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The State of Research on Human–Animal Relations: Implications for Human Health

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ABSTRACT Since the late 1970s, scientific evidence has accumulated showing that pet ownership can have positive effects on people's physical and mental wellbeing. This paper reviews the current state of affairs regarding the relationship between companion animals and human health, focusing on both the physical and psychological health outcomes related to human–animal interactions. Although designed to set the general scene on the link between animals and human wellbeing, research specific to older adults is highlighted where relevant. A particular emphasis is placed on disorders prevalent in modern-day society, notably cardiovascular disease and depression. The possible mechanisms by which companion animals might be able to enhance human wellbeing and quality of life are discussed, focusing on routes including, amongst others, the provision of companionship, social lubrication, and improvements to physical fitness. The role of the social bonding hormone, oxytocin, in facilitating attachment to our pets and the implications for human health is also discussed. Inconsistencies in the literature and methodological limitations are highlighted throughout. It is concluded that future human–animal interaction experiments should aim to account for the confounding variables that are inherent in studies of this nature.

Keywords: attachment, cardiovascular disease, depression, human–animal interaction, human health, pets



Pet ownership is a widespread phenomenon in modern-day, industrialized developed countries. Figures vary considerably around the globe, but the ownership of dogs and cats is commonplace in countries including the USA (dog population: ~90 million, cat population: ~94 million, American Pet Products Association, 2018), UK (dog population: ~9 million, cat population: ~8 million, Pet Food Manufacturer's Association, 2018), and Australia (dog population: ~9 million, cat population: ~6 million, Healthydogtreats.com, 2018), with most pets considered by their caregivers to be an integral part of the family unit. Until recently, it was assumed that the pet–owner relationship was a largely

unidirectional one, with owners caring for pets in much the same way as children, but without the same apparent benefits from a Darwinian perspective (Archer, 1997). Recent research, however, points to a complex relationship, with many people reportedly gaining significant improvements to health and wellbeing from the ownership of a pet or even interaction with a companion animal (see Beetz, Uvnas-Moberg, Julius, & Kotrschal, 2012; Friedmann, Thomas, & Eddy, 2000; Herzog, 2011; Wells, 2007, 2009).

This article reviews the current state of affairs regarding the relationship between companion animals and human health to explore whether there is merit to the long-held claim that pets are good for us. The paper is intended to set the general context on the relationship between animals and human wellbeing, but, where relevant, highlights research specific to older adults (see also Gee, Mueller, & Curl, 2017; McNicholas, 2014). The paper focuses on both the physical and psychological health outcomes related to human–animal interactions and discusses the possible mechanisms by which companion animals might be able to enhance human wellbeing and quality of life. Inconsistencies in the literature and methodological limitations are discussed throughout. A particular emphasis is placed on disorders prevalent in modern society, for example, cardiovascular disease, and depression. A key inclusion criterion for the review was publication of the original research in a peer-reviewed scientific journal. A variety of electronic search engines (PubMed, Web of Science, Medline, Psychlit) were used to source original research articles, reviews, and meta-analyses, using search terms including “pets/dogs/cats and human health.” Since the article was designed for a thematic issue concerned with healthy aging, publications relevant to the health benefits of pets for children (e.g., pets and allergic desensitization) or the use of animals as a diagnostic tool for ill-health (for review, see Wells, 2012) were excluded for inclusion.

Pets and Cardiovascular Health

Cardiovascular Disease (CVD) is the most common cause of death worldwide and presents a significant burden to healthcare systems around the globe (Global Burden of Disease, 2013). Finding a way of both reducing the risk of developing CVD and enhancing recovery from cardiovascular-related illnesses is therefore of utmost importance.

Some studies point to a preventative role of pet ownership in the development of CVD (see Schreiner, 2016). For example, systolic blood pressure was found to be significantly lower in a sample of pet owners than non-owners attending an Australian screening clinic for heart disease, even when controlling for body mass index and other health-related variables, for example, propensity to smoke (Anderson, Reid, & Jennings, 1992). Similarly, systolic and diastolic blood pressures were found to be significantly lower in the home environment in couples who owned a pet than those who did not (Allen, Blascovich, & Mendes, 2002). More recently, an online study highlighted a lower risk of self-reported hypertension in dog owners than non-owners (Lentino, Visek, McDonnell, & DiPietro, 2012), while a study on Chinese patients revealed a protective factor of pet ownership, and notably dog ownership, for CVD (Zhi-Yong et al., 2017). More specific to the elderly population, Friedmann et al. (2013) reported that the mere presence of a pet, and in particular a dog, improved ambulatory blood pressure in older (50–83 years) adults with hypertension.

Other studies in this area point to enhanced survival arising from pet ownership in patients who have suffered cardiovascular-related health problems. One of the earliest studies in this area found that pet owners were significantly more likely to still be alive one year after a myocardial infarction or angina pectoris than non-pet owners (Friedmann, Katcher, Lynch, &

Thomas, 1980). Dog ownership may be more advantageous for survival than cat ownership in this respect. Indeed, dog owners were found to be 8.6 times more likely to survive acute myocardial infarction for one year than non-dog owners (Friedman and Thomas, 1995). Cat ownership, by contrast, was not associated with decreased mortality risk.

Not all of the studies in this area point to cardiovascular improvements arising from pet ownership. For example, similar patterns of systolic blood pressure have been reported in middle-aged pet owners and non-owners, with slightly higher diastolic blood pressure recorded in the pet-owning cohort (Parslow & Jorm, 2003). Wright and colleagues (Wright, Kritz-Silverstein, Morton, Wingard, & Barrett-Connor, 2007) similarly found no significant differences in the blood pressure or risk of hypertension in pet-owning than non-owning older adults. The role of pets in improving the outcome (survival and/or chances of not being re-hospitalized) of people with heart-related problems is equally conflicting. Indeed, one study found that heart-attack victims were more likely to have died or suffered cardiac-related hospital re-admission if they owned a pet, and in particular a cat, than if they were non-pet owners (Parker et al., 2010). Although data arising from survival rates in people without established CVD are sparse, the few existing studies point to no significant relationship between pet ownership status and mortality (Gillum & Obisesan, 2010; Qureshi, Memon, Vazquez, & Suri, 2009).

Overall, research presents a mixed picture regarding the role of pet ownership in both CVD prevention and recovery. Indeed, this is reflected in a scientific statement arising from the American Heart Association. The authors of the review (Levine et al., 2013) conclude that pet, and notably dog, ownership, *may* have a causal role to play in decreasing cardiovascular disease risk, although the acquisition of a pet should not be considered for the primary purpose of CVD risk reduction. Central to the statement is the call for further research in this area.

Pets and Depression

Depression is one of the most common psychological disorders in Western society and a major cause of morbidity worldwide (e.g., Keller, 1994). It is typically characterized by a flat affect, loss of interest in activities, changes in sleep and appetite, fatigue, and, in some cases, suicidal thoughts (see Kanter, Busch, Weeks, & Landes, 2008). It is particularly prevalent among older adults, affecting roughly seven million people over the age of 65 (Steinman et al., 2007). Given the high prevalence of depression in today's society, it is somewhat surprising that only a handful of studies have addressed the role of pet ownership in its intervention, and most of these investigations focus on specific cohorts of the population. The research in this area has yielded mixed results, with some authors highlighting a positive relationship between pet ownership and reductions in depression. For instance, pet-owning men infected with AIDS (Siegel, Angulo, Detels, Wesch, & Mullen, 1999) and dog-owning people living with HIV (Muldoon, Kuhns, Supple, Jacobson, & Garofalo, 2017), have been reported to suffer from less depression than individuals without a companion animal. People with hearing impairments have been found to display significant, and long-lasting (i.e., up to 18 months), reductions in depression following the acquisition of a service dog (Guest, Collis, & McNicholas, 2006). More recently, pet ownership has been found to be negatively associated with depression in homeless youths, with the odds of suffering from depression being three times greater in individuals without a pet (Lem, Coe, Haley, Stone, & O'Grady, 2016).

Other studies in this area have reported less positive results. For example, no relationship has been found between pet ownership and depression in men infected with HIV, but who do not have AIDS (Siegel et al., 1999). Similar negative findings have been reported in studies of

people with Alzheimer's (Fritz, Farver, Kass, & Hart, 1995), unmarried men (Tower & Nokota, 2006), working women (Watson & Weinstein, 1993), and psychiatric patients (Barker, Pandurangi, & Best, 2003). Perhaps more worryingly, some authors have actually reported *higher* levels of depression in certain groups of pet owners (e.g., Fritz, Farver, Hart, & Kass, 1996; Parslow, Jorm, Christensen, Rodgers, & Jacomb, 2005). For example, Miltiades and Shearer (2011) found that adults who reported themselves as highly attached to their pet dogs were more depressed than individuals with less of an emotional investment in their pet.

Given the high prevalence of depression amongst the elderly, some studies have focused on the merits of either pet ownership or human–animal interactions for people over the age of 65. The research, again, presents a mixed picture in relation to outcome success. For example, community-dwelling elderly people with pets have been shown to have fewer symptoms of depression than those without pets (Ko, Youn, Kim, & Kim, 2015; Roberts, McBride, Rosenvinge, Stevenage, & Bradshaw, 1996), although the degree of attachment between the individual and the animal can impact upon the health benefits accrued (Peretti, 1990); this may explain why some research has failed to find a relationship between pet ownership and levels of depression in older adults (Branson, Boss, Cron, & Kang, 2016; Miller & Lago, 1990). One recent study even found that older adults who owned a pet were nearly two times more likely than non-pet owners to have suffered depression at some point in their lives, although the authors indicated that it was impossible to determine the directionality of the relationship between depression and pet ownership (Mueller, Gee, & Bures, 2018). Studies of older adults residing in institutional care have proven equally conflicting, with some reporting lower levels of depression as a response to animal-assisted interventions (Colombo, Dello Buono, Smania, Raviola, & De Leo, 2006; Friedmann, Galik, Thomas, Hall, Chung, & McCune, 2015; Le Roux & Kemp, 2009; Moretti et al., 2011; Travers, Perkins, Rand, Bartlett, & Morton, 2013; Virues-Ortega, Pastor-Barriuso, Castellote, Poblacion, & de Pedro-Cuesta, 2013), but others showing no significant effect of such schemes (Phelps, Miltenberger, Jens, & Wadson, 2008; Thodberg et al., 2015).

Together, research presents a variable picture regarding the relationship between human–animal interactions and depression. This conflict is likely to be a consequence of dramatic differences in methodological design (see Fritz et al., 1996; Garrity et al., 1989), participants recruited, severity of depression, measurement scales, and so forth. Again, further work is needed in this area, ideally using more rigorous methodology, before firm conclusions regarding the relationship between companion animals and human depression can be established.

Mechanisms Underlying the Ability of Animals to Improve Human Health

Considerable attention has been devoted to trying to elucidate the mechanisms by which pets might be able to promote human health. This section discusses some of the potential routes. Our inherent biological attraction to animals is explored, before focusing on the roles of companionship, social lubrication, buffers to stress, and improved physical fitness. The connection between attachment to one's pet and human health is also discussed, particularly in relation to the bonding hormone, oxytocin.

Biophilia

Although more of a conceptual framework than a mechanism, the human propensity to navigate toward animals warrants discussion. It has been proposed that people may be inherently programmed to affiliate with, or focus their attention on, animals (Wilson, 1984). This so-called "biophilia" is apparent at an early stage of life. Babies focus more on animals than other objects

in their environment (DeLoache, Pickard, & LoBue, 2011) and even children with impaired social skills (e.g., those with autism spectrum disorders) often display a preference for animal features (e.g., Prothmann, Ettrich, & Prothmann, 2009) and an increase in social behaviors when exposed to animals (O'Haire, McKenzie, Beck, & Slaughter, 2013). It is also the human tendency to attribute intentionality and mental states to animals, that is, anthropomorphize (see Urquiza-Haas, & Kotrschal, 2015). From an evolutionary perspective, it is believed that paying attention to animals may offer advantages for individual fitness (Mormann et al., 2011). The biophilia hypothesis recognizes the importance of outside influences (e.g., culture, environmental factors) in shaping our attitudes and behavior toward animals and may go some way to explain why certain animals have a calming effect on us, while others, especially those which could have posed dangers to our ancestors (e.g., snakes, see Baynes-Rock, 2017), may not offer the same types of health advantages. One must exert caution in adopting biophilia as the primary explanation for animal-related health outcomes in humans. It has been argued that the construct is still too expansive and under-determined to render it a useful theoretical conclusion for animal-assisted intervention studies (Joye, 2011).

Companionship

Some benefits to human health may arise directly from the mere provision of companionship offered by pets. The presence of another living being can simply help to reduce the feelings of loneliness and isolation that some cohorts of society are prone to (e.g., Headey, 1998; Jessen, Cardiello, & Baun, 1996; Mahalski, Jones, & Maxwell, 1988). With this in mind, pets may be particularly advantageous for people living alone (Zasloff & Kidd, 1994), or in institutional settings, and indeed a large body of work has explored the effect of pet- or animal-assisted therapy schemes on such individuals. These have largely shown or suggested positive effects on residents and/or staff (e.g., Abrahamson, Cai, Richards, Cline, & O'Haire, 2016; Kaiser, Spence, McGavin, Struble, & Keilman, 2002; McCabe, Baun, Speich, & Agrawal, 2002). For example, the presence of a residential dog in a nursing home has been shown to result in happier, more alert and more responsive patients, as assessed by staff reports (Salmon & Salmon, 1982). That said, a recent meta-analysis concluded that animal-assisted therapy had only a small effect on the psychological status of nursing home residents (Virues-Ortega et al., 2013). Despite this, and the risks associated with introducing animals into health-care settings (see DiSalvo et al., 2006), pet-facilitated therapy programs involving dogs, cats, and even horses (i.e., hippotherapy, see Burgon, 2003), are now relatively commonplace across the UK, Europe, and North America (see Fine, 2015).

Lately, institutions such as prisons have also started to employ animals in a therapeutic capacity. Like those residing in other institutional settings, prisoners can suffer from feelings of loneliness and isolation. Schemes have therefore been introduced to various prisons in a bid to enhance the psychological wellbeing of prison inmates and rehabilitate them. Participants are typically required to care for an animal, and in many cases train it for a specific purpose, for example as an assistance dog for older people or for those with physical disabilities. Studies exploring the efficacy of such programs, albeit limited, are largely supportive of the idea that they promote better mental wellbeing (Fournier, Geller, & Fortney, 2007; Harkrader, Burke, & Owen, 2004; Moneymaker & Strimple, 1991). For example, studies have found that a dog-assisted therapy program was associated with both improved mood (Koda et al., 2015) and lower stress levels, as assessed by salivary cortisol, in male inmates in a Japanese prison (Koda et al., 2016). Unfortunately, prison animal programs vary significantly in their design and

relatively few have been subject to scientific evaluation. A need for a more focused examination of the efficacy of such schemes has been stressed (Mulcahy & McLaughlin, 2013).

Social Lubrication

Psychological wellbeing may be facilitated by pets indirectly through the facilitation of interpersonal social contacts. Pets, in particular dogs, have long been noted for their socializing role. For example, walking with a dog results in a significantly higher number of chance conversations with strangers than walking alone (McNicholas & Collis, 2000; Messent, 1983; Wells, 2004). This so-called social catalysis, or lubrication, effect does not, however, appear to be a generic one; rather it seems related to features of the animal. Young dogs, with their endearing features and clumsy movements, are more likely than older animals to evoke social responses (Wells, 2004). Likewise, dogs that are generally perceived in a positive light, for whatever reason (e.g., reputed temperament, color), are more likely to facilitate social interactions than those that are less popular (Wells, 2004).

While dogs may serve as particularly strong social lubricants, other species can also facilitate interactions between people. Thus, a woman sitting in a park received significantly more social approaches from passers-by when she was accompanied by a rabbit or turtle, than when she sat alone blowing bubbles or with an operational television set (Hunt, Hart, & Gomulkiewicz, 1992).

The ability of animals to serve as a social lubricant is perhaps most obvious in individuals with disabilities who happen to have a service animal. Numerous organizations now train dogs, and other animals (e.g., monkeys), to enhance the visual, auditory, and/or mobility capabilities of their owners. In addition to achieving the goal for which they were purposely trained, assistance animals have been shown to act as strong social catalysts, helping to normalize relationships with other people. Hart, Hart, and Bergin (1987), for example, reported that wheelchair users received a median of eight friendly approaches from unfamiliar adults per shopping trip when they were accompanied by their service dogs, but typically only one friendly approach if the animal was not present. Similar findings have been reported by others (e.g., Eddy, Hart, & Boltz, 1988; Guest et al., 2006; Mader, Hart, & Bergin, 1989).

Stress Reduction

Animals may be able to promote human health by serving as “stress busters.” The action of stroking, or even looking at an animal, particularly a familiar one, has repeatedly been shown to result in transient decreases in blood pressure and/or heart rate (e.g., Katcher, 1981; Shiloh, Sorek, & Terkel, 2003); this, in the longer term, may contribute to improved cardiovascular fitness. The mere presence of a companion animal can also offer short-term health benefits, helping to lower autonomic responses to conditions of moderate stress. For example, the presence of a pet dog or cat has been shown to result in lower heart rate and blood pressure responses relative to the presence of a friend or spouse, in people exposed to the psychological stressor of mental arithmetic, and the physical stressor of a cold pressor test (Allen et al., 2002). It must be assumed that the animal in this context serves as a buffer or distraction to the stressful situation. More recently, it has been shown that mere videos of animals can have similar stress-reducing effects. For example, DeSchrive and Riddick (1990) reported decreases in the physiological stress levels of elderly people exposed to a videotape of fish swimming in an aquarium. Similarly, Wells (2005) found that video-recordings of fish, birds, and monkeys buffered participants from the stressor of reading aloud, significantly more than exposure to moving images of people or blank television screens. Although limited, the findings

from these investigations point to the potential value of videotapes of certain animals to be used as transient mediators of stress. This mode of presentation may offer advantages where the use of live animals is not feasible or desirable.

Physical Fitness

Physiological health advantages, particularly long-term ones, may be gained from pets through the increase in exercise that typically accompanies the ownership of an animal (Bauman, Russell, Furber, & Dobson, 2001; Brown & Rhodes, 2006). This obviously applies more to the ownership of a dog than any other type of pet. There is ample evidence to suggest that dog owners of all ages, including older adults (Curl, Bibbo, & Johnson, 2017; Dall et al., 2017; Dembicki & Anderson, 1996; Thorpe et al., 2006; Toohey, McCormack, Doyle-Baker, Adams, & Rock, 2013), take more exercise than non-owners (for review see Christian et al., 2013), and this mode of action may explain why some studies (e.g., Rajack, 1997; Serpell, 1991) have found greater health advantages for dog than cat owners (e.g., Pruchno, Heid, & Wilson-Genderson, 2018). Some authors, however, point to many owners not actually walking their dogs (Bauman et al., 2001; Cutt, Giles-Corti, & Knuiiman, 2008; Westgarth, Christley, & Christian, 2014) and highlight the need for more interventive strategies designed to educate people on the advantages of taking exercise with their pets.

Attachment and Oxytocin

The neurochemical oxytocin (OT) may have a role to play in our interactions and bonding with our pets (see Julius, Beetz, Kotrschal, Turner, & Uvnas-Moberg, 2013). OT is a peptide hormone synthesized in the hypothalamus and released during birth and lactation. It also appears to have an important role in stress release (e.g., Amico, Johnston, & Vagnucci, 1994), social affiliations (e.g., Witt, Winslow, & Insel, 1992), and pair bonding (e.g., Panksepp, 1992). Studies now suggest that interactions with our pets can also trigger the release of OT, and that this hormone may be behind some of the health benefits arising from interactions with animals and pet ownership (for review see Beetz et al., 2012). For example, higher concentrations of OT have been found in the urine of owners whose dogs gazed at them for longer periods of time than owners who were looked at by their pets for shorter lengths of time (Nagasawa, Kikusui, Onaka, & Ohta, 2009). A similar increase in OT has been reported in dog owners following episodes of petting their own dogs (Odendaal & Meintjes, 2003). Interestingly, lower increases in OT were recorded following the petting of an unfamiliar dog, lending support for the idea that OT release is dependent upon the relationship between the person and his or her pet. Indeed, higher OT levels have been reported in owners and dogs that are more closely attached to each other than in those with a weaker bond (Handlin et al., 2011). Not all studies have reported an increase in OT following interactions with an animal, however. A decrease in serum OT levels was observed in men, compared with an increase in OT in women, following interactions with a familiar dog, leading the authors to suggest that men and women may have different hormonal responses to interactions with their pets (Miller, Kennedy, DeVoe, Hickey, Nelson, & Logan, 2009). This may or may not determine how the two sexes differ in the extent to which they gain health benefits from their pets.

The role of OT in human–animal health relations is still sparse and in need of further research attention. While activation of the OT system may go some way to explaining some of the health benefits derived from people’s interactions with animals, other physiological and psychological mechanisms, as previously discussed, cannot be overlooked. The mechanisms underlying the ability of companion animals to improve human health are complex, and much further

research is needed before firm conclusions can be drawn. The possibility that there is a *non-causal* association between animals and human health must also be acknowledged at this point in time; there may well be a correlation between the two variables, but pet ownership per se may not necessarily be responsible for any improvements in owners' health status. It is possible, for example, that people who choose to acquire a pet also harbor traits more likely to dispose them to enhanced health and well-being (McNicholas & Collis, 1998).

Conclusions

The research reviewed in this article points to a mixed picture regarding the effect of pets on human health and well-being. By and large, most studies report a positive association between interactions with animals and the physical and/or psychological health of people, and lend support for the commonly held belief that pets are good for us. This review, however, has drawn attention to the range of studies that suggest otherwise. The discrepancy in results may be due to a wide variety of variables, including differences in methodological design, type of outcome under investigation, or failure to control for confounding variables, for example, owner–pet attachment, and gender balance. There is also often the tendency to report more positive than either negative or non-significant results (Herzog, 2011). Further work is clearly needed in this area, paying heed to robust methodological issues.

In addition to setting the scene, this paper has highlighted studies targeted specifically at older adults. It is clear that particular attention needs to be addressed to the role of pet ownership and animal-assisted interventions in the lives of the elderly, given the fact that people are living longer in today's society. Many of the issues that have dogged existing research in this area more generally (e.g., poor methodological design) are equally applicable to that involving older adults, but some of the issues are likely to be unique to this cohort and need to be identified and carefully negotiated. Gee et al. (2017), for example, draw attention to challenges including how to define the lower age limit for "older" adults, the lack of heterogeneity in the elderly population, and problems involving attrition. High quality methodology is at the fore of resolving the issues that are inherent in research of this nature. Companion animals play a significant role in today's society, and future research in this area will hopefully shed more substantial light on how pets may contribute to the health and well-being of our growing older population.

Conflicts of Interest

The author states there are no conflicts of interest.

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