-343.
75. Lichtenberg, D. (2012). It's time for a talk about pets and elderly people. Retrieved from <http://www.petful.com/pet-health/pets-and-elderly-people>
76. Meals On Wheels. (2016). Keeping seniors and their pets together. Meals on Wheels. Retrieved from <http://www.mealsonwheelsamerica.org/senior-pet-support>

77. HUD. (n.d.). Pets in properties that serve the elderly or handicapped. Retrieved from <https://portal.hud.gov/hudportal/HUD?src=/states/shared/working/west/mf/petpolicy>
78. Eppinger, B. (2012). Pets allowed at more assisted living facilities. All Pet News. Retrieved from <http://allpetnews.com/pets-allowed-at-more-assisted-living-facilities>
79. Anderson, K. A., Lord, L. K., Hill, L. N., & McCune, S. (2015). Fostering the Human-Animal Bond for Older Adults: Challenges and Opportunities. *Activities, Adaptation & Aging*, 39(1), 32-42.
80. BlueCross. (2016, 26 August). Pets into Care Scheme. Retrieved from <https://www.bluecross.org.uk/pets-care-scheme>
81. Hirschfeld, R. (2007). Estate planning issues involving pets. <https://scholarship.law.marquette.edu/cgi/viewcontent.cgi?referer=https://www.google.pt/&httpsredir=1&article=1049&context=elders>
82. Pedigree UK website (2018) Dog Dates <https://uk.pedigree.com/dogdates>
83. Souter, M. A., & Miller, M. D. (2007). Do animal-assisted activities effectively treat depression? A meta-analysis. *Anthrozoos*, 20(2), 167-180.
84. Virues-Ortega, J., Pastor-Barriuso, R., Castellote, J. M., Poblacion, A., & de Pedro-Cuesta, J. (2012). Effect of animal-assisted therapy on the psychological and functional status of elderly populations and patients with psychiatric disorders: a meta-analysis. *Health Psychology Review*, 6(2), 197-221. doi:10.1080/17437199.2010.534965
85. Majic, T., Gutzmann, H., Heinz, A., Lang, U. E., & Rapp, M. A. (2013). Animal-assisted therapy and agitation and depression in nursing home residents with dementia: a matched case-control trial. *Am J Geriatr Psychiatry*, 21(11), 1052-1059. doi:10.1016/j.jagp.2013.03.004
86. Richeson, N. E. (2003). Effects of animal-assisted therapy on agitated behaviors and social interactions of older adults with dementia. *American journal of Alzheimer's disease and other dementias*, 18(6), 353-358.

87. Alzheimer's Society. (n.d.). The later stages of dementia: Eating and weight loss. Retrieved from https://www.alzheimers.org.uk/info/20073/how_dementia_progresses/103/the_later_stages_of_dementia/8
88. Edwards, N. E., & Beck, A. M. (2002). Animal-assisted therapy and nutrition in Alzheimer's disease. *Western Journal of Nursing Research*, 24(6), 697-712.
89. Werner, C. A. (2011). The Older Population: 2010. 2010 Census Briefs. Retrieved from <https://www.census.gov/prod/cen2010/briefs/c2010br-09.pdf>
90. Kemper, P., Komisar, H. L., & Alecxih, L. (2005). Long-term care over an uncertain future: what can current retirees expect? *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, 42(4), 335-350.
91. Anderson, R. K., Hart, B. L., & Hart, L. A. (1984). *The Pet Connection: Its Influence on Our Health and Quality of Life*. Minneapolis, Minnesota: University of Minnesota.
92. Olsen, G., Anderson, R. K., Quigley, J. S., & Beahl, N. (1983). Pet-facilitated therapy: A study of the use of animals in health care in Minnesota. In A. H. Katcher & A. M. Beck (Eds.), *New perspectives on our lives with companion animals*. (pp. 431-435). Philadelphia: University of Pennsylvania Press.
93. Behling, R. J., Haefner, J., & Stowe, M. (2011). Animal programs and animal assisted therapy in Illinois long-term care facilities twenty years later (1990-2010). *Academy of Health Care Management Journal*, 7, 109+.
94. Schuurmans, L., Enders-Slegers, M. J., Verheggen, T., & Schols, J. (2016). Animal-Assisted Interventions in Dutch Nursing Homes: A Survey. *J Am Med Dir Assoc*. doi:10.1016/j.jamda.2016.03.015
95. Linder, D. E., Siebens, H. C., Mueller, M. K., Gibbs, D. M., & Freeman, L. M. (2017). Animal-assisted interventions: A national survey of health and safety policies in hospitals, eldercare facilities, and therapy animal organizations. *Am J Infect Control*, 45(8), 883-887. doi:10.1016/j.ajic.2017.04.287

96. Murthy, R., Bearman, G., Brown, S., Bryant, K., Chinn, R., Hewlett, A., . . . Weber, D. J. (2015). Animals in healthcare facilities: recommendations to minimize potential risks. *Infect Control Hosp Epidemiol*, 36(5), 495-516. doi:10.1017/ice.2015.15
97. American Veterinary Medical Association (n.d.). Animal-assisted interventions: Guidelines. Retrieved from <https://www.avma.org/KB/Policies/Pages/Animal-Assisted-Interventions-Guidelines.aspx>
98. Tufts Institute for Human-Animal Interaction. (2016). Animal-assisted interventions: How-to guide for facilities. Retrieved from <http://hai.tufts.edu/animal-assisted-intervention-manual-for-facilities-now-available-to-download>
99. HABRI, NCOA & NISC (2018) Older adults and animal programming: A handbook for senior centers, May 2018. https://www.ncoa.org/wp-content/uploads/HABRI-NCOA-Senior-Center-Handbook_updatedjune5_compressed.pdf
100. Uvnas-Moberg, K., Handlin, L., & Petersson, M. (2011). Promises and pitfalls of hormone research in human-animal interaction. In P. McCardle, S. McCune, J. A. Griffin, & V. Maholmes (Eds.), *How Animals Affect Us: Examining the Influence of Human-Animal Interaction on Child Development and Human Health* (pp. 53-81). Washington, DC: American Psychological Association.
101. Odendaal, J. S. J., & Meintjes, R. A. (2003). Neurophysiological correlates of affiliative behaviour between humans and dogs. *The Veterinary Journal*, 165(3), 296-301. doi: [http://dx.doi.org/10.1016/S1090-0233\(02\)00237-X](http://dx.doi.org/10.1016/S1090-0233(02)00237-X)
102. MacLean, E. L., Gesquiere, L. R., Gee, N. R., Levy, K., Martin, W. L., & Carter, C. S. (2017). Effects of Affiliative Human-Animal Interaction on Dog Salivary and Plasma Oxytocin and Vasopressin. *Frontiers in Psychology*, 8. doi:10.3389/fpsyg.2017.01606
103. Polheber, J. P., & Matchock, R. L. (2014). The presence of a dog attenuates cortisol and heart rate in the Trier Social Stress Test compared to human friends. *J Behav Med*, 37(5), 860-867. doi:10.1007/s10865-013-9546-1
104. Hennessy, M. B. (2013). Using hypothalamic-pituitary-adrenal measures for assessing and reducing the stress of dogs in shelters: A review. *Applied Animal Behaviour Science*, 149(1-4), 1-12. doi:10.1016/j.applanim.2013.09.004

