Sustanimalism

A sustainable perspective on the relationship between human and non-human animals

Pim Martens



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'Some people talk to animals.
Not many listen though.
That's the problem.'

- A.A. Milne

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Brunssum, July, 2020



Chapter 1

Introduction and summary

Wikipedia

In philosophy, ***animalism*** *is a theory about personal identity according to which personal identity is a biological property of human beings, just as it is for other animals. Animalism is not a theory about personhood, that is, a theory about what it means to be a person. Animalists could hold that robots or angels were persons without that contradicting their animalism. According to the German philosopher W. Sombart, "Animalism", in opposition to "Hominism", contains every ideology that gives up the notion of humans possessing a life-form of their own, and understands them as a part of nature, as an animal species.*

"The greatness of a nation can be judged by the way its animals are treated", Mahatma Gandhi said many years ago. Somewhere between this observation and the sustainability debate in recent years it has gone wrong. If we look at the many sustainability indicators that have been developed over the years, it is striking to see that animal-wellbeing hardly plays a role. Biodiversity and ecosystems indicators put more emphasis on the number and variety of different species than their well-being. Assuming that the words of Gandhi make sense, can we then conclude that the concept of sustainability has nothing to do with civilization? Or is it that animal-wellbeing is a blind spot in the sustainability debate?

Of course our interaction with the environment, other people and other animals is part of our civilization. The reason that 'animals 'and 'sustainability' are not often mentioned together in one sentence is likely to be found in the fact that the sustainability debate has been hijacked in recent years by industry and governments; their view regarding sustainable development has significantly been subordinate to the dogma of economic growth with little regard for animal welfare. How short-sighted this is has been illustrated by the various outbreaks of animal diseases in intensive farming and the development of antibiotic resistance of many pathogens, in large part because our farmed animals are given too many antibiotics. These are just some examples, but it is increasingly clear that our own well-being is closely connected with the welfare of the animals with whom we live.

Pets, for example. Research shows that people with a pet are in general healthier than non- pet owners. Pets also increase the capacity for empathy and social contacts among children (which are useful characteristics for a healthy and happy life). Furthermore, people who are heavily involved in animal welfare appear to have more compassion for the problems of people. Of course, this supposes a good care of the (domestic) animal. Keeping animals just because it's (temporary) fun / useful / convenient for us, of course, is not always the most sustainable course of action. We all know the stories of neglected pets and there is also a relationship between domestic violence and animal cruelty.

Some more examples: we are happy for animals in the zoo to have large enclosures, but if we have bought a ticket we do want to be able to see them. We like to eat meat, but we

prefer not to be confronted with pictures of battery cages. We are vegetarian ourselves, but still have a large dog that eats meat. We live in glasshouses.

With this thesis, we study the sustainability of our relationship with animals. By looking at animals, you can put the sustainability debate on the map in an engaging way. Animal welfare should therefore be central in the sustainability debate: what we term 'sustanimalism' (in Dutch, the combination of 'dieren' (animals), and 'duurzaamheid' (sustainability) leads to the neologism 'dierzaamheid'). With this in mind, it is also practical and easy to make a contribution to a sustainable society. Acting animal-friendly – for example, take good care of your animals and eating less meat – is not only beneficial to your health, but also to a better and more civilized world. We hope to encourage people to think about our interaction with the animals that surround us. What is sustainable and what is not, is not a black and white story.

Without claiming to cover the full complexity of our relationships with animals, in this thesis we explore the sustainability of the relations humans have with the non-humans we are living with on various levels of interaction. Chapter 2 gives an overview how our relationships with animals has evolved over time and what different relationships we have. On the one hand, animals can serve instrumental purposes: we currently use animals for clothing, for testing a range of human products, for gaining basic insights into human biology and behavior, and as food. On the other hand, human-animal relations are social. The clearest example is the practice of pet-keeping, with people attributing a special status to their pets. We review the current state of research on human-animal relations by focusing particularly on pets and on the psychological mechanisms involved in this special relationship.

In Chapter 3 we move closer into the relationships we have with our pets, in particular cats and dogs. In this chapter, we present, amongst others, information on how the attachment level of companion animal owners correlates to their attribution of emotions to their companion cat or dog. Our findings suggest that respondents attributed all posited basic (anger, joy or happiness, fear, surprise, disgust and sadness) and complex (shame, jealousy, disappointment and compassion) emotions to their companion animals, with a general trend towards basic emotions (with the exception of sadness) being more commonly attributed to companion animals than complex emotions. All pet owners showed strong attachment to their companion animal(s), with the degree of attachment (of both cat and dog owners) varying significantly with education level and gender.

In Chapter 4 we go another step deeper into the relationship we have with our pets. Regarding dogs and cats, most people that live together with these companion animals claim to recognize emotional facials expressions and body postures in their pet. However, the 'decoding' of facial expression across species has been rather limited. In this chapter

we used photographs of dogs and cats to which companion-animal owners attributed an emotion and compared their assessments with those made by independent experts.

Chapters 5 and 6 broadens the analysis of our interaction with animals, by looking at the social context and culture of the individual in relation to their attitude towards animals. We look how ethical ideologies relate to public attitudes toward animals, and analyse a number of factors including: sex, age, nationality/ethnicity, residence area, animal related activities and hobbies, food habits, culture/religion, education, and pet ownership among others. Chapter 5 presents a case study on Dutch and Belgian high school students; Chapter 6 analyses the data we gathered for the Dutch population.

In Chapter 7, we assess the impacts of companion animals on the environment, by introducing the "ecological paw print" (EPP). Here, we explain the impact of companion dogs and cats; quantifying their dietary EPP and greenhouse gas (GHG) emissions according to data we collected from China, the Netherlands and Japan, and discuss how to reduce their dietary EPP and GHG emissions in order to understand the sustainable relationship between companion animals and the environment.

Finally, in Chapter 8 we broaden the scope again by looking at policy determinants and cross-country differences in animal protection policies. Based on a review of relevant literature and borrowing concepts from environmental policy research, we suggest three broad factors to be positively related with stricter animal protection policies: economic development, democracy, and civil society. Results suggest that countries with stronger democratic institutions and more civil society groups focused on animal protection are likely to have stricter animal protection policies. For economic development and broad civil society strength we do not find significant effects.



Chapter 2

People and animals: A long history

Based on: Amiot, C., Bastian, B. & Martens, P. (2016). People and companion animals: it takes two to tango. *BioScience*, 66(7), 552-560.

Abstract

Animals have accompanied humans for thousands of years, with a strong bond forged between humans and other species. Our relationships with animals can take different forms. On the one hand, animals can serve instrumental purposes: we currently use animals for clothing, for testing a range of human products, for gaining basic insights into human biology and behavior, and as food. On the other hand, human-animal relations are social. The clearest example is the practice of pet-keeping, with people attributing a special status to their pets. We review the current state of research on human-animal relations by focusing particularly on pets and on the psychological mechanisms involved in this special relationship. Our aim is to highlight key findings from human-animal relations research that also have implications for different scientific disciplines.

2.1 Introduction

Our relations with animals clearly have consequences for both animals and for humans (Amiot & Bastian, 2015). These consequences range from physical to psychological. For instance, research has demonstrated that human relationships with animals are good for human health, as they can reduce stress and medical complaints while also increasing self-confidence (e.g., Herzog, 2011). Yet, research suggests that human-animal interactions are no panacea, with a number of detrimental outcomes also identified, for example through the spread of disease.

The goal of this Chapter is to first highlight that our relationships with animals – particularly pets – are a central element of human life. To this end, we first discuss how human-animal relations have been prevalent over the course of human history and how they are rooted in our shared evolution. Next, we provide an overview of research into the beneficial aspects of human-animal interactions, both for humans and for animals. We then bring nuances to these conclusions by presenting empirical evidence that identifies some of the boundary conditions for these effects and which reveals how our relations with pets and animals can also be detrimental (e.g., zoonoses, meat-eating), both for humans and/or for animals. Our aim is to highlight human-animal relations as a field of research that merits continued theoretical and empirical attention from a diversity of scientific disciplines, and to provide a basis for new research directions.

2.2 Human-animal relations from a historical and evolutionary perspective

For more than 99% of human history, people have lived in hunter-gatherer bands totally and intimately involved with other living organisms (Wilson, 1993), suggesting that the evolution of human responses to animals were shaped by these interactions. Through paintings (including ancient cave paintings) and other art forms like epitaphs on animals' tombs, we know that animals played important and significant roles in the lives of our ancestors. From historical evidence, we also know that many examples of "relationships" between people and animals are emotional in nature (Serpell & Paul, 1994) – including our relationships with pets. Pets – formally defined as animals we live with and that have no obvious function – represent one category of animals that have been assigned a special status by humans. Whereas the value we attribute to most animals stands on economic and practical considerations, the importance ascribed to pets comes from the benefits of the relationship we have with them (Serpell and Paul, 1994). Indeed, approximately 90% of pet owners consider their pets as fully-fledged family members (e.g., Carlisle-Frank & Frank, 2006; Cohen, 2002). This relationship is long-standing and enduring: Recent genetic analyses suggest that the co-evolution of dogs and humans started as long as 32,000 years ago (Wang et al. 2013). Dogs and

their owners are hence an excellent example of the co-evolution that took place between humans and animals (e.g., Hare & Tomasello, 2005; Nagassawa, 2015).

The ability for humans to communicate and coordinate with dogs became increasingly possible due to this co-evolution process. Indeed, dogs have a unique ability to adjust their behavior in response to non-verbal cues from humans (e.g., Hare & Tomasello, 2005; Kubinyi, Miklosi, Topal, & Csanyi, 2003). This enhanced sensitivity to cues in the relationship between dogs and humans is also evident at a biological level. Recent research shows that gazing behavior from dogs (but not wolves) increased oxytocin concentrations in owners, which consequently facilitated owners' affiliation and increased oxytocin concentration in the dogs, suggesting an interspecies oxytocin-mediated positive feedback loop (Nagasawa et al., 2015).

Our history with cats is still unclear. Up until recently, most authorities on the subject believed that cats were first domesticated in ancient Egypt (between 3000 BCE and 30 BCE), but a recent study suggests that cats were domesticated at the same time as the cultivation of wheat and barley in the Near East, about 10,000 years ago (Driscoll et al., 2007). Today, cats, dogs, and a number of other species we consider pets (e.g., rabbits and other rodents, reptiles, horses, fish, birds) continue to play an important role in society. Two out of three Americans live with animals, spending more than $55 billion annually on their welfare (American Pet Products Association, 2013). In Australia, 63% of households own pets (Animal Health Alliance, 2013), whereas in Canada, 57% of people are pet owners (Perrin, 2009).

These historical accounts indicate that over time, humans became part of a co-evolutionary system in which they developed together with other animals that are not part of the same ecological niche. Moreover, that they have forged particular bonds with some of those animals such that they became domesticate pets. Where does this attraction toward animals, or at least interest in them, come from? One of the most often cited theories as to why humans are interested in animals is the biophilia hypothesis (e.g., Wilson, 1993). Biophilia refers to the tendency of humans to focus on life and life-like processes. It involves the emotional affiliation that humans have toward other life forms, including animals. Revised theoretical accounts of the biophilia hypothesis state that biophilia is not a single instinct but a complex of learning rules that trigger a variety of emotional reactions to animals, which are themselves shaped by culture (Wilson, 1993). Importantly, the feelings molded by these learning rules fall along several emotional spectra: From attraction to aversion, from awe to indifference, from peacefulness to fear-driven anxiety. In this sense, biophilia refers to a selective attentiveness to other forms of life, which is neither inherently positive nor negative. In line with the biophilia hypothesis, the human mind appears to be wired to think differently about animals than about inanimate objects, suggesting that part of the brain evolved to specialize in processing information about animals (see also New, Cosmides, & Tooby, 2007).

Indeed, empirical evidence confirms this proposition and provides support for the biophilia hypothesis (for reviews, see DeLoache & Pickard, 2010; Kahn, 1997). For example, in a series of experiments, children were more attentive to animals than they were to inanimate objects. In free-play sessions, children aged 1–3 interacted more with live animals than with interesting toys. Further, they behaved differently toward the animals than the toys, talking about the animals more than the toys and asking more questions about them (LoBue, Bloom Pickard, Sherman, Axford, & DeLoache, 2013).

So humans are innately drawn to animals – especially young ones – possibly because, and in line with Lorenz's (1942) 'cute response', these animals share perceptual features with human infants, such as big eyes, large foreheads, and soft contours. This tendency is referred to as neoteny, where neoteny is defined as the retention of juvenile features (looks and behaviour in the adult animal) It has been argued that the human tendency to care and feel empathy for animals may have been a trait that was selected for, as it could reflect a more general capacity to care for human infants. Concern for animal welfare may have also given certain groups of humans an evolutionary advantage as it allowed for the efficient domestication of animals and herding (Bradshaw & Paul, 2010). In support of this contention, faces with infant features – including baby animal faces – are rated by adult participants as more attractive than those without such features (Archer & Monton, 2011).

The co-evolution of humans and animals has been observed across cultures and social contexts, suggesting that this is a built-in, universal human drive. Indeed, people from a diversity of cultures and social classes (Messent & Horsfield, 1985) own and are in contact with animals. However, it is the specifics of our relationships with animals that vary across cultures, and there are large differences between cultures in the meaning of the bond that people have with their pets. While in the United States, Western Europe, and Western-oriented countries pets act as "family members", in many non-Western countries the welfare of those same animals is little concern. Indeed, cultural differences determine which species of animals are viewed as desirable to keep as pets, which animals should be eaten (Gray & Young 2011), and which animals are considered cute (Herzog & Burghardt, 1988). For example, dogs are kept as pets in the US, but eaten in South Korean (Podberscek, 2009), and stag beetles are kept as pets in Japan, but not in the US. While cultural differences in attitudes toward animals have been identified (Kellert, 1993), even within the same culture, pet preferences – such as preference for different breeds of dogs – have been found to change over time, often in a highly random and unpredictable manner (Herzog, Bentley, & Hahn, 2004).

2.3 Pets and human health and well-being

Humans have developed an interdependent relationship with many animal species, and in particular dogs (Hare & Tomasello, 2005). Coevolution of both humans and animals over long periods of time has underpinned this relationship, including the development of biological responses that facilitate interspecies affiliation. More recently research has begun to examine whether this human-animal bond may have well-being consequences. The general assumption has been that people benefit from the presence of animals and in particular with pets. However emerging evidence suggests that the association between the presence of animals and human health is varied and complex, with empirical research on this question often leading to contradictory evidence (for reviews, see Amiot & Bastian, 2015; Friedmann & Son, 2009; Herzog, 2011; Wells, 2009). To reflect the state of these findings, we first review empirical evidence that confirms the beneficial role that pets play in people's lives; in terms of physical, psychological, and psychosocial functioning. Next, we review evidence highlighting the detrimental effects of human-animal relations. We end by identifying potential moderating factors that could explain who is likely to benefit most from the presence of animals.

2.3.1 Beneficial physical outcomes

One of the best known examples of the positive link that has been uncovered empirically between animal presence and human health is a longitudinal study by Friedmann, Katcher, Lynch, and Thomas' (1980). This seminal work, focusing on 92 heart-attack victims, revealed that 28% of pet owners survived for at least a year, compared to 6% of non-pet owners. This study spurred a lot of interest in the benefits of animals on human health and inspired a series of replications and extensions (e.g., Friedmann, Thomas, Cook, Tsai, & Picot, 2007). One of the few experimental studies examining the association between pet presence and human health randomly assigned hypertensive stockbrokers to either a pet ownership or a no-pet ownership condition (Allen, Shykoff, & Izzo, 2001). After six months of owning an animal or not, measures of blood pressure during a stressful task were taken. This revealed smaller increases in blood pressure in the pet ownership group compared to the non-pet ownership group.

One reason why pet-ownership may improve stress tolerance is via neurochemical responses that increase the capacity to cope with stress and the direct capacity of animals to alleviate (human) stress. Supportive of this, research has shown increases in oxytocin, dopamine, and endorphins in both humans and dogs when they interacted positively with one another; such as when gently stroking/scratching the dog. In comparison, the activation of these neurochemicals was more modest when reading a book (Odendaal & Meintjes, 2003). Providing converging evidence, a brain imaging experiment revealed that pet owners display a lower stress response when they are in the presence of their own pet than when their pet is absent (Sugawara et al., 2012), and elderly people exposed

to fish in tanks reported lower physiological stress compared to those who were not (DeSchriver & Riddick, 1990). Epidemiological and longitudinal studies have also uncovered positive associations between the presence of pets and human physical well-being, revealing that pet owners had fewer physician visits than similar patients without pets (e.g., Headey, Grabka, Kelley, Reddy, & Tseng, 2002).

Beyond reducing the likelihood of illness, dogs may even have the capacity to detect the emergence of illness. For instance, dogs have been trained to detect cancer among humans beyond chance levels (McCulloch et al., 2006), to alert their owners of upcoming epileptic seizures (Brown & Goldstein, 2011), and to respond to their owners' hypoglycaemic state (Rooney, Morant, & Guest, 2013). More broadly, animal care farms can also play a role in 'green care' for those with dementia, psychiatric problems, and physical disabilities (De Bruin et al., 2012).

2.3.2 Beneficial psychological outcomes

Just thinking about one's animal may confer psychological benefits. Indeed, experimental evidence revealed that when a pet is either physically or cognitively present (i.e., recalled to memory), pet owners expressed higher aspirations and report greater feelings of capability and self-efficacy in attaining personal goals compared to when not in the presence of or not thinking about the pet (Zilcha-Mano et al., 2012). Other work has shown that writing about how one's pet fulfilled social needs in the context of social rejection had the same psychological benefits compared to thinking about one's best friend, suggesting that pets provide a direct source of social support (McConnell, Brown, Shoda, Stayton, & Martin, 2011).

Epidemiological and longitudinal studies have both uncovered positive associations between the presence of pets and human psychological well-being. For example, in a 10-month prospective study, new pet owners reported a significant reduction in minor health problems during the first month following pet acquisition (Serpell, 1991). This effect persisted among dog owners at a 10-month follow-up, and dog owners also reported improved self-esteem over this time period. Pets have also been found to play a critical role in the well-being of those who suffer from dementia and the families who care for them. For these people, the presence of pets may make them feel soothed and calmed and can also facilitate their increased inclusion in social interactions (Baun & McCabe, 2003).

2.3.3 Beneficial psychosocial outcomes

Going beyond these individual-level outcomes, pets can also serve as a springboard toward more positive relations even with fellow humans. Children with pets often develop improved empathy, self-esteem, cognitive capacities and social participation (Melson, 2001). Furthermore, pets also can be used in the treatment of conduct disorder in children

(Levinson, 1969). In support for these contentions, a longitudinal study conducted among children aged 8 to 12 who had just acquired a new dog showed that compared to a matching group of non-dog owners, children with the new dog were visited more often by their friends, and their families engaged in more leisure activities together at the one-month follow-up (Serpell, 1991). Exposure to affectionate relationships with pets during childhood predisposes people – at least retrospectively – to develop more positive affect not only toward animals later in their lives, but also to report greater empathy and positive attitudes toward humans (e.g., Miura, Bradshaw, & Tanida, 2002).

To account for these intriguing beneficial effects, commentators have proposed that animals can facilitate human-human relations by acting as "social lubricants" that help to catalyze social relationships more broadly (Collis & McNicholas, 1998). Even our social perceptions of another individual change depending on whether or not an animal accompanies him/her. For example, therapists accompanied by a dog are evaluated more positively than those without a dog (Schneider & Harley, 2006). These perceptions in turn impact on human-human behaviors. In experiments that systematically compare human-human interaction when a dog is present vs. absent, being accompanied by a dog was associated with increased frequency of social interactions among humans (McNicholas & Collis, 2000). When accompanied by a dog, for example, people were more like to receive help from others, such as a money donation, and others were more likely to trust them, more often providing their phone number to those accompanied by a dog (Guéguen & Ciccotti, 2008).

While dogs – who are highly social animals – were used in many of these studies, even rabbits and turtles encouraged approaches by other people and stimulated conversations between children and unfamiliar adults in a community park setting (Hunt, Hart, & Gomulkiewicz, 1992). Whereas service and assistance animals can forge deep relationships with their owners, their presence can also lead to increased interactions among humans per se (Bernstein, Friedmann, & Malaspina, 2000). In interviews conducted among parents of autistic children (Burrows, Adams, & Spiers, 2008), service dogs were found to promote positive social interactions, also improving these families' social recognition and status and contributing to others awareness of autism.

2.3.4 Therapeutic interventions

Some types of contact with animals are more structured than others (such as informal human-pet relationships) and aim specifically to be therapeutic. This includes animal-assisted therapy (AAT) which is defined as an intervention with specific goals and objectives delivered by health professionals with specialized expertise in using an animal as an integral part of treatment (Fine, 2006). In AAT, animals are seen as playing the role of secure attachment figures who may then serve to facilitate more permanent and positive (human) relationships (Zilcha-Mano, Mikulincer, & Shaver, 2011).

To summarize and integrate the quantitative research findings on the effectiveness of AAT, Nimer and Lundahl (2007) conducted a meta-analysis that included 49 studies with appropriate methodology. Dogs were the most common animal therapists. AAT had moderate beneficial effects on well-being outcomes such as anxiety and depression, moderate beneficial effects on behavioral and medical outcomes such as blood pressure and heart rate), and also highly beneficial therapeutic effects on autistic spectrum behaviors.

2.4 Do animals benefit too?

The presence of animals may be associated with improved health and well-being outcomes for humans, but is the presence of humans beneficial for animals? Empirical evidence provides support for this alternative direction, and for the beneficial role of humans in animals' health. For instance, the action of stroking an animal reduced the animals' heart rate (e.g., Lynch & McCarthy, 1969). Other work has shown that dogs with owners who consider them as social partners showed lower levels of morning cortisol (Schoberl et al., 2012), suggesting that how dogs are integrated into their owner's life more generally is associated with the dogs' level of stress. Other work has shown that positive human-animal interactions have similar effects at the neurotransmitter level (increased levels of phenylacetic acid, a catabolite of β-phenylethylamine (causing feelings of elation, exhilaration and euphoria)) in both humans and animals, suggesting that both gain benefits from the interaction (Odendaal & Lehmann, 2000).

2.5 Detrimental human–animal relations?

While some work suggests that human-animal interactions can be beneficial for both humans and animals, other studies support a negative association between pet presence and human health and well-being. Research conducted among 425 heart-attack victims revealed that pet owners (22%) were more likely than non-pet owners (14%) to die or suffer remissions within a year of suffering from their heart attack (Parker et al., 2010). Large epidemiological studies also revealed that pet owners suffered more from psychological problems than non-pet owners (e.g., anxiety, depression, panic attacks; Parslow, Jorm, Christensen, Rodgers, & Jacomb, 2005). In addition, a small number of studies have uncovered non-significant associations between the presence of animals and human health and well-being. For example, new pet owners taking part in a 6-month prospective study did not report reduced loneliness over time relative to non-pet owners (Gilbey, McNicholas, & Collis, 2007), and depression scores between pet and non-pet owners in a nine-year longitudinal study were not significantly different (Simons, Simons, McCallum, & Friedlander, 2000).

Other negative effects of human-animal relations come from the medical history of our relationship with animals, including dogs and cats. Here, the detrimental effects of animal contact include infectious diseases, zoonoses, parasitism, and injury from bites. In terms of zoonoses specifically, a study conducted among Canadian pet owners revealed that the household practices that increase zoonotic disease risk most frequently identified included: allowing dogs (13%) and cats (30%) to sleep in a child's bed, dogs licking a child's face (24%), and allowing a pet reptile (14%) to roam through the kitchen. Despite the fact that hand washing by children was high (76% washed hands after touching the pet), the authors concluded there is a need to educate people on zoonotic disease prevention practices (Stull et al. 2013). On a more positive note, being exposed to a pet during childhood (including during one's mother pregnancy) was consistently associated with a reduced risk of allergic reactions and atopic asthma at the age of 7, but tended to be associated (particularly for rabbits and rodents) with an increased risk of non-atopic asthma (Collin et al., 2014).

2.6 Bringing the findings together: Potential moderators

In other to bring together the contradictory associations between pet presence and human well-being, Amiot and Bastian (2015) have recently proposed different moderating factors that could explain why animals sometimes appear to have positive, negative, or simply null effects on human well-being. For instance, life conditions and stages, as well as the nature of our relations with animals, may represent such moderators. Specifically, the presence of pets may be particularly beneficial for individuals who have illnesses that reduce their mobility, when they have limited access to social support, or when living alone. In terms of age, pets appear to play a more beneficial role among children and the elderly than among younger and middle-age adults (Enders-Slegers, 2000; cf. Wells, 2009). Indeed, the elderly prefer to have pets as to supply them entertainment and companionship, especially during the "empty nest" stage of their life.

The nature of our link to animals may also help to predict when the animals' presence will be associated with more vs. less human well-being. For instance, the more pet owners perceived discrepancies between their own personality and their pet's personality, the less likely they were to report higher life satisfaction and lower negative affect (El-Alayli, Lystad, Webb, Hollingsworth, & Ciolli, 2006). Similarly, the more pet owners perceived that their behaviors are compatible with their pets', the higher they reported being attached to their pet, and the more likely they were to report positive overall mental health (Budge, Spicer, Jones, & St-George, 1998). Together, these studies confirm the importance of accounting for moderating factors that can explain the conditions under which animals are associated with more positive human health and well-being.

2.7 Capturing the nature of our link with non-human animals

What are the specific ways that humans develop a psychological 'link' to animals? Attachment is an important factor that has been studied in this domain (e.g., McNicholas, Gilbey, Rennie, Ahmedzai, & Ormerod, 2005). Secure attachment, which is also beneficial to well-being, refers to the ability of an attachment figure to provide a secure basis, or sense of safety when the other feels threatened or unsafe. While it is mostly humans who act as caregivers and meet their pets' immediate needs (e.g., exercise, food, health), companion animals may serve as attachment figures for their owners (Zilcha-Mano et al., 2011). In this sense, both humans and their animals can serve as attachment figures for each other. Usually people are questioned through self-reports about the quality of the relationship with their animal. There are a number of such self-reported instruments that measure the degree of attachment to animals for example, the Lexington Attachment to Pets Scale (Johnson, Garrity, & Stallones, 1992), the Pet Relationship Scale (e.g., Lago, Kafer, Delaney, & Connell, 1988), and the more recent Pet Attachment Questionnaire, based on Bowlby's psychological attachment taxonomy (Zilcha-Mano et al., 2011). Studies that have adapted the Strange Situation Test – such that dogs (instead of babies) are placed in the 'strange situation' – show that dogs display attachment patterns toward their human caregivers that are similar to those patterns observed in human-human relations.

Apart from attachment, other work shows that self-expansion may capture the strength of the human-animal relationship. Self-expansion is defined as the capacity to integrate, to some extent, another individual's resources, perspectives, and characteristics into the self-concept (Aron, Aron, Tudor, & Nelson, 1991). In the realm of human-animal relations, self-expansion has been measured by adapting the Inclusion of the Other in the Self Scale (IOS) to assess inclusion of one's pet in the self (McConnell et al., 2011). Research suggests that this feeling of closeness, proximity, and intimacy with an animal, can also be beneficial to well-being. For instance, dog owners who felt a closer psychological proximity to their dog – as measured with higher scores on the IOS – and had owned their dog for longer, showed higher levels of well-being (Cavanaugh, Leonard, & Scammon, 2008).

2.8 Where to from here: Broader issues involved in human-animal relations

While the focus of this paper is on human-pet relations, highlighting the 'special' status of pets in human lives (Serpell & Paul, 1994), the ways in which humans relate to animals more broadly remains an important focus for investigation. Tackling this broader view of human-animal relations requires a different type of approach: One that takes into account that such relations may be fraught by conflict and prejudice

(or speciesism; Singer, 2009). Specifically, understanding human-animal relations as an *intergroup* topic allows for this broader understanding. In many cases, animals may be viewed as an outgroup (i.e., a group one does not belong to) in the same way that members of other cultures, religions, or nationalities are regarded as outgroups. From this starting point, the psychological research on intergroup relations and "us" vs. "them" dynamics becomes relevant to understanding human-animal relations (Plous, 1993). Social psychological theories of intergroup relations (e.g., Tajfel & Turner, 1986) are particularly useful for capturing these dynamics. For instance, drawing on realistic conflict theory can provide insight into the tension that may arise when human interests conflict with those of endangered species (e.g., use of land for human development vs. protecting the environment; Plous, 1993). Just as intergroup hostility can emerge between human groups under these conditions (e.g., conflict over valued resources such as oil), so too can conflicting goals and competition over limited resources lead to hostility and conflict within human-animal relations.

Sometimes, too, animals themselves are the resources that humans hunt and kill. Meat-eating is a longstanding human behavior. Meat is an important source of protein and calories, although with current agricultural practices, it needs far more water and land than a comparable amount of vegetables or grain. By integrating meat into their diet humans gained important benefits such as increased body size and enhanced mobility due to increased energy levels. Eating meat also meant less time was spent foraging for lower quality foods and more time could be spent advancing social and cognitive abilities. Indeed, meat eating has been credited with a central role in the emergence of human culture (Leroy & Praet, 2015). Today around 97% of Americans are meat-eaters with around 9 billion animals processed for meat annually (American Meat Institute, 2013). Despite the popularity of meat, preferences for which animals are considered appropriate for consumptions vary considerably. This is evident in the shocked reactions of those from the western world when people from other cultures put their beloved pets like dogs and cats on the menu. Denying animals human characteristics (e.g., consciousness and the capacity to think) and their individuality are concrete strategies that allow us to distance ourselves from animals prior to harming and exploiting them (Burghardt, 2009). These processes have been found to be at play when people were experimentally reminded of their own meat-eating practices and the harm this brings to animals (Bastian, Loughnan, Haslam, & Radke, 2012). Even just categorizing a novel animal as food reduced concern over its welfare (Bratanova, Loughnan, & Bastian, 2011).

Other factors that are well-established within the tradition of research on intergroup relations can also be applied to human-animal relations. For instance, perceiving similarities between humans and animals can lead to a perception of relatedness with them, also triggering empathy toward animals as well as an increased desire to protect

their rights (Plous, 1993). Similarly, the tendency to anthropomorphize animals – which involves assigning them human-like characteristics, such as emotions and cognitions (e.g., Waytz et al., 2010) – has been associated with greater concerns for their welfare (Butterfield, Hill, & Lord, 2012). In sum, adopting an intergroup perspective to human-animal relations provides important insights into the broader nature of our relationships with animals and the conditions under which these relations are likely to be harmonious vs. conflictual and exploitative. This wider-lens approach hence has the potential to identify the factors leading to more vs. less speciesism, and to pave the way to social interventions that are likely to foster mutually beneficial relations between animals and humans.

The current Chapter focused on the nature of human-animal relations, with a particular emphasis on pets, and the implications of this relationship for both humans and animals. Furthermore, that the nature of our relationships with animals also has broader consequences for human-human relations. According to anthropologist Lévi-Strauss (1966), by "thinking with" animals and investigating how we interact toward other species, we can also gain insights into human nature and understand human societies in new ways. These questions will become increasingly important to tackle as we (humans) are confronted with progressively scarce resources due to human overpopulation, and as we need to make decisions about how to distribute these resources between both humans *and* animals.

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Chapter 3

The emotional life of companion animals: Attachment and subjective claims by owners of cats and dogs

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Abstract

There is a growing body of scientific evidence supporting the existence of emotions in non-human animals. Companion animal owners show a strong connection and attachment to their animals and readily assign emotions to them. In this Chapter we present information on how the attachment level of companion animal owners correlates to their attribution of emotions to their companion cat or dog, and the owners' attribution of mirrored emotions. The results of an online questionnaire (n = 1,023) distributed amongst Dutch speaking cat and/or dog owners (mainly in the Netherlands and Belgium) suggest that companion animal owners attributed several emotions to their pets. Our findings suggest that respondents attributed all posited basic (anger, joy or happiness, fear, surprise, disgust and sadness) and complex (shame, jealousy, disappointment and compassion) emotions to their companion animals, with a general trend towards basic emotions (with the exception of sadness) being more commonly attributed to companion animals than complex emotions. All pet owners showed strong attachment to their companion animal(s), with the degree of attachment (of both cat and dog owners) varying significantly with education level and gender. Owners that ascribed human characteristics to their dog or cat also scored higher on the Pet Bonding Scale (PBS). Finally, owners who found it pleasant to pet their dog or cat had a higher average PBS score than those that do not like to do so. The relationship between the owner's attribution of mirrored emotions and the degree of attachment to dogs was significant for all emotions, whilst for cats this relationship was significant only for joy, sadness, surprise, shame, disappointment and compassion.

Keywords

Companion animal, cats, dogs, mirroring emotions, primary emotions, secondary emotions, owner attachment

3.1 Introduction

Companion animal owners express strong emotional connections to their animals (Hall et al. 2004), often considering them part of the family and providing them with levels of affection, comfort and support similar to that of another human family member (Wrobel and Dye 2003; Donohue 2005; Zilcha-Mano, Mikulincer and Shaver 2011). Additionally, companion animals can fulfill 'basic social needs' of their owners, such as emotional closeness (attachment), social integration, reassurance of worth, reliable alliance, guidance, and the opportunity for nurturance (Enders-Slegers 2000; Kurdek 2009; Wang et al. 2013).

Emotions can act as a process to mobilize behavioral and physiological processes in response to stimuli that subsequently allow animals to avoid harm or approach resources, functioning to improve their chance of survival (Rolls 2000; Boissy et al. 2007). Electrical stimulation of the brains of both human and non-human animals has evidenced that the mammals tested have similar brain structures and similar unconditioned emotional responses (Panksepp 2011). It is therefore plausible that both intra and inter-species understanding and mirroring of emotions may occur (Rizolatti, Fogassi and Gallese 2001). Emotion contagion is a phenomenon that causes animals, upon perceiving other animals in a particular emotional state (e.g. fear) to shift their own affective state in the same direction (Špinka 2012). In human-to-human attachment relationships, participants 'attune' to each other's emotions and behavior (Fogel 1993; Van Geert and Steenbeek 2005). This social referencing is well documented in children who look to their parents in unknown situations to 'mirror' their parent's appraisal of the situation (Feldman 2003). Additionally animals have been evidenced to both emit and detect emotional signals; for example, the social group can lower an individual's arousal level in cattle undergoing stressful events (Veissier and le Neindre 1992; Bouissou et al. 2001; Merola, Prato-Previde and Marchall-Pescini 2012). In the case of inter-species social referencing, dogs have been repeatedly documented to refer to their owners' appraisal and portrayed emotional messages to seek information about a situation and determine their behavior (Merola, Prato-Previde and Marchall-Pescini 2012; Hare and Woods 2013; Wang et al. 2013). A recent fMRI study demonstrated that companion animal owners report parallel emotional ratings when presented with an image of their child and their companion dog and that these images elicited greater positive emotional (neural) responses than pictures of unfamiliar children and unfamiliar dogs (Stoeckel et al. 2014). Research, carried out by Costa et al. (2014) which asked humans to identify the facial expressions in pictures of (unfamiliar) dogs, showed that professionals and dog owners recognized emotions significantly better than people that did not have experience with dogs.

It is obviously unknown as to whether animals experience emotions in the same way as humans. There is a fundamental difficulty in measurement (and determination of

existence) of animal emotions because animals are unable to verbalise their experiences in the same way as humans. However, there is general agreement that basic (or primary) emotions such as anger, joy, sadness, surprise, disgust and fear can be found across a wide range of (vertebrate) species (Panksepp 1982; Le Doux 1996; Boissy et al. 2007). Complex (or secondary) emotions such as shame, jealousy, disappointment and compassion are often restricted to humans and other primates (Preston and De Waal 2002), with relatively sparse claims of complex emotions in (non-primate) animals (Bekoff 2002). A notable exception is the recent work of Steiner and Redish (Steiner and Redish 2014) who evidenced that rats are capable of experiencing regret.

Companion animal-owner relationships, lasting for several years in most cases, provide owners with a unique perspective (Reddy and Morris 2006), potentially providing a source of enquiry into animal emotions that is not readily available to the outside observer. Rather than being confounded by anthropomorphic interpretations, owner reports have been demonstrated to provide reliable and consistent interpretation of their animal's behavior (Morris, Doe and Godsell 2008; Mariti et al. 2012). Additionally, owners are the primary source of information regarding companion animal behavior problems (Bennett and Rohlf 2007; Blackwell et al. 2008; Arhant et al. 2010), and are able to identify overt behavioral indicators of stress (e.g. trembling, crying or excessive barking) indicative of reduced welfare (Mariti et al. 2012). In detailed reviews the value of observer assessments (when used in careful experimental design) in investigating animal welfare, are described (Wemelsfelder 1997; Meagher 2009). Of particular interest are studies correlating human assessment of an animal's emotional experience to physical and physiological measures of stress in animals (Minero et al. 2009; Stockman et al. 2012), inferring some verisimilitude in human assessment of animals' emotional experiences.

A large body of literature documents how demographic variables influence attitudes towards animals (for a summary see Walker et al. 2014b), yet the amount of research investigating the correlation between demographics (both owner and animal) and the attribution of emotions to animals is limited. Recent research by Walker et al. (Walker et al. 2014a,b) demonstrated that experience (in the form of animal ownership) and gender (female) was positively correlated with attribution of grief, anxiety and depression to animals, and Morris et al. (Morris, Knight and Lesley 2012) demonstrated that owners of a particular species reported a greater range of emotions for that species than for species they did not own. Additionally, previous research has demonstrated that increased attachment levels result in the increased use of emotive terms to describe animal behavior (Kiesler, Lee and Kramer 2006). Other studies have shown that owners attribute advanced human capabilities and emotions to their own animals but not to animals owned by others (Sanders 1993; Fidler, Light and Costall 1996; Bahlig-Pieren and Turner 1999), which may be the result of differing attachment levels. In

this study we aimed to extend the knowledge of demographic variables that underpin owner attribution of emotions to companion animals for six basic emotions: anger, joy (happiness), fear, surprise, disgust and sadness and four complex emotions: shame, jealousy, disappointment, compassion. Additionally, we investigated how owner attachment influences the attribution of (mirrored) emotions to animals.

3.2 Methods

3.2.1 Questionnaire

Research into owners' perceptions of their companion animal's (dog or cat only) emotional experiences, and levels of attachment to their companion animal, was conducted in the period February-May 2014. During this period, an online survey (in Dutch) was distributed via the networks of the authors of this paper. By means of snowball sampling (Goodman 1961) amongst cat and/or dog-owners, 1,023 completed surveys were returned. The group of respondents that filled in the questionnaire owned a dog and/or cat (or several of them). Owners were asked to respond for only one companion animal. Where an owner had more than one pet, they were asked to fill in the questionnaire for the animal which they had owned the longest. The majority of the respondents lived in Belgium and The Netherlands (95.7%). Fifty-seven percent of the questionnaires were completed pertaining to dogs and forty-three percent pertained to cats.

The questionnaire (see Appendix 1) consisted of four sections. In the first section, respondents were asked about the basic characteristics of their pet (species, breed, age, size, sex, neutered status and health status) and husbandry practices (How often do you go to the vet?; How often do you feed your dog/cat (and how much)?; How often do you brush you dog/cat?; Can your dog/cat stay alone at home?; Where does your dog/cat sleep?' Who is taking care of your dog/cat when you are not around?; How often and how long do you go for a walk with the dog?; Is your dog friendly towards strangers?; How often does your cat go outside?; How often is the litter changed?; Does your cat sit frequently on your lap?). Respondents were also asked why and where they got their pet, if they were the main caregiver of the pet and how many years they owned their pet.

In the second section, the Pet Bonding Scale (PBS) (Angle 2007) was used to measure an owner's attachment to their companion cat or dog. Investigating connections between attachment to pets and interpersonal relationships is important for establishing a potential mediating role of pets in interpersonal relationships. Attachment to companion animals is commonly established through the use of a series of questions that relate to assessing the Human-Animal Bond. Over the past four decades a number of scales designed to measure this attachment have been developed, validated and reported in peer-reviewed

literature (Anderson 2007). Although, like most measures of the human-animal bond, the PBS can be susceptible to social desirability and the 'halo effect' (Anderson 2007), we chose the PBS for its conciseness of design, which allowed us to arrive at a single aggregated outcome. We should note, however, that the construct of pet-attachment is due to various cultural and individual perceptions of animals which can cause qualitative differences difficult to define.

In brief, the Pet Bonding Scale includes 25 questions that each owner is requested to score by assigning a number value to the five possible choices: (0) strongly disagree, (1) somewhat disagree, (2) neutral, (3) somewhat agree or (4) strongly agree. A high score on a question indicates strong attachment and the sum of the scores provides a measure of the overall strength of the owner's attachment to their companion animal. Examples of questions are: "I have warm feelings when I think about my pet; My pet makes me feel important; I like to talk to my pet about things that are important to me." Additionally, in section two we asked respondents how they communicated with their companion animal (e.g. talking, petting) and how their pet communicated with them (e.g. meowing/barking, body language, touching, looking, scratching, sniffing).

In the third section, the respondents were given a list of six primary (anger, joy [happiness], fear, surprise, disgust and sadness) and four secondary emotions (shame, jealousy, disappointment, compassion) as described by Ekman (Ekman 2003). Respondents were asked if they had witnessed any (or all) of these emotions in their companion animal, and if they thought that these emotions had been influenced by their own behavior (mirroring emotions [attunement of the emotions of the owner and the pet]), by choosing one of the following response options: never', 'sometimes', 'often' and 'no idea'.

Finally, in the fourth section, the questionnaire collected information on respondent demographics, including gender (9% male; 91% female), nationality (17.5% Belgium; 78.2% Netherlands, 4.3% other), age (mean 43.1 years with a SD of 12.8), highest level of education (51.8% higher education or university diploma), composition of household (48.3% couples without children; 20.7% couples with children; 19.1% single without children; 5.1% single with children; 6.8% other) and housing (22.3% apartment; 29.6% detached house; 48.1% semi-detached house).

3.2.2 Statistical analysis

The relationships between demographic variables and respondents' attribution of emotions to their pet were analyzed using IBM SPSS 20 Statistics. A t-test was carried out to calculate the difference between the average scores of two groups. For the differences between three or more groups we used a One-Way ANOVA test. For both, a sequential Bonferroni correction was applied to control for type one errors

due to repeated testing, and the questions were corrected for multiple testing.Pearson correlations between various variables (see results section) were performed. Results were considered significant at $p < 0.05$. Results are based on two-sided tests assuming equal variances with significance level 0.05.

To investigate variables that significantly influenced attachment levels (measured using the Pet Bonding Scale), linear regression was used. Stepwise linear regression was conducted using backward elimination; non-explanatory variables were removed until the optimum model was found (see results section) (McDonald 2014).

3.3 Results

3.3.1 Which emotions did owners attribute to their companion cats and dogs?

Joy was the most commonly attributed emotion by the respondents, followed by fear, jealousy and surprise. Shame and compassion were the least common. Anger and disgust were more frequently attributed to cats than dogs. In contrast, joy, sadness, shame, disappointment and compassion were more frequently attributed to dogs than cats (Table 1).

Table 1. The attribution of emotions to dogs and cats. Emotions were scored on a 3-point scale: 1 (never); 2 (sometimes); 3 (often).

	Dog Mean (*SD*)	Cat Mean (*SD*)	*df*	*t*	*p*
Anger	1.7 (0.55)	1.8 (0.55)	955	-3.74	< 0.01
Joy	3.0 (0.13)	2.7 (0.50)	1006	11.16	< 0.01
Sadness	1.7 (0.52)	1.5 (0.55)	809	5.34	< 0.01
Disgust	1.7 (0.59)	1.8 (0.58)	896	-3.15	< 0.01
Fear	2.1 (0.49)	2.1 (0.48)	1012	-2.36	0.02
Surprise	2.0 (0.56)	2.0 (0.64)	892	1.41	0.16
Shame	1.4 (0.54)	1.3 (0.51)	809	3.44	0.01
Jealousy	2.0 (0.67)	2.0 (0.72)	952	2.09	0.04
Disappointment	1.8 (0.53)	1.6 (0.58)	869	6.80	< 0.01
Compassion	1.5 (0.63)	1.3 (0.53)	759	5.37	< 0.01

Does sex, age, size or breed of the animal influence the attribution of emotions?
Respondents who owned a female dog were more likely than those that owned a male dog to attribute sadness, jealousy and disappointment to their companion dog (Table 2a). Furthermore, respondents that owned small sized dogs (less than 10 kg) comparative to those that owned larger dogs (not presented in Table) were more likely to attribute

Table 2 a and b. Sex and age of companion animals and the attribution of emotions by their owners. Emotions were scored on a 3-point scale: 1 (never); 2 (sometimes); 3 (often).

A	Dog					Cat				
Sex	Male	Female	*df*	*t*	*p*	Male	Female	*df*	*t*	*p*
Anger	1.70	1.63	544	1.40	0.07	1.76	1.84	409	-1.47	0.14
Joy	2.98	2.99	580	-0.45	0.65	1.75	2.73	424	0.55	0.58
Sadness	1.65	1.76	484	-2.31	0.02	1.54	1.46	323	1.37	0.17
Disgust	1.64	1.72	509	-1.42	0.16	1.73	1.88	385	-2.52	0.01
Fear	2.07	2.07	577	-0.12	0.91	2.12	2.16	433	-0.83	0.41
Surprise	2.02	2.04	520	-0.39	0.70	1.94	2.00	370	-0.85	0.40
Shame	1.41	1.47	479	-1.19	0.24	1.30	1.32	328	-0.52	0.61
Jealousy	1.99	2.11	551	-2.14	0.03	1.91	2.01	399	-1.39	0.17
Disappointment	1.76	1.88	518	-2.66	0.01	1.56	1.55	349	0.10	0.92
Compassion	1.50	1.55	441	-0.69	0.49	1.29	1.30	316	-0.01	0.93

B	Dog						Cat					
Age	Less than 5 years	5–10 years	10 years and over	*df*	*F*	*p*	Less than 5 years	5–10 years	10 years and over	*df*	*F*	*p*
Anger	1.59	1.73	1.73	545	4.31	0.01	1.79	1.85	1.76	410	0.95	0.39
Joy	2.98	2.99	2.98	581	0.69	0.51	2.85	2.67	2.69	425	6.09	< 0.01
Sadness	1.63	1.75	1.81	485	4.43	0.01	1.45	1.54	1.52	324	0.90	0.41
Disgust	1.62	1.74	1.70	510	2.23	0.11	1.72	1.84	1.86	386	2.57	0.08
Fear	2.09	2.06	2.02	578	0.76	0.47	2.11	2.18	2.14	434	0.79	0.45
Surprise	2.09	1.98	1.97	521	2.67	0.07	2.08	1.98	1.82	371	5.34	0.01
Shame	1.41	1.46	1.48	480	0.55	0.58	1.33	1.25	1.36	329	1.31	0.27
Jealousy	2.01	2.10	2.04	552	0.97	0.38	2.01	1.92	1.92	400	0.64	0.53
Disappointment	1.75	1.82	1.99	519	6.77	< 0.01	1.58	1.54	1.55	350	0.12	0.89
Compassion	1.50	1.52	1.59	442	0.52	0.60	1.34	1.27	1.27	317	0.65	0.52

sadness, fear, jealousy and compassion to their companion animal. Anger, sadness and disappointment were more commonly attributed to older dogs than younger dogs (Table 2b).

For cats, disgust was more commonly attributed to females than males (Table 2a). Joy and surprise were more commonly attributed to young cats than older cats (Table 2b). See Appendix 2 for the detailed Bonferroni test.

Do respondent demographics influence the attribution of emotions to companion animals?

Male respondents were more likely to attribute surprise and shame to their companion animal than female respondents (Table 3a). Furthermore, young people attributed anger, fear, surprise and compassion to their pet more often than older people (Table 3b). Joy, jealousy and compassion were increasingly attributed by less educated people comparative to educated people (not in Tables). Other demographic variables showed less clear results. For example, respondents who considered spirituality important attributed some emotions (anger and shame) to their pet more frequently than other respondents (Table 3c).

What are the most important determinants of the PBS?

The participants in this study showed an average attachment score of 78.6 out of 100 on the Pet Bonding Scale. The majority of owners reported that they liked to look at their pet (99.8%) and to caress their pet (99.4%). Respondents reported that their pet communicated with them 'verbally' (44.5% sometimes and 46% often), by touching them with head or paws (18.2% sometimes and 80% often), by body postures (9.9% sometimes and 88.6% often) and by looking at them (13.2% sometimes and 84.1% often). Additionally, owners reported that their pet provided them with an opportunity for nurturance, with 99.7% of the participants indicating they like to care for their pet.

We identified a number of dog-owner demographic variables that influenced PBS scores (see Table 4a). These included: education level, where the PBS of people with higher education (college, university) was on average 9.9 points lower than the PBS for people with lower education (primary school, etc.); gender, women displayed a degree of attachment 6.3 points higher than men; age, the older one gets, the lower the PBS (PBS decreases with an average of 0.1 per year). Furthermore, the PBS of people who ascribed human characteristics to their pet was 5.8 points higher compared to those that did not. The PBS of people who are members of, or donate to, an animal welfare charity was 2.4 points higher than the PBS of people that did not.

Investigation of the relationship between how owners cared for their dog and their level of attachment to that dog, revealed that owners who walked their dog for more than two

Table 3 a, b and c. Companion-animal owners' attributions, by their sex and age, of emotions to their pets. Emotions were scored on a 3-point scale: 1 (never); 2 (sometimes); 3 (often).

A Sex of Owner	Male	Female	*df*	*t*	*p*
Anger	1.77	1.72	938	0.79	0.43
Joy	2.85	2.88	989	-0.81	0.42
Sadness	1.72	1.61	795	1.72	0.09
Disgust	1.78	1.72	880	0.82	0.41
Fear	2.05	2.11	995	-1.10	0.27
Surprise	2.19	1.98	877	2.98	< 0.01
Shame	1.55	1.37	793	2.78	0.01
Jealousy	1.99	2.01	936	-0.27	0.70
Disappointment	1.67	1.71	853	-0.66	0.51
Compassion	1.47	1.42	744	0.65	0.52

B Age of Owner	18–29 years	30–39 years	40–49 years	50–59 years	60 years and older	*df*	*F*	*p*
Anger	1.80	1.76	1.69	1.74	1.55	917	3.49	0.01
Joy	2.93	2.87	2.89	2.86	2.86	964	1.34	0.25
Sadness	1.57	1.62	1.64	1.63	1.65	774	0.50	0.74
Disgust	1.77	1.75	1.69	1.72	1.70	858	0.58	0.68
Fear	2.18	2.12	2.09	2.08	1.97	970	3.28	0.01
Surprise	2.13	2.02	1.96	1.98	1.91	855	2.83	0.02
Shame	1.46	1.42	1.31	1.37	1.35	773	2.07	0.08
Jealousy	2.08	2.05	1.98	1.96	1.95	914	1.15	0.33
Disappointment	1.67	1.65	1.76	1.74	1.73	831	1.34	0.25
Compassion	1.56	1.40	1.37	1.37	1.47	729	2.97	0.02

	How do you consider religion/spirituality?				
C	Important	Not important	*df*	*t*	*p*
Anger	1.79	1.7	821	2.051	0.041
Joy	2.92	2.86	857	2.24	0.025
Sadness	1.69	1.6	688	1.945	0.052
Disgust	1.79	1.72	758	1.537	0.125
Fear	2.1	2.1	864	0.058	0.954
Surprise	2.04	1.99	760	1.188	0.235
Shame	1.45	1.35	687	2.2	0.028
Jealousy	1.98	2.04	812	-1.235	0.217
Disappointment	1.76	1.68	741	1.877	0.061
Compassion	1.46	1.4	644	1.183	0.237

Table 4 a and b. Important determinants of the Pet Bonding Scale scores regarding dogs and cats

A Pet Bonding Scale for Dogs (*df* = 480)	Unstandardized Coefficients		Standardized Coefficients		
	B	*SE*	Beta	*t*	*p*
(Constant)	49.99	7.19		6.96	< 0.01
Do you sometimes attribute human characteristics to your pet? yes (0), no (1)	5.77	1.06	0.23	5.44	< 0.01
Sex of owner: male (1), female (2)	6.32	1.61	0.16	3.92	< 0.01
Age of owner (in years)	-0.09	0.04	-0.10	-2.24	0.03
Level of schooling of owner*: low (0), middle (1)	-5.58	1.81	-0.23	-3.08	< 0.01
Level of schooling of owner*: low (0), high (1)	-9.90	1.77	-0.42	-5.60	< 0.01
Do you belong or donate to an organization or charity involved in or concerned with improving the welfare of animals? yes (0), no (1)	2.40	1.07	0.09	2.24	0.03
Go for a walk less than 1 hour/day (0), more than 2 hours/day (1)	2.77	1.26	0.09	2.20	0.03
Where does your dog sleep? Bedroom: no (0), yes (1)	2.88	0.99	0.12	2.92	< 0.01
How many years have you owned your pet? Less than 1 year (0), 5 years or more (1)	2.60	0.99	0.11	2.63	0.01
Do you like touching your pet? no (0), yes (1)	11.50	5.42	0.09	2.12	0.03
Does your pet communicate with you – by touching you (with head/legs)?	2.48	1.08	0.10	2.30	0.02
Does your pet communicate with you – by scratching?	1.47	0.65	0.09	2.25	0.03

B Pet Bonding Scale for Cats (*df* = 326)	Unstandardized Coefficients		Standardized Coefficients		
	B	*SE*	Beta	*t*	*p*
(Constant)	48.06	5.46		8.81	< 0.01
Do you sometimes attribute human characteristics to your pet? yes (0), no (1)	5.29	1.43	0.18	3.71	< 0.01
Sex of owner: male (1), female (2)	10.56	2.31	0.23	4.58	< 0.01
Level of schooling of owner: low (0), high (1)*	-3.96	1.32	-0.15	-3.01	< 0.01
Does your pet communicate with you - by touching you (with head/legs)?	2.24	0.86	0.13	2.59	0.01
What is the sex of your cat? male (1), female (2)	-2.55	1.30	-0.10	-1.96	0.05
How often does your cat go outside? always (0), never (1)	3.93	1.37	0.14	2.88	< 0.01
Does your cat sleep in the kitchen? yes (1), no (0)	4.47	1.81	0.12	2.47	0.01
Does your cat sleep in the bedroom? yes(1), no (0)	4.34	1.40	0.16	3.09	< 0.01

hours per day had an attachment score 2.8 points higher than owners that walked their dog less than one hour per day. Owners who allowed their dogs to sleep in their bedroom had an attachment score 2.9 points higher than dogs that slept elsewhere. Attachment scores were also positively correlated to length of ownership: PBS scores were 2.6 points higher for owners that had lived with their dog for 5 years or longer compared with owners that had lived with their dog for less than one year. Additionally, owners who found it pleasant to pet their dog had a higher average PBS than people who did not enjoy it (difference 11.5 points). Finally, owners of dogs that communicated with their owner by touching them with their head or paw, or by scratching (e.g. against a dog) had higher PBS scores (2.5 and 1.5 points respectively) than owners whose dogs did not perform these communicative behaviors. No demographic variables of the dog were found to significantly correlate with the owners' attachment levels.

For cats (see table 4b), the strongest influencing variable on the degree of owner attachment was the sex of the owner: the PBS of women was on average 10.6 points higher than the PBS of men. In addition to the gender of the owner, the degree of attachment also varied by education level: like with dogs, the PBS of people with higher education (college, university) was an average of 4.0 points lower than the PBS of people with lower education (primary school.) Furthermore, the PBS was an average of 5.3 points higher for owners who sometimes attribute human characteristics to their cat compared to people who do not.

The attachment to cats that never go outside was on average 3.9 points higher than the attachment to cats that have the opportunity to go outside ad lib. For cats that slept in the bedroom or kitchen the PBS was on average 4.3–4.5 points higher than cats that were not allowed to sleep there. Owners of cats that frequently touch them have a PBS 2.2 points higher than owners of cats that did not seek out physical contact. The degree of owner attachment to female cats was on average 2.5 points lower than attachment to male cats.

The model to predict PBS in dogs has an adjusted R Square of 0.226. This means that the total variance in the PBS in dogs can be explained for 22.6% by the model, taking into account the number of explanatory variables in the model. The model to predict PBS in cats has an adjusted R Square of 0.201. This means that the total variance in the PBS in cats can be explained for 20.1% by the model, taking into account the number of explanatory variables in the model.

Is there a relationship between PBS score and the attribution of emotions to companion animals?

There was a significant positive correlation between the degree of attachment to the companion animal, as measured by the PBS, and the attribution of the emotions joy,

sadness, surprise, shame, jealousy, disappointment and compassion to companion animals. There was no significant correlation found between the degree of attachment and the attribution of anger, disgust and fear to companion dogs and cats. The same pattern was observed for both cat and dog owners, although for cat owners the positive correlations between PBS scores and joy, sadness, surprise and compassion were slightly stronger. For dog owners, the positive correlation between PBS scores and shame and jealousy was stronger (Table 5b). The correlation between the degree of attachment and the recognition of emotions did not differ greatly between men and women, but the recognition of surprise and jealousy occurred more with women than with men (Table 5a).

Table 5 a and b. Correlations of the Pet Bonding Scale (PBS) scores and the attribution of emotions to companion animals by their owners (by sex of owner and species owned)

A	Male		Female	
Sex of Owner	Correlation PBS	*p* (2-tailed)	Correlation PBS	*p* (2-tailed)
Anger	-0.022	0.845	0.008	0.823
Joy	0.297	0.005	0.251	< 0.001
Sadness	0.384	0.001	0.279	< 0.001
Disgust	-0.037	0.740	0.011	0.765
Fear	-0.171	0.111	-0.047	0.154
Surprise	0.132	0.249	0.251	< 0.001
Shame	0.375	0.002	0.205	< 0.001
Jealousy	0.058	0.604	0.151	< 0.001
Disappointment	0.357	0.002	0.137	< 0.001
Compassion	0.465	< 0.001	0.420	< 0.001

B	Dog Owner		Cat Owner	
Species Owned	Correlation PBS	*p* (2-tailed)	Correlation PBS	*p* (2-tailed)
Anger	0.002	0.955	0.039	0.430
Joy	0.123	0.003	0.303	< 0.001
Sadness	0.249	< 0.001	0.263	< 0.001
Disgust	0.056	0.206	-0.028	0.587
Fear	-0.031	0.455	-0.058	0.231
Surprise	0.180	< 0.001	0.254	< 0.001
Shame	0.197	< 0.001	0.174	0.002
Jealousy	0.150	< 0.001	0.107	0.032
Disappointment	0.130	0.003	0.131	0.014
Compassion	0.388	< 0.001	0.411	< 0.001

There are no fixed rules for the interpretation of correlation coefficients in statistics, i.e. there are no limit values at which a correlation may be called high or low. This strongly depends on the context of the research. In the social sciences the following limit values are used relatively often: strong: 0.5–1.0; moderately strong: 0.3–0.49; weak: 0.1–0.29; no relation: 0.0–0.09.

Are the emotional experiences attributed to companion animals believed to be influenced by the owner?

The relationship between the owner's attribution of mirroring emotions (attunement of the emotions of the owner and the pet) and the degree of attachment was significant for all emotions attributed to dogs (with the correlation in female dogs generally being stronger than in male dogs), whilst this relationship was significant only for the attribution of joy, sadness, surprise, shame, disappointment and compassion to cats (the relationship being similar for both cat-sexes) (Table 6). The overall relationship between the attribution of mirroring the emotions and the degree of attachment was significant for more individual emotions by female companion animal owners (n = 7) than male owners (n = 5). This difference can be partly explained by the far fewer male respondents (91 males compared to 915 females).

Table 6. Correlations between owners' attachment scores and their beliefs that their animals' emotional experiences mirror their own

	Dog		Cat	
	Correlation PBS	*p* (2-tailed)	Correlation PBS	*p* (2-tailed)
Anger	0.126	0.005	0.071	0.192
Joy	0.161	< 0.001	0.268	< 0.001
Sadness	0.352	< 0.001	0.348	< 0.001
Disgust	0.197	< 0.001	0.039	0.497
Fear	0.105	0.015	0.039	0.452
Surprise	0.229	< 0.001	0.258	< 0.001
Shame	0.185	< 0.001	0.185	0.002
Jealousy	0.111	0.012	0.093	0.087
Disappointment	0.156	0.001	0.169	0.003
Compassion	0.328	< 0.001	0.333	< 0.001

3.4 Discussion and conclusions

The aim of this Chapter was to investigate which of ten posited emotions companion animal owners' assign to their companion cat or dog, the influence of demographic variables on assignment of emotions, and if the assignment of emotions correlated with attachment levels. The results suggest that companion animal owners were willing

to attribute all posited basic and complex emotions to their animals, with increased attachment levels positively correlating with increased willingness to attribute four out of six basic emotions and all four complex emotions. All participants were highly attached to their companion animal. Dog owners were more attached to their dogs than cat owners were to their cat, independent of animal characteristics such as gender and age. Cat owners were more attached to a male cat than to a female cat. Female owners showed stronger attachment to their companion animal than male owners and the older the person, the lower the attachment score while the lower education and income, the higher the attachment score was.

3.4.1 Emotions attributed and species differences

In this study, we asked respondents to comment on whether they believed their companion animals could experience six basic emotions (anger, joy [happiness], fear, surprise, disgust and sadness) and four secondary emotions (shame, jealousy, disappointment, compassion). Although our findings suggest that respondents attributed all posited basic and complex emotions to their companion animals, we saw a general trend towards basic emotions (with the exception of sadness) being more commonly attributed to companion animals than complex emotions. One complex emotion; jealousy, was an exception to this finding and the frequency of its attribution to companion animals in this study parallels earlier findings of complex emotions in animals (Morris, Doe and Godsell 2008). A general trend in predominately complex emotions attributed to dogs was also observed, in comparison to a greater attribution of predominately basic emotions to cats. This result parallels recently published work by Paul et al. (Paul et al. 2014) who demonstrated that cat owners tended to report a greater capacity for basic emotions in their companion animals. The increased attribution of complex emotions to dogs may be explained by the high level of mutual understanding and shared emotions suggested to exist between humans and dogs (Bekoff 2006). Additionally these differences may be explained by the fact that dogs are group-animals in contrast to cats that have an evolutionary tendency to be semi-solitary animals (consequently they might be considered to have less need for expression of their emotions for the maintenance of social relationships within a group). The degree of owner-attachment to their dog correlated significantly with the perceived attunement to the emotions of the owner. This was only partly the case with cats, which again, might be explained by their different evolution.

3.4.2 The influence of owner demographics

In contrast to earlier studies (Walker et al. 2014b), both male and female respondents attributed primary and secondary emotions to their companion animals, with some emotions (shame and surprise) attributed more frequently by men than women. Previous literature suggests that females in general show greater empathy towards animals (Taylor

and Signal 2005; Phillips et al. 2011), more positive attitudes towards animals (Ascione and Weber 1996; Kruse 1999; Mariti et al. 2011) and are more willing to attribute secondary (complex) emotions to animals (Walker et al. 2014b) than males. Conversely, the results of this research suggest that when respondents are attributing emotions to their own companion animals, men and women do not differ in the frequency or complexity of emotions attributed. Some recent research has demonstrated that belief in animal mind, belief in animal cognition and belief in animal sentience is dependent on the species in question (Knight et al. 2004; Knight et al. 2009) and familiarity with animals increases attitudes and empathy towards them (Wells and Hepper 1995; Fidler, Light and Costall 1996; Cutt et al. 2006; Daly and Morton 2009; Morris, Knight and Lesley 2012). Familiarity with animals has previously been demonstrated to influence the attribution of one complex emotion, grief. Another study (Walker et al. 2014b) found that companion animal owners were significantly more likely to believe that animals experience grief than non-owners. Other research has indicated that the number of emotions attributed to individual animal species increases if the person attributing the emotion also owns a member of that animal species (Morris, Knight and Lesley 2012). The strong familiarity with, and attachment to, the companion animals in this study may explain why male and female respondents did not differ significantly as has been described in previous studies. However, given the relative limited number of male respondents in this study (9%) this finding needs to be viewed with caution.

Our results also suggest that respondent age and education influenced attribution of emotions to companion animals. Empathizing with animals has also been demonstrated to differ according to belief systems, contexts and own experiences (Knight et al. 2010; Walker et al. 2014a). This might explain why the attribution of emotions differed between owners of different age groups and educational levels (e.g. research has shown that younger respondents are more likely to oppose animal testing (Kruse 1999)).

3.4.3 Owner attachment and attribution of emotions

Our results demonstrate that attachment influences an owner's willingness to attribute emotions to their companion animal. Increased attachment levels positively correlated with increased willingness to attribute all four complex emotions, and four out of six basic emotions. These results parallel previous work by Fidler, Light and Costall (1996) and Kiesler, Lee and Kramer (2007) who demonstrated that companion animal owners, compared with non-owners describe animals utilizing more emotive terms.

3.4.4 Attunement/mirroring of emotions

We found a significant positive correlation between the attribution of all posited emotions for dogs and 60% for cats, and the respondents' beliefs that their animal's emotional

experience is influenced by their own emotions and behaviors, suggesting that a mutual attunement of behavior and/or mirroring of emotions takes place in the relationship between companion animal and owner. Our finding that the relationship between the owner's attribution of mirrored emotions (attunement of the emotions/behavior of the owner and the pet) and the degree of attachment is positively correlated, suggests a similar mechanism to the attunement in human-human attachment relationships and is in line with the findings of Hare and Woods (2013).

3.4.5 Limitations of the study

It must be acknowledged that sources of error may exist in this descriptive study, such as respondents providing socially desirable answers (all were dog lovers and/or cat lovers; however, as the questionnaire was fully anonymous, we feel that the chances of social desirable responses are minimal), respondent recruitment methodology (internet fora), skewed distribution of respondents (the proportion of women that filled in the questionnaire was several magnitudes higher than that of men) and possible anthropomorphic attributions. Furthermore, the question still remains if the owners' claims regarding the emotions of their companion animals can be taken as a source of evidence or dismissed as anthropomorphic projections. Recently, research attempting to explore underlying components and variation in anthropomorphic attributions to non-human animals has gained growing interest (Epley, Waytz and Cacioppo 2007; Paul et al. 2014). Indeed, research has demonstrated that owners are more reliable in their assessment of the expression of positive emotions in dogs than non-owners (Costa et al. 2014). In parallel, the area of research investigating the ability of various animal species, including companion animals, to experience a range of positive and negative emotions (both basic and complex) is experiencing exponential growth. This includes, but is not limited to; pain, fear, joy; anger; disgust; regret; compassion; empathy; depression; surprise (Yue, Moccia and Duncan 2004; Custance and Mayer 2012; Meridda, Gazzano and Mariti 2014).

Understanding when, why and how the general public attributes emotional states to animals is very important, since the recognition of emotions in animals will be of great help in improving animal welfare (Walker et al. 2014a). More research is now required to reveal the mechanisms underlying the process of recognition of emotions in pets and attunement of emotions between owners and their pets. Furthering the understanding of the capacity for emotion and the range of emotion that animals experience will be invaluable if environments are to be created in which animals and their emotions are noticed and respected and optimal animal welfare can be addressed.

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Chapter 4

The (im)possibility to classify dogs' and cats' facial expression from photographs

Based on: Martens, P. & Enders-Slegers, M. (2016). The (im)possibility to classify dogs' and cats' facial expression from photographs. AnimalWise Report May 2016.

Abstract

There is a growing body of scientific evidence supporting the existence of emotions in non-human animals. Companion animal owners show a strong connection and attachment to their animals and readily assign emotions to them. Regarding dogs and cats, most people that live together with these companion animals claim to recognize emotional facials expressions and body postures in their pet. However, the 'decoding' of facial expression across species has been rather limited. In this Chapter we used photographs of dogs and cats to which companion-animal owners attributed an emotion, and used these photos to be rated by experts.

4.1 Introduction

Evidence for a relationship between humans and dogs extends beyond 12,000 years (Clutton-Brock, 1995), with recent genetic analysis of both species suggesting the co-evolution of dogs and humans occurred from 32,000 years ago (Wang et al., 2013). Our history with cats is still ambiguous. Up until very recently, most sources believed that cats were first domesticated in ancient Egypt, but a recent study suggests that cats were domesticated at the same time as the cultivation of wheat and barley in the Near East region, about 10,000 years ago (Driscoll et al., 2007). Today, cats and dogs play an important role in the lives of many people. The relationship between owners and their companion animal can affect psychological, physical and social wellbeing of humans (Kurdek, 2009; Zilcha-Mano, Mikulincer, & Shaver, 2011), with positive research outcomes of human-animal interactions frequently reported in the literature (Enders-Slegers, 2000; Friedmann & Thomas, 1998; Headey, Na, & Zheng, 2008; Julius, Beetz, Kotrschal, Turner, & Uvnas-Moberg, 2013; Wilson & Turner, 1998). Companion animal owners express strong emotional connections to their animals (Hall et al., 2004), often considering them part of the family and providing them with levels of affection, comfort and support similar to that of another human family member (Donohue, 2005; Wrobel & Dye, 2003; Zilcha-Mano et al., 2011). Additionally, companion animals can fulfil 'basic social needs' of their owners, such as emotional closeness (attachment), social integration, reassurance of worth, reliable alliance, guidance, advice and information and the opportunity for nurturance (Enders-Slegers, 2000; Wang et al., 2013).

Electrical stimulation of the brains of both human and non-human animals has evidenced that all mammals have similar brain structures and similar unconditioned emotional responses (Panksepp, 2011). It is therefore plausible that both intra and inter-species understanding and mirroring of emotions may occur (Rizolatti, Fogassi, & Gallese, 2001). In the case of inter-species social referencing, dogs have been repeatedly documented to refer to their owners' appraisal and portrayed emotional message to seek information about a situation and determine their behaviour (Hare & Woods, 2013; Merola, Prato-Previde, & Marchall-Pescini, 2012; Wang et al., 2013). Costa et al. (2014) carried out research in which humans were asked to identify the facial expressions (food, alone, reunion) in pictures of (unfamiliar) dogs. The results showed that professionals and dog owners recognized the emotions significantly better than did people with no experience with dogs.

How emotions manifest themselves in animals (e.g. whether animals experience emotions in the same way as humans) presents a fundamental difficulty in the measurement (and determination of existence) of animal emotions, as animals are unable to verbalise their experiences in the same way as humans. However, there is general agreement that basic (or primary) emotions such as anger, joy, sadness, disgust and fear can be found across a wide range of (vertebrate) species (Boissy et al., 2007; Le Doux, 1996; Panksepp, 1982).

Complex (or secondary) emotions such as surprise, shame, jealousy, disappointment and compassion are often restricted to humans and other primates (Preston & De Waal, 2002), with relatively sparse claims of complex emotions in (non-primate) animals (Bekoff, 2002). Rather than being confounded by anthropomorphic interpretations, owner reports have been demonstrated to provide reliable and consistent interpretation of their animal's behaviour and emotions (Mariti et al., 2012; Morris, Doe, & Godsell, 2008). Additionally, owners are the primary source of information regarding companion animal behavior problems (Arhant, Bubna-Littitz, Bartels, Futschik, & Troxler, 2010; Bennett & Rohlf, 2007; Blackwell, Twells, Seawright, & Casey, 2008), and are able to identify overt behavioral indicators of stress (e.g. trembling, crying or excessive barking) indicative of reduced welfare (Mariti et al., 2012).

Although humans are able to read other humans' facial expressions (Ekman, 2003), discriminating emotional expressions in other species is particularly challenging, as emotions are not necessarily expressed in similar ways across species. Therefore, the ability to recognize emotional expressions in individuals of a different species is likely dependent on (professional) expertise of animal behavior and emotions. Similar experience effects have previously been shown, for example, for the ability to discriminate individual faces of another species (Hare et al., 2002; Dufour and Petit, 2009; Bloom and Friedman, 2013).

Regarding dogs and cats, most people that live together with these companion animals claim to recognize emotional facials expressions and body postures in their pet (Martens et al., 2015). However, the 'decoding' of facial expression across species has been rather limited. In this paper we used photographs of dogs and cats to which companion-animal owners attributed an emotion, and used these photos to be rated by experts.

4.2 Dogs' and cats' expression of emotions

Dogs use facial expressions, ear set, tail carriage and overall demeanour to signal their intentions and feelings to others. Dogs can, within limits, vary the shape and size of his eyes or the direction and intensity of his gaze. Next to facial expressions, dogs also use their bodies to communicate their intentions. If a dog's feeling happy and contented, he will have relaxed muscles and his weight evenly balanced on all four feet. Similar when he's playful. He may be bouncing around or running wildly with exaggerated movements, but his facial expression and his muscles will be relaxed and nothing about his body will look unnatural.

Wild ancestors (*Felis* spp) of domestic cats are known for their independence and solitary hunting methods (with the lion as an exception). Unlike wild ancestors of dogs (wolf *Canus lupus*) they do not work together in the hunt or do not form groups for

protection. Yet they interact with other cats, not only to mate or to raise offspring, but also for more 'social' contacts (Bekoff, M. (2002)). In a cat, the posture of the head, ears, eyes and whiskers can tell us a lot about the feelings of the cat. The many facial muscles create a large number of expressions, while the attitude of the head itself can indicate whether the cat is trying to make contact or whether it would prefer to be left alone.

4.3 Methods

As part of a Dutch online questionnaire (Martens et al., 2015) distributed amongst Dutch speaking cat and/or dog owners (mainly in the Netherlands and Belgium) related to the perception and attribution of emotions to companion, we asked the respondents to send us pictures of their dog and/or cat in which they clearly recognized one of the following basic (anger, joy (happiness), fear, disgust and sadness) and complex (surprise, shame, jealousy, disappointment and compassion) emotions. The photos of the dogs and cats received were subsequently put online randomly, and experts in the field of dog and/or cat behaviour and a group of companion animal owners that were not experts and were not part of the earlier questionnaire were asked to assign one of the emotions mentioned above to the pictures.

4.4 Results

Of the photos that we received, 100 were from dogs and 74 were from cats (see Annex). Ten experts independently judged the photos: six experts related to dog behaviour, two cat behavioural experts, and two experts on both cat and dog (Table 1). Of the experts involved, three had working experience between 5 and 10 years, the others over 10 year of working with dogs and/or cats. The experts judging the photos were either scientific consultants, animal coaches, of animal caretakers. Next to this, twenty-nine 'non-expert' companion animal owners categorized the photos (of the pets that were thus not their own) as well: four of them interpreted the dog photos only, seventeen the cat photos only, and eight people looked at both the dog and cat photos.

We calculated the proportion of the experts that assigned the same emotion as the companion animal owner that send in the photo (Table 2). Most photos that were sent in assigned the emotion joy. There were also relatively many pictures with the emotion fear and surprise assigned to it. These three emotions showed the most agreement between the expert judgement and the attribution of the emotion by the dog or cat owner. The emotions in cats showed less similarity between owner and expert than the emotions in dogs. As for most emotions there is only a small number of photographs evaluated, we did not test differences in recognition statistically, as this research was not designed beforehand and was rather exploratory (see also discussion).

Table 1. Proportion of experts that think dogs and cats can feel or show a particular emotion

	Do you think dogs and cats can feel this emotion?	Do you think dogs can express this emotion by their body language and facial expression?	Do you think cats can express this emotion by their body language and facial expression?
Anger	100%	87.5%	100%
Joy	100%	100%	100%
Sadness	90%	100%	100%
Disgust	90%	87.5%	100%
Fear	100%	87.5%	100%
Surprise	90%	87.5%	100%
Shame	30%	25%	25%
Jealousy	70%	75%	25%
Disappointment	90%	62.5%	50%
Compassion	50%	25%	25%

Table 2. Proportion of (non) experts that attributed similar emotions as assigned by owner

Dogs	Mean proportion Experts (%)	Mean proportion Non-experts (%)	n (# pictures)
Anger	13	17	1
Joy	65	62	44
Sadness	28	27	5
Disgust	47	23	4
Fear	51	34	15
Surprise	47	47	17
Jealousy	25	31	3
Disappointment	17	20	9
Compassion	25	0	2

Cats	Mean proportion Experts (%)	Mean proportion Non-experts (%)	n (# pictures)
Joy	53	78	18
Sadness	10	9	5
Disgust	0	11	7
Fear	50	48	20
Surprise	37	59	13
Jealousy	19	31	4
Disappointment	1	18	4
Shame	8	17	3

4.5 Discussion and conclusions

To get a complete picture of how an animal feels, we typically need to take a look at the full body – meaning head (eyes, ears, whiskers and mouth) and body (tail, attitude, size and angle) – because, for example, the attitudes of fear and anger can greatly resemble each other, signals are the separate "components" then seemingly contradict each other. In order to get the full image, the whole body is to be viewed, as well as the context in which the picture is taken. As appears from the examples, isolating one particular element can be misleading because signals often change very quickly.

In conclusion we note that the emotions of dogs and cats are rather difficult to determine, and instruments to measure them are not yet available. Moreover, the individual facial expressions of the diverse breeds may differ importantly, within as well as between breeds. Specialized breed-related knowledge of professionals as well as specific knowledge of the individual dog or cat of owner may be needed to obtain reliable and valid data.

However, the results in this chapter are more to see as a first exploration for future research. As our own well-being is closely connected with the welfare of the animals with whom we live, understanding and empathizing with animals would provide a change toward a more animal-friendly, and hence sustainable society. By taking the companion animal-owner relationships as a starting point, we do believe that increasing our insights in the behaviour and emotions of the animals that are closest to us – our pets, will lead to more compassion with other animals (we eat, abuse or imprison) as well. However, as said before, it is obviously unknown as to whether animals experience emotions in the same way as humans. To understand the non-human co-inhabitants of our planet better, the companion animal-owner relationships can be taken as a starting point. The owner-pet relationship, lasting for several years in most cases, provides a unique perspective and a source of enquiry into animal emotions that is not readily available to the outside observer. This information supplemented by experts' views and opinions, may be used to ran through 'facials expression software' or other software to be developed. The resulting device will be able to quickly assess a dog or cat's emotions by using your cell-phone. Future music maybe, but hopefully the work in this Chapter could be a first step towards a Pet Emotions Device (PED).

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Annex

Emotions dogs (as ascribed by owners)

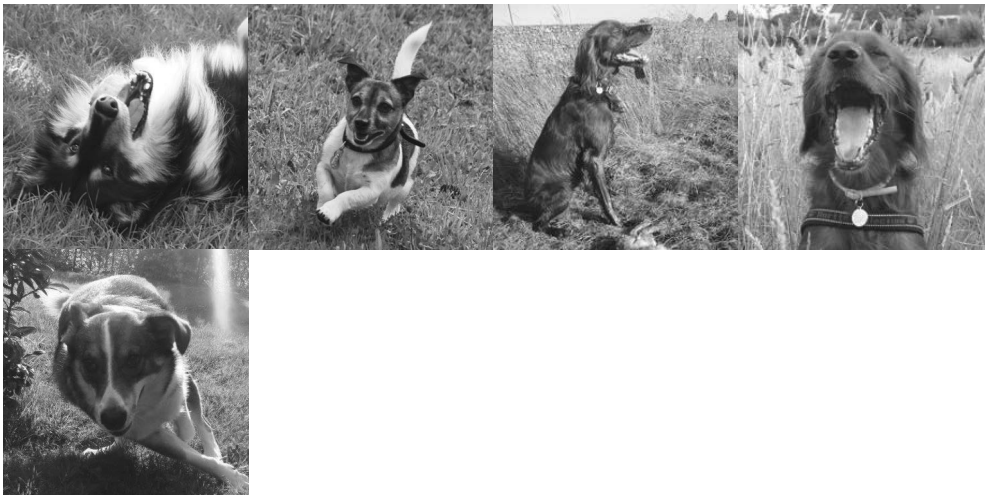
Anger



Joy







Sadness



Disgust



Fear



Surprise





Jealousy



Disappointment



Compassion



Emotions cats (as ascribed by owners)

Joy



Sadness



Disgust



Fear



Surprise



Shame



Jealousy



Disappointment





Chapter 5

Young adult attitudes towards animals – the case of high school students in Belgium and The Netherlands

Based on: Martens, P., Hansart, C., and Su, B. (2019). Attitudes of Young Adults toward Animals—The Case of High School Students in Belgium and The Netherlands. *Animals*, 9(3), 88.

Abstract

The social context and culture in which individuals grow shapes their perspectives through life. Early on, children learn about animals through storybooks, animated movies, toys, and through interactions with pets and wildlife, and will slowly start to build beliefs around those experiences. Their attitudes towards animals will be influenced by a number of factors, including: sex, age, nationality/ethnicity, residence area, animal-related activities and hobbies, food habits, culture/religion education, and pet ownership. A case study of Dutch and Belgian high school students (aged 12–21) investigated the attitudes of young people towards animals. By using the Animal Attitude Scale (AAS) and the Animal Issue Scale (AIS) questionnaires, our study shows that levels of concern for animal welfare were distinctly higher among: female participants; those who ate little to no meat; Belgian students; pet owners; and those who had been to a zoo at least once. In general, students who reported having more contact with animals also had more positive attitudes towards animals. To understand younger generations and their attitudes toward animals is to understand how future generations will look towards and treat our fellow animals, with which we share the planet Earth.

Keywords

Animal welfare, children attitudes, animal attitudes

5.1 Introduction

Animals have accompanied humans for thousands of years, with a strong bond forged between humans and other species. Our relationships with animals can take different forms. On the one hand, animals can serve instrumental purposes: we currently use animals for clothing, for testing a range of human products, for gaining basic insights into human biology and behavior, and as food. On the other hand, human–animal relations are social. The clearest example is the practice of pet-keeping, with people attributing a special status to their pets (Amiot, Bastian, & Martens, 2016).

Studies have shown that most children reject the idea of humans being animals (Leddon et al., 2012), although they do have a propensity to anthropomorphise animals (Kellert, 1984; Archer, 1997). Most children have an appreciation for animals on the emotional and recreational levels. They tend to show affection as well as concern for them, in contrast to the more practical and utility-based perspectives of adults (Kellert, 1985; Eagles & Muffitt, 1990). Kellert (1984) found that children were strongly emotionally attached to individual animals. Hunting was not popular among the children and was only deemed acceptable if the end purpose was to feed oneself as opposed to sheer trophy hunting. Similar results were found by Pagani et al. (Pagani, Robustelli, & Ascione, 2007), who reported the majority of children were against hunting, zoos, animals used in circuses, and their exploitation for leather. Slight preferences were expressed for zoos compared to circuses, perhaps because zoos pursued a greater mission in terms of education and conservation. Earlier, Driscoll (1992) outlined the different views adults have on how humans should use animals. Despite considerable opposition, most were in favour of animals being used in medical or scientific research, but did not approve of their use in product testing. Expressing similar ethical concerns, a large proportion of children disapproved of the use of animals in fur farming (Kellert, 1984).

Understanding the attitudes that younger generations have toward animals may help us to understand the sustainability of future societies, as our attitude towards animals are central in the sustainability debate. Many factors including gender, age, nationality/ethnicity, residence area, animal-related activities and hobbies, food habits, culture/religion, education, and pet ownership are associated with people's attitudes toward animals (Su & Martens, 2017; Su & Martens, 2018). The present study was conducted among high school students in Belgium and the Netherlands. Through this study, we aim to find out whether the variables we mentioned above and other variables like household, house type, meat-eating frequency correlate with young adults' attitudes toward animals.

5.2 Methodology

Research into children's attitudes toward animals in the Netherlands and Belgium was conducted between May and July in 2016. During this period, a paper-based questionnaire was implemented in four different schools, including three schools in the French-speaking province of Walloon, Collège du Christ Roi (N = 54), Athénée Maurice Carême (N = 148), Paul Delvaux (N = 45) and one school in the south of the Netherlands, Rombouts College (N = 120). All participants were high school students aged 12 to 21. Selection of participants in this study was made through simple random sampling; however, only those classes that replied to the invitation to participate in the research are represented here. Schools were contacted via mail and/or telephone prior to visits.

5.2.1 Questionnaire

The questionnaire consisted of three parts (see Appendix 3, sections 1, 3 and 4). In the first, we asked respondents to provide their demographic details, including age, gender, nationality, highest level of education, household composition, residence area, type of house, presence of a garden, zoo/aquarium visiting frequency, meat-eating frequency, pet ownership and religious affiliation.

In the second part, we introduced the Animal Attitude Scale (AAS) (Herzog, Betchart, & Pittman, 1991), which was used to assess the participant's attitude toward animals by means of a Likert scale. The questionnaire consisted of 20 questions rated from 1 (strongly agree) to 5 (strongly disagree) for all questions except questions number: 1, 3, 4, 7, 10, 11, 17, 19, 20, which were all reverse coded from 1 (strongly disagree) to 5 (strongly agree). Total AAS scores were calculated by adding up all individual questions scores. Higher AAS scores indicated a higher concern and respect for animals. Questions included: "I do not think that there is anything wrong with using animal in medical research" Or "Wild animals, such as mink and raccoons, should not be trapped and their skins made into fur coats". Originally developed for a study of sex role orientation and attitudes toward animal welfareissues, the AAS has subsequently been used to investigate other aspects of human–animal interactions. the Animal Attitudes Scale (AAS) was used to further measure public attitudes toward animals. Due to its scientific content and concise design, the AAS was chosen for this research. The current AAS, a 20-item Likert-scale, was simplified from a 29-item scale by using factor analysis. The AAS has excellent psychometric properties. Cronbach's alphas typically range from 0.85 to 0.95. The AAS names a number of species (cattle and hogs, whales and dolphins, cats, dogs and rabbits) and potential uses of animals (e.g. medical research, human consumption, clothing, education, safety testing, pet keeping and zoos).

In the third part of the questionnaire, the Animal Issue Scale (AIS) (Meng, 2009) was introduced and served as a complement to the AAS questionnaire. The Animal

Issue Scale (AIS), which includes eight animal issues (use of animals, animal integrity [destruction], killing animals, [deprive] animal welfare, experimentation on animals, changes in animals' genotypes, animals and the environment [harm animals for environment], and societal attitudes toward animals [harm animals for social issues]), was introduced to respondents in order to assess their attitudes toward animals. There are 43 questions in AIS and each question is rated on a five-point scale ranging from 1 (extremely acceptable) to 5 (extremely unacceptable). A high score on a question indicates a low level of acceptability of the issues. Typical items include: 'Using animals for work'; 'Killing young animals that are dependent on their parents'; 'Controlling wildlife populations by killing'.

These questions were grouped across eight separate sections (use of animals, disrupting animal integrity, killing animals, compromising animal welfare, experimenting on animals, changing animals' genotypes, animals and the environment, and societal attitudes toward animals). Again, respondents had to rate the questions on a five-mark scale ranging from high acceptability to high non-acceptability. Total AIS scores were calculated by adding individual section scores. Akin to the AAS questionnaire, a higher total AIS score indicates a more positive attitude toward animals, and lower acceptability for the issues described (Phillips et al., 2012). For example, these issues included: "Keeping animals for the education of the public in zoos, wildlife parks, etc." and "Killing young animals that are dependent on their parents".

5.2.2 Statistical analysis

Responses from the questionnaires were analysed through IBM SPSS Statistics (version 21, Armonk, NY: IBM Corp). Descriptive statistics were used to analyse the independent variables of age, sex, education level, household composition, residence place, housing type, presence of a garden, zoo and aquarium visiting frequency, meat-eating frequency, pet ownership and religious affiliation. Data was then analysed to check for normality so as to use the best fitted statistical test for analysis. All variables were non-normally distributed. They were thus analysed using a Mann–Whitney U-test and a Kruskal–Wallis test. All results are assessed for significance based on the cut-off value of 0.05. Similar shapes of distribution were assumed for the Mann–Whitney U-test for all variables.

5.3 Results

5.3.1 Demographics

In total, 367 hard copy questionnaires were distributed in all the four schools. Of these 367 questionnaires, 358 were kept for analysis, and 9 discarded because they were mostly

incomplete. 54.5% of the respondents were male; 45.5% female. Considering the relatively small variance in age, participants were divided into only two groups: 12–15 years old (77.7%) and 16–21 years old (22.3%). Mean age and variance across the entire sample was 14.44 ± 1.61 years old. 33.4% of students were Dutch and 66.2% were Belgian. All participants had a level of schooling below or equal to the 12th grade. In terms of household composition, 19.2% of the students lived under the guardianship of a single parent and 80.8% under the guardianship of a couple. 44.1% of the participants lived in urban areas and 55.9% in rural areas. Analysis of the different housing types showed that 7.6% of the children lived in apartments, 42.2% in semi-detached houses, and 50.1% in detached houses. 92.1% reported having a garden, while 7.9% did not. The frequency of visits to zoos and aquariums was predominantly 'once every two years or less' (31.7%), then 'once per year' (27.8%), followed by 'once every six months' (22.1%), 'never' (15.6%), and lastly 'once a month or more' (2.8%). In the sample of students studied, 0.6% were vegetarian, 5.6% ate meat once a week or less, 19% ate meat two or three days a week, 43% four to six days a week, and 31.9% ate meat every day. Regarding pet ownership, 77% replied that they had a pet, while 23% did not.

5.3.2 The AIS score

The total AIS score for participants in the study was on average 158.61 out of 215 (see Table 1). Students scored relatively high (high score here means less acceptability) on variables related to: 'deprive animal welfare' (22.82 out of 25), 'harm animals for environment' (23.96 out of 30), 'harm animals for social issues' (24.00 out of 30), and 'killing animals' (18.74 out of 25).

Table 1. Descriptive statistics: total Animal Issue Scale (AIS) and individual variables mean scores

	Minimum	Maximum	Mean	*SD*
Total AIS	79	206	158.61	18.76
Use of animals (score: 5–25)	6	24	15.36	3.21
Animal integrity destruction (score: 6–30)	12	30	21.05	3.16
Killing animals (score: 5–25)	9	25	18.74	2.79
Deprive animal welfare (score: 5–25)	5	25	22.82	2.67
Experimentation on animals (score: 5–25)	5	59	16.40	4.38
Changes in animals' genotypes (score: 5–25)	5	25	17.00	4.13
Harm animals for environment (score: 6–30)	0	30	23.96	3.96
Harm animals for social issues (score: 6–30)	0	30	24.00	3.69

A multiple regression analysis was run to find the factors most predominantly influencing AIS questionnaire scores (significance value $p < 0.05$). Pet ownership was an important determinant, with students who owned any pet scoring 5.41 points higher on average,

compared to those who did not. However, only owning a pet dog is significant. AIS scores were 6.30 points higher for students who were dog owners, indicating that owning a dog may strongly influence the AIS scores. Test results also showed that the country of origin influences AIS scores: Belgian students scored 9.81 points higher than Dutch students. Gender was another important determinant in the AIS score; with females scoring 8.54 points higher than males. Lastly, eating meat also influenced total AIS scores (Table 2).

Table 2. Correlations between independent questionnaire variables and the total AIS score

	Unstandardized coefficients		Standardized coefficients		
Y: Total AIS score	*B*	*SE*	Beta	*t*	*p*
(Constant)	160.80	9.03		17.81	< 0.001
X_1: Do you own a pet?	-5.41	3.16	-0.13	-1.71	0.088
X_2: In what country do you live?	9.81	2.38	0.27	4.13	< 0.001
X_3: What is your sex?	8.54	2.28	0.24	3.74	< 0.001
X_4: How often do you eat meat (including fish) every week?	-3.34	1.35	-0.16	-2.47	0.014
X_5: What pet (s) do you have? Dog (s)	-6.30	2.64	-0.18	-2.39	0.018

5.3.2.1 Age groups

There was no significant difference between the two age groups in terms of their total score on the AIS questionnaire (U = 5612.500, N (12–15 years old) = 194, N (16–21 years old) = 63, p = 0.331). This implies that age had no influence on responses. However, the Mann-Whitney U-test did show a significant difference between 12–15 years old participants and 16–21 years old participants in the scoring results for one variable: 'Use of animals' (U = 7823.500, p = 0.007). The median score in this specific section of the questionnaire was significantly higher for 12–15 year olds (Mdn = 16.00) than for 16–21 year olds (Mdn = 15.00).

5.3.2.2 Gender

Results indicate a significant difference in the total score for the AIS between the two genders (U = 5858.000, N (males) = 150, N (females) = 107, p < 0.001). Females had a higher median total score for the AIS questionnaire (Mdn = 165.00) than males (Mdn = 156.00) (Table 4). This suggests that female students scored higher overall on the AIS questionnaire.

A statistically significant difference between the two genders was observed for all variables, except two: 'Changes in animal's genotypes' (U = 11646.000, p = 0.988) and 'Animal integrity destruction' (U = 13944.000, p = 0.801). Females scored significantly higher than

males for the following variables: 'Use of animals' (U = 11680.500, p = 0.017), 'Killing animals' (U = 11704.500, p = 0.009), 'Deprive animal welfare' (U = 11522.000, p = 0.003), 'Experimentation on animals' (U = 9889.500, p < 0.001), 'Harm animals for environment' (U = 7954.500, p = 0.000) and 'Harm animals for social issues' (U = 9102.000, p < 0.001). For all variables, median values were higher for female participants. These results were in accordance with results obtained from the analysis of the total AIS score.

5.3.2.3 Nationality

Test results for the nationality variable indicate a significant difference between questionnaire scores for variables 'Use of animals' (U = 9561.500, p < 0.001), 'Animal integrity destruction' (U = 6709.00, p < 0.001), 'Killing animals' (U = 9448.000, p < 0.001), 'Deprive animal welfare' (U = 10113.500, p < 0.001), 'Experimentation on animals' (U = 10346.500, p = 0.023), 'Changes in animal's genotypes' (U = 6544.000, p < 0.001), 'Harm animals for environment' (U = 9807.500, p = 0.036). The only non-significant exception was the following variable: 'Harm animals for social issues' (U = 11475.500, p = 0.392).

This is in alignment with results for the total score of the AIS questionnaire (see below), which indicate a significant difference between Belgian and Dutch respondents (U = 5069.500, N (Belgian) = 157, N (Dutch) = 100, p < 0.001). The total median score was also higher for Belgian participants (Mdn = 164.00) than for Dutch participants (Mdn = 152.50).

5.3.2.4 Household

The total score of the AIS questionnaire was not found to be significantly different between those students living with a single parent, and those living with a couple (U = 3722.00, p = 0.250). However, there were significant differences in scores for the following separate sections of the questionnaire: 'Use of animals' (U = 5806.000, p = 0.036, Mdn = 17.00) and 'Animal integrity destruction' (U = 5703.500, p = 0.006, Mdn = 22.00), with higher medians attributed to students living with a single parent.

5.3.2.5 Residence area

No significant difference was found between the total scores for students who lived in rural areas and those who lived in urban areas (U = 6764.500, p = 0.825), nor between any of the separate sections of the questionnaire (p < 0.05 in all cases).

5.3.2.6 House type

No significant difference was found between the three groups of participants for residence (either: apartment, semi-detached house, or detached house). All p-values were higher

than the threshold value of 0.05, which suggests that the type of house wherein students lived did not influence their AIS questionnaire score.

5.3.2.7 Owning a garden

Ownership of, or access to a garden did not influence total scores on the AIS questionnaire ($U = 2215.00$, $p = 0.955$). Furthermore, no significant difference in scores was found in any individual section of the questionnaire.

5.3.2.8 Zoo/aquarium visiting frequency

Equality of variance was assumed for all variables except for: 'Harm animals for social issues'. A significant difference in total scores was found between students, based on how often they visited a zoo or an aquarium (χ^2 (2) = 9.624, $p = 0.047$). Significant differences were also noticed in the following separate variables of the questionnaire: 'Harm animals for environment' (χ^2 (2) = 14.823 $p = 0.005$), 'Deprive animal welfare' (χ^2 (2) = 10.936, $p = 0.027$). A post-hoc analysis of variables showed that students who never visited zoos and/or aquariums had lower total AIS scores than those who did.

5.3.2.9 Meat-eating frequency

Equality of variance was assumed for all variables except: 'killing animals' and 'experimentation on animals'. There was no significant difference in total scores between students who ate meat and those who did not (χ^2 (2) = 8.825, $p = 0.066$). There was however a significant difference for the 'Harm animals for social issues' variable of the questionnaire (χ^2 (2) = 3.862, $p = 0.425$).

5.3.2.10 Pet ownership

Data analysis of the AIS questionnaire variables: 'experimentation on animals' ($U = 6587.000$, $p < 0.001$), 'Deprive animal welfare' ($U = 8299.000$, $p = 0.021$), and 'killing animals' ($U = 7792.000$, $p = 0.003$) show pet owners scored significantly higher than non-pet owners. The total AIS score was also significantly higher ($U = 3989.000$, $p < 0.001$, N (pet owners) = 198, N (non-pet owners) = 58) for pet owners.

5.3.2.11 Religious outlooks

Results indicate that there was no significant difference in the total score in replies to the question: 'is religion important in your life?' ($U = 5942.500$, N (yes) = 62, N (no) = 195, $p = 0.841$). Whilst analysis of the total score for the AIS questionnaire did not show any distinction between students who considered religion important and those who did not, there were significant differences in terms of individual sections of the questionnaire. Significant differences only occurred for the following variables: 'Animal integrity destruction'

Table 3. Descriptive statistics: total Animal Attitude Scale (AAS) and individual variables mean scores

	Minimum	Maximum	Mean	*SD*
Total AAS	37	99	67.94	10.33
1. It is morally wrong to hunt wild animals just for sport.	1	5	4.02	1.18
2. I do not think that there is anything wrong with using animal in medical research.	1	5	3.32	1.66
3. There should be extremely stiff penalties including jail sentences for people who participate in cock-fighting.	1	5	3.56	1.11
4. Wild animals, such as mink and raccoons, should not be trapped and their skins made into fur coats.	1	5	4.06	1.16
5. There is nothing morally wrong with hunting wild animals for food or a better living for poor people.	1	5	2.55	1.07
6. I think people who object to raising animals for meat are too sentimental.	1	5	2.99	1.11
7. Much of the scientific research done with animals is unnecessary and cruel.	1	5	3.21	1.08
8. I think it is perfectly acceptable for cattle and dogs to be raised for human consumption.	1	5	3.08	1.27
9. Basically, humans have the right to use animals as we see fit.	1	5	3.73	1.22
10. The slaughter of whales and dolphins should be immediately stopped even if it means some people will be put out of work.	1	5	4.11	1.13
11. I sometimes get upset when I see wild animals in cages at zoos.	1	5	2.61	1.18
12. In general, I think that human economic gain is more important than setting aside more land for wildlife.	1	5	3.56	1.16
13. Too much fuss is made over the welfare of animals these days when there are many human problems that need to be solved.	1	5	3.16	1.21
14. Breeding animals for their skins is a legitimate use of animals.	1	5	4.01	1.11
15. Some aspects of biology can only be learned through dissecting preserved animals, such as cats.	1	5	3.15	1.22
16. Continued research with animals will be necessary if we are to ever conquer diseases such as cancer, heart disease and AIDS.	1	5	2.64	1.06
17. It is unethical to breed purebred dogs for pets when millions of dogs are killed in animal shelters each year.	1	5	3.48	1.05
18. The production of inexpensive meat, eggs, and dairy products justifies maintaining animals under crowded conditions.	1	5	3.04	1.08
19. The use of animals, such as rabbits, for testing the safety of cosmetics and household products is unnecessary and should be stopped.	1	5	3.82	1.20
20. The use of animals in rodeos and circuses is cruel.	1	5	3.78	1.20

(U = 9626.500, p = 0.008) and 'Killing animals' (U = 9928.500, p = 0.044), with higher median scores for those students who replied religion was important in their lives.

5.3.3 The AAS score

The total AAS score for participants in the study was on average 67.94 out of 100 (see Table 3 and 4). The highest scores were observed for the following variables: 'it is morally wrong to hunt wild animals just for sport (4.02 out of 5), 'wild animals such as mink and raccoons should not be trapped and their skins made into fur coats' (4.06 out of 5), 'the slaughter of whales and dolphins should be immediately stopped even if it means some people will be put out of work' (4.11 out of 5), and 'breeding animals for their skins is a legitimate use of animals' (4.01 out of 5). The model in Table 4 has an adjusted R Square of 0.282. This means the independent variables in our regression models can explain 28.2% of the variance in the dependent variable, taking into account the number of explanatory variables in the model.

To summarise, results from multiple regression analysis showed that AAS questionnaire scores were mostly influenced by: sex, as females scored 7.85 points higher than males on the questionnaire; meat-eating frequency, as those who ate meat less frequently scored 7.85 points higher than others; pet ownership, as pet owners scored 5.55 points higher than non-pet owners; and nationality, as Belgian students scored 5.13 points higher than Dutch students.

Table 4. Most prevalent correlations between independent questionnaire variables and the total AAS score

	Unstandardized coefficients		Standardized coefficients		
Y: Attitudes towards animals	*B*	*SE*	Beta	*t*	*p*
(Constant)	74.07	5.77		12.84	< 0.001
X_1: What is your sex?	7.85	1.12	0.38	7.00	< 0.001
X_2: How often do you eat meat (including fish) every week?	-2.14	0.67	-0.16	-3.18	0.002
X_3: What is your main source of inspiration? Christianity	-2.73	1.46	-0.10	-1.87	0.063
X_4: Do you own a pet?	-5.68	1.36	-0.23	-4.18	< 0.001
X_5: In what country do you live?	4.82	1.25	0.23	3.86	< 0.001
X_6: In what sort of house do you live?	-2.11	0.97	-0.12	-2.18	0.030

5.3.3.1 Age

There was no significant difference between the total AAS scores, for students 12–15 years old and those who were 16–21 years old (U = 8759.500, N (10–15 years old) = 245, N (16–21 years old) = 76, p = 0.436).

5.3.3.2 Gender

Female students had significantly higher total AAS scores than males (U = 7522.500, N (females) = 146, N (males) = 175, $p < 0.001$). Higher medians for females were also found in the individual AAS questionnaire questions.

5.3.3.3 Nationality

The total AAS score was significantly higher for Belgian students than Dutch students (U = 8177.000, N (Dutch students) = 114, N (Belgian students) = 209, $p < 0.001$). Likewise, medians for the individual AAS questions were in general, higher for Belgian students.

5.3.3.4 Household

Students who lived with a single parent scored significantly higher on the total AAS score than those who lived with a couple (U = 5419.000, N (students living with single parents) = 58, N (students living with parents forming a couple) = 236, $p = 0.036$). Regarding the individual AAS questions, medians were generally higher for students living with a single parent.

5.3.3.5 Residence area

Place of residence (either urban or rural area) did not influence total AAS scores in any significant way, as shown in table 4 (U = 10810.500, N (students living in urban areas) = 130, N (students living in rural areas) = 168, $p = 0.882$).

5.3.3.6 House type

Living in either an apartment, a semi-detached house or a detached house did not significantly influence the total AAS score (χ^2 (2) = 0.401, N (students living in an apartment) = 22, N (students living in a semi-detached house = 131, N (students living in a detached house) = 157, ($p = 0.818$) of students.

5.3.3.7 Owning a garden

There was no significant difference in the total AAS scores between students who had a garden and those who did not (U = 3455.500, N (students who have a garden) = 297, N (students who do not have a garden) = 24, $p = 0.804$).

5.3.3.8 Zoo/aquarium visiting frequency

There was a significant difference in the total AAS score for students depending on how often they visited zoos and/or aquariums (χ^2 (2) = 21.989, N (once a month or more) = 9, N (once every six months) = 75, N (once every year) = 88, N (once every two years or less)

= 101, N (never) = 47, $p < 0.001$). A post-hoc analysis revealed that those who never went to a zoo and/or aquarium scored significantly lower than others on the AAS questionnaire.

5.3.3.9 Meat-eating frequency

There was a significant difference in total AAS score (χ^2 (2) = 15.420, N (I do not eat meat, I am vegetarian/vegan) = 2, N (once a week or less) = 17, N (2–3 days a week) = 63, N (4–6 days a week) = 134, N (everyday) = 96, $p = 0.004$). A post hoc analysis revealed higher scores for those who ate meat less frequently (once a week or less) than others.

5.3.3.10 Pet ownership

A significant difference was found between students who owned a pet and those who did not, in their total AAS score. Those who had pets scored significantly higher (U = 6359.500, N (pet owners) = 250, N (non-pet owners) = 73, $p < 0.001$). Overall, medians were also higher for pet owners.

5.3.3.11 Religious affiliation

Religious affiliation had no significant influence on total AAS scores from students as shown in table 4 (U = 10146.000, N (religion/spirituality is important) = 92, N (religion/spirituality is not important) = 232, $p < 0.001$).

5.4 Discussion and conclusion

Results from the study revealed several strong correlates for young adults' attitudes towards animals. The most important factors identified here were: gender, nationality, zoo/aquarium visiting frequency and pet ownership. Similarly to results reported by previous research (Eagles & Muffitt, 1990; Phillips et al., 2012; Kidd & Kidd, 1990), students' attitudes towards animals measured by both AIS and AAS were found to be relatively positive.

Female respondents scored higher on both AAS and AIS than their male counterparts. Girls showed more concern for animals specifically in categories where the welfare and life of the animal was compromised (e.g. 'killing animals', 'experimentation on animals', 'Harm animals for environment'). There were no differences between the two genders for items which involved animals being treated to improve their appearance or productivity ('changes in animals' genotypes' and 'animal integrity destruction'). The present results confirm findings of previous studies on gender differences identifying a prevalent female inclination for animal well-being and nurturing (Kellert, 1984; Pagani et al., 2007; Herzog et al., 1991; Phillips & McCulloch, 2005; Pifer, Shimizu, & Pifer, 1994; Amiot & Bastian, 2015; Hagelin, Carlsson, & Hau, 2003).

Results also showed that Belgian students scored significantly higher in the attitudes questionnaires for most items in contrast to Dutch students. Previous studies have revealed fairly similar attitudes from citizens in both countries, in contrast to the present study. In his study on the welfare of pets in commerce, Dewar found that both Dutch and Belgian respondents were in favour of improving animal welfare in their respective countries. Additionally, in a study investigating the use of animals in society, European students expressed more concern for animal well-being than Asian students (Phillips et al., 2012; Phillips & McCulloch, 2005). However, more closely aligned to the present study were results from Pifer, Kinya Shimizu and Pifer (1994). These authors found that Belgian respondents expressed more opposition towards animal research than their Dutch counterparts. The two countries do both in fact express concern for animal well-being; however Belgian respondents may be somewhat more passionate about these issues than Dutch students.

The present results also suggest a link between visits to the zoo/aquarium and positive attitudes towards animals. Young adults who reported that they never visited zoos or aquariums had lower AIS and AAS scores than the others. These findings support claims that zoos can fulfil more roles than mere entertainment, by encouraging learning experiences, a sense of connection towards wild animals, and focusing people's attention on conservation issues (Clayton, Fraser, & Saunders, 2009; Conde et al., 2013). Alternatively, and not mutually exclusive, it could be that students with no interest in animals do not go to zoos. However, Tunnicliffe, et al. (1997) warn that these connections can only lead to a better-educated public if zoos integrate the experience with follow up discussions and leave space for reflection. Special attention should also be paid to less popular animals (e.g. bats, spiders etc.) to increase awareness on the vital role of biodiversity.

Pet ownership was another significant correlate in determining students' attitudes. Analysis showed that students who owned a pet scored higher on the questionnaires and expressed greater concern for animal welfare than students without a pet. These outcomes are consistent with Prokop and Tunnicliffe (2010) previous findings on the relation between pet ownership and positive attitudes towards other animals. However research in this area has not yet shown consistent results and theories oscillate between whether pet ownership has a relationship to young adults' attitudes towards animals (Paul & Serpell, 1993); for example, how such ownership might correlate with attitudes towards less popular animal species Prokop & Tunnicliffe, 2008). Alternatively, like with zoo/aquarium visits, it could be that students with no interest in animals do not obtain a pet.

Regarding diet, significant differences were only observed in response scores for the AAS questionnaire. Those who ate meat once a week or less had higher scores than those who ate meat more frequently. The expression of higher concern for animal welfare from those

who report to eat very little to no meat may be explained through the same line of thought found in Amato and Partridge (1989) work on vegetarians. Here, the authors reported that a majority of vegetarians had made their dietary choice for ethical beliefs in animal rights. Another study on vegetarian girls revealed that most also made their choice on an ethical basis, and as an effort to reduce animal suffering (Kenyon & Barker, 1998). Furthermore, these results can also be interpreted in a similar fashion to those of Hagelin, Carlsson and Hau (2003) who report that concern for animals killed for food can also be extended to a concern for animal well-being in other domains such as animal research. Finally, a short comment must be made on the relatively small number of self-reported vegetarians in the present study. Most students ate meat at least once a week; however, in those responses a few had added that they wished to be vegetarian, but their parents wouldn't allow it. The results are therefore not entirely reflective of the dietary choices of all students.

Another important variable was household composition. Students living with a single parent demonstrated more concern for animal welfare in the questionnaire than those who lived with two parents. Perhaps these differences can be explained by Albert and Bulcroft (1988) work on pet owners, who wrote that, "Attachment to pets is highest among never married, divorced, widowed, and remarried people, childless couples, newlyweds, and empty-nesters. Never married, divorced, and remarried people, and people without children present, are also most likely to anthropomorphize their pets." The young adults' single parents in the present study fall under the category of 'never married' or 'divorced'. As a parents' behaviours influence that of their child (Maccoby, 2000), it may be possible that these young adults adopted similar attitudes.

No differences were found between young adults who lived in urban areas and those who lived in rural areas, as has also been found in China (Su & Martens, 2017). This is despite observations that urban and rural citizens have different opportunities to interact with animals, as is reflected in the finding of greater knowledge about animals in rural residents compared to city dwellers (Kellert, 1984). Perhaps one reason that the present study found no differences between urban and rural residents is because the "urban" areas reflected in the present demographic were actually somewhat rural; small towns in close proximity to surrounding rural environments. In further support, neither the type of residence nor garden access correlated with attitudes in the present study.

Religion, more specifically Christianity, showed a weak relationship to young adults' attitudes towards animals but only for a few particular questionnaire items rather than to overall scores. Items on the AIS that asked students for how acceptable they found the killing of animals or the destruction of their integrity correlated with higher values reported for the importance of religion in a respondent's life.

Finally, age did not significantly correlate with attitudes. Because others have reported that significant changes in attitudes towards animals occur throughout childhood

(Kellert, 1984), this finding was unexpected. However, variability in age in the present sample study group was small, and this may be why no relationship was found between age and attitude ratings.

As shown in the present study, pet ownership is usually associated with positive attitudes towards other animals (Prokop & Tunnicliffe, 2010; Paul & Serpell, 1993). It is important to note however that pet ownership is not necessarily an end-all contributing factor to more positive attitudes. Although there is a relative correlation between pet ownership and more positive attitudes towards other animals, there is no guarantee that this attitude will extend to all animal species. The popularity, familiarity, biophilia (attraction), and the types of emotions that an animal species triggers can greatly influence the protection and welfare it receives from humans (Martín-López, Montes, & Benayas, 2007). Likewise, Vining (2003) stresses that emotion is at the heart of the actions or inactions of humans in terms of the respect and protection they provide animals. Furthermore, what arguably matters more is the quality of the relationship between young adults and their pets, or other animals in general. A study about animal abuse showed that fear of animals was a considerable determinant of negative attitudes (cruelty, apathy etc.) (Pagani et al., 2007). This again highlights the importance of engaging in meaningful connections with animals.

Another positive correlated factor to positive attitudes are visits to zoos or aquariums. Young adults gain knowledge and significant appreciation for the environment and its different species, when learning outside the classroom setting, in direct contact with nature and wildlife (Lindemann-Matthies, 2005). Informal educational settings such as zoos and aquariums should work to ensure exposure of their visitors to less popular animal species (e.g., pests, predators), in order to help students to understand the importance of each species in the ecosystem (Prokop & Tunnicliffe, 2010; Martín-López et al., 2007). A commitment to education is a common element in the mission statements of contemporary zoos; such institutions can make substantive contributions towards improving public understanding of and appreciation for an animal's specific role in the ecosystem and thus enhance positive attitudes towards that animal (Martín-López et al., 2007).

Lastly, the present study found that those who reported eating meat less frequently (once a week or less) also had more positive attitudes towards animals and their welfare as measured in one of the scales used (the AAS). People who opt to eat little or no meat may do so for many different reasons, including reasons having to do with health, economics, and/or an interest in reducing the ecological impact of meat production, as well as for reasons that stem from a moral objection to consuming animals (Steinfeld et al., 2006). It should be noted that in the present study, the number of respondents stating that they ate meat only rarely was small (only about 5% of the total number of respondents); nonetheless the significant difference between this group and others in the

study suggests that moral convictions that affect dietary choice may also correlate with moral convictions about the humane treatment of animals.

As this Chapter has shown, a variety of variables correlate with young people's attitudes towards animals and their welfare. A better understanding of the causes of these correlations and the development of these variables over the lifetime of a child may help us to better structure the kinds of experiences that promote empathy and concern for all living things.

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Chapter 6

How ethical ideologies influence public attitudes toward animals: The Dutch case

Based on: Su, B. & Martens, P. (2018). How Ethical Ideologies Relate to Public Attitudes toward Animals: The Dutch Case. *Anthrozoos*, 31(2), 179-194.

Abstract

Ethical ideologies, which include dimensions of idealism and relativism, are often involved in the process of decision-making regarding operational and economic research. However, the study of the role of ethical ideologies concerning public attitudes toward animals has been largely neglected. This Chapter analyzed how ethical ideologies and their interaction with human demographics relate to public attitudes toward animals in the Netherlands. The Ethics Position Questionnaire (EPQ) was used to assess respondents' ethical ideologies and their relationship with attitudes toward animals, which were measured by the Animal Issue Scale (AIS) and the Animal Attitude Scale (AAS). The results demonstrated that respondents' gender and age were both significantly associated with attitudes toward animals, although gender showed a stronger correlation than age. Absolutists and situationists tended to show greater concern for animals than did exceptionists and subjectivists. Public attitudes toward animals were found to be significantly related to idealism; this confirms previous findings in the United States and China. Consistent with some previous findings in the United States, no significant correlation between relativism and public attitudes toward animals was found among Dutch respondents. However, this finding is inconsistent with findings in China indicating that relativism was negatively related to people's attitudes toward animals. Our study indicates that the correlation between idealism and attitudes toward animals is the same in different countries, while the correlation between relativism and attitudes toward animals differs between developed and developing countries.

Keywords

Animals, attitudes, demographics, human–animal interaction, idealism, relativism

6.1 Introduction

It is well-documented that human demographic and personality factors are associated with people's attitudes toward animals. A growing body of evidence shows the relationship between a person's attitudes toward animals and their gender (Driscoll, 1995; Herzog, Grayson, & McCord, 2015; Herzog, Betchart, & Pittman, 1991; Pifer, Shimizu, & Pifer, 1994), age (Ascione, 1992; Kavanagh, Signal, & Taylor, 2013; Kellert, 1985), household income (Signal & Taylor, 2006), humane education (Ascione & Weber, 1996; Furnham, McManus, & Scott, 2003; Nicoll, Trifone, & Samuels, 2008), pet ownership (Driscoll, 1992; Martens, Enders-Slegers, & Walker, 2016; Serpell, 1996), religion (Bowd & Bowd, 1989; Driscoll, 1992; Gilhus, 2006), as well as geographic region (Phillips et al., 2012; Pifer et al., 1994). However, research into the correlation between public attitudes toward animals and ethical ideologies is still in its infancy and needs further investigation (Bègue & Laine, 2017)

In the past two decades, a few studies have explored the relationship between ethical ideology and people's attitudes toward animals (Galvin & Herzog, 1992; Nickell & Herzog, 1996; Su & Martens, 2017; Taylor & Signal, 2005; Wuensch, Jenkins, & Poteat, 2002). The Ethics Position Questionnaire (EPQ) (Forsyth, 1980) is often used to measure people's ethical ideology, and has increasingly become a methodological cornerstone in studies of ethical decision-making. The EPQ is divided into two ethical dimensions: idealism and relativism (Figure 1) (Forsyth, 1980). Idealism refers to the extent to which one believes that ethical behavior will always lead to desirable consequences, while relativism refers to the extent to which people accept the belief that moral decisions should be based on universal principles (Banas & Parks, 2002; Forsyth, 1980; Galvin & Herzog, 1992; Wuensch & Poteat, 1998). Individuals who score high on the idealism dimension think that ethical actions will always lead to good results, while individuals who score high on the relativism dimension believe that moral decisions should be based on local principles and situational analysis, rather than universal principles (Forsyth, 1980; Galvin & Herzog, 1992; Wuensch & Poteat, 1998). Based on the idealism and relativism scores, Forsyth (1980) further proposed that individuals can be classified into four ethical categories: situationists (high idealism and high relativism), absolutists (high idealism and low relativism), subjectivists (low idealism and high relativism), and exceptionists (low idealism and low relativism). Situationists accept the belief that it is permissible to deviate from moral rules when better results can be attained by doing so. Absolutists admit that moral rules should be followed, even if there may be benefits to deviating from them. Subjectivists accept the inevitability of occasional negative outcomes because different individuals have different views about moral principles. Exceptionists endorse the statement that the morality of an action depends on the consequences produced by it (Ameh & Odusami, 2010; Galvin & Herzog, 1992).

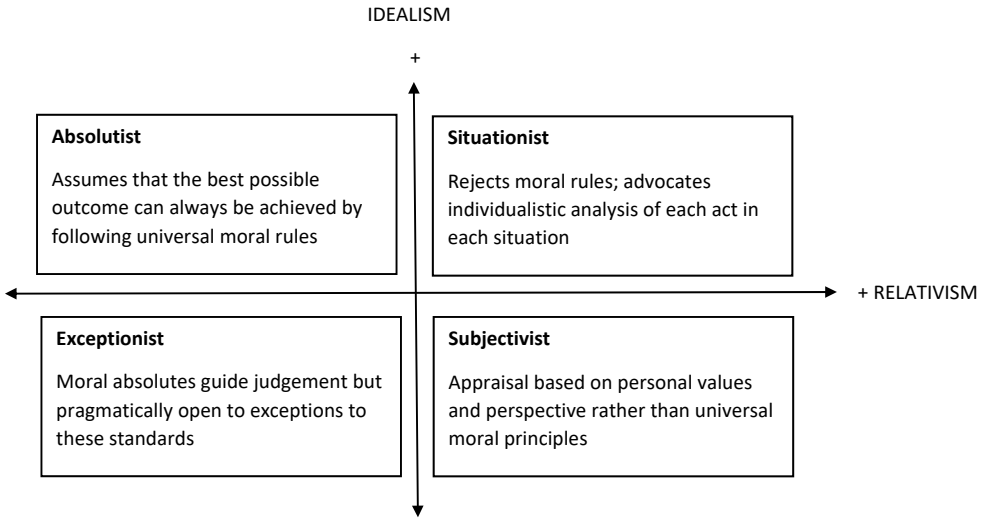


Figure 1. Ethical positions according to idealism and relativism (from Forsyth (1980)).

Building on this classification, Forsyth and Pope (1984) demonstrated that public attitudes toward animals or animal experiments are related to their ethical perspectives. For instance, absolutists regarded animal experiments as more unethical than did individuals in any other ethical category. Studies conducted in the United States have investigated the role of idealism and relativism, showing that individuals who scored higher on idealism often showed greater moral concern for ways of using animal, while individuals who scored higher on relativism often showed less moral concern for animal use (Wuensch & Poteat, 1998). Similar results were also found in a recent study conducted in China (Su & Martens, 2017). These findings indicate that both idealism and relativism are associated with attitudes toward animals. However, other investigations conducted in the United States have demonstrated significant correlations between ethical idealism and attitudes toward animals, but nonsignificant correlations between ethical relativism and attitudes toward animals (Galvin & Herzog, 1992; Nickell & Herzog, 1996) Thus, there is a need to answer the question how ethical ideologies relate to attitudes toward animals in different countries with different cultures.

We assume that idealism may be positively related to people's concern for animal welfare in different countries, since the absolute nature of idealistic individuals' moral principles always have crucial implications for their concern for others, including animals (Park, 2005). However, whether the correlation between relativism and attitudes toward animals is also the same in different countries, particularly when comparing developed and developing countries, still needs further investigation. People from developed countries already have a high awareness of animal welfare, and their attitudes toward animals are likely to have been formed by concern for animal well-being, rather than being based

on a cost-benefit analysis (Wuensch et al., 2002). We therefore assumed that relativism would not be a reliable predictor of attitudes toward animals in developed countries. However, a Chinese study demonstrated a significant correlation between relativism and attitudes toward animals (Su & Martens, 2017). With the booming economy, Chinese people's awareness of animal welfare seems to be counteracted by their pursuit of technological innovation. Some Chinese people's awareness of animal welfare is considered to be poor, and their attitudes toward animals are more likely to be based on the specific benefits that can be derived from using animals. Therefore, we hypothesized that the correlation between relativism and attitudes toward animals would be stronger in developing countries than in developed countries. In view of the cultural difference between developed countries (e.g., Netherlands) and certain developing countries (e.g., China), we hypothesized that human demographics and their interaction with ethical ideology might also link to attitudes toward animals, differently. Additionally, since animal welfare is a new concept in China, and younger people are more aware of it than older people (Su & Martens, 2017), we hypothesized that age would play a more important role in Chinese people's attitudes toward animals, than in those of Dutch people.

In the present study, we wanted to find out how ethical ideologies (idealism and relativism) and their interaction with human demographics relate to attitudes toward animals among Dutch people. Additionally, as Dutch people have a greater awareness of animal welfare than Chinese people, and this high awareness in the Netherlands could explain the strong link between ideologies and attitudes toward animals, we examined whether the correlation between ethical ideologies and attitudes toward animals differed between Dutch and Chinese people, by utilizing the same questionnaire that was used in China (Su & Martens, 2017). Religion (Bowd & Bowd, 1989; Driscoll, 1992; Gilhus, 2006), pet ownership (Costa, Guagliumi, Cannas, Minero, & Palestrini, 2014; Martens et al., 2016) and meat consumption (Kenyon & Barker, 1998; Loughnan, Haslam, & Bastian, 2010; Povey, Wellens, & Conner, 2001) have been demonstrated to be important factors in attitudes toward animals. In order to verify the reliability of these reports, we investigated whether such variables also relate to attitudes toward animals among Dutch people. Since few of the studies of the correlation between ethical ideology and attitudes toward animals that have been published in the literature specifically explain the differences and key drivers of such correlations between different countries, the current study can serve as a starting point for understanding attitudes toward animals and their associated factors in different countries, and can also help to diversify approaches to alter human-animal relationships.

6.2 Methods

6.2.1 Participants and procedure

In brief, an online questionnaire was distributed throughout the Netherlands in November 2015. This study adhered to the ethical guidelines of Taylor & Francis policy, and was conducted under protocols approved by Maastricht University's Ethical Review Committee Inner City faculties (ERCIC). In total, 506 responses were obtained from 581 people (among a panel which included 897 people throughout the Netherlands) who provided their e-mail addresses and received the invitation email with a unique hyperlink to our questionnaire. All the respondents in the present study were 18 years or older and participated in the "Golden Standard" panel, which was developed by the MOA (Center for Information Based Decision Making and Marketing Research) in collaboration with CBS (Statistics Netherlands) in the Netherlands. The mean (± *SD*) age of all respondents (51.2% male and 48.8% female) was 48.48 (± 16.78) years. The respondents were representative of the Dutch population aged 18 years or older with respect to gender and age (see results section). Utilizing a standard "forward-backward" translation procedure, the English version of the questionnaire was translated into Dutch, and two Dutch-speaking researchers who had not seen the English version translated it back into English. The re-translated version was found to closely match the original one. In the questionnaire, we explained the purpose of our study to the participants and stated that all information they provided would be kept completely confidential, and that personal information would not be released to or viewed by anyone other than the researchers involved in this project. The Ethics Position Questionnaire, Animal issue Scale, and Animal Attitude Scale were presented to each respondent in randomized order. Background information on the respondents' is in Table 1.

Table 1. Background details of the respondents

	n (%)
Gender	
Male	259 (51.2)
Female	247 (48.8)
Age	
Young (19–44 years)	196 (38.7)
Middle-aged (45–59 years)	152 (30.0)
Old (60 years and older)	158 (31.2)
Highest level of education	
Less than grade 12	11 (2.2)
Middle school	146 (28.9)
High school	69 (13.6)
College or technical school	224 (44.3)
University	52 (10.3)

Table 1. ***Continued***

	n (%)
Place of residence	
Urban areas	307 (60.7)
Rural areas	199 (39.3)
Housing type	
Apartment	143 (28.3)
Semi-detached house	302 (59.7)
Detached house	61 (12.1)
Main source of inspiration	
Buddhism	29 (5.7)
Judaism	3 (0.6)
Islam	4 (0.8)
Christianity	114 (22.5)
Taoism	4 (0.8)
Other	19 (3.8)
Pet ownership	
Yes	249 (49.2)
No	257 (50.8)
Pet species	
Cat	139 (27.5)
Dog	103 (20.4)
Fish	43 (8.5)
Birds	26 (5.1)
Reptiles	8 (1.6)
Rodents	34 (6.7)
Chickens, pigeon, gees or other poultry	10 (2.0)
Ponies and horses	5 (1.0)
Other	4 (0.8)
Meat-eating frequency	
Never	18 (3.6)
Once a week or less	35 (6.9)
2–3 days a week	125 (24.7)
4–6 days a week	244 (48.2)
Every day	84 (16.6)
Visiting zoo/aquarium	
Once a month or more	15 (3.0)
Once every six months	50 (9.9)
Once every year	119 (23.5)
Once every two years or less	233 (46.0)
Never	89 (17.6)

6.2.2 Questionnaire

In the first part of the questionnaire (see Appendix 3), respondents were asked to supply some background information, including gender, age, highest attained level of education, place of residence, housing type, main source of inspiration, pet ownership and pet species, meat consumption, and frequency of visiting zoos/aquariums.

In the second part of the questionnaire, the Ethics Position Questionnaire (EPQ) was used to determine the respondents' dominant ethical ideologies (Rawwas, 1996). Cronbach's alpha (Cronbach's alpha tests the internal validity and the reliability of a psychometric test/questionnaire) for the EPQ in the present study was 0.898. The EPQ is a 20-item questionnaire which yields four ethical positions (absolutists, exceptionists, situationists, and subjectivists) based on two 10-item subscale scores for idealism and relativism (Forsyth, 1980). The idealism dimension asks respondents to indicate their degree of agreement with items like "One should never psychologically or physically harm another person" and "The dignity and welfare of the people should be the most important concern in any society." Typical items for relativism include "What is ethical varies from one situation and society to another" and "No rule concerning lying can be formulated; whether a lie is permissible or not permissible totally depends upon the situation." Respondents were asked to respond to statements using 9-point Likert scales, ranging from 1 (completely disagree) to 9 (completely agree). The mean scores of the idealism subscale (7.27) and the relativism subscale (6.07) in the present study were used as cut-off values to classify respondents as high or low in idealism and relativism, respectively.

In the third part of the questionnaire, the Animal Issue Scale (AIS) (Meng, 2009) was used to measure respondents' attitudes toward animals. Cronbach's alpha for the AIS in the present study was 0.922. The AIS, a 43-item scale, includes eight sections (use of animals, disrupting animal integrity, killing animals, compromising animal welfare, experimenting on animals, changing animals' genotypes, animals and the environment, and societal attitudes toward animals). Respondents were asked to respond to each question on a 5-point Likert scale, ranging from 1 (extremely acceptable) to 5 (extremely unacceptable). A higher score on the AIS indicates greater concern for the welfare of animals (Phillips et al., 2012). Examples of items include: "Using animals for work"; "Marking animals by branding or ear notching"; "Depriving animals of their needs for food and water"; "Controlling wildlife populations by killing."

In the fourth part of the questionnaire, the Animal Attitudes Scale (AAS) (Herzog et al., 1991) was introduced to further examine respondents' attitudes toward animals. Cronbach's alpha for the AAS in the present study was 0.875. The AAS is a 20-item questionnaire, which was chosen because of its concise design and scientific content. Items 1, 3, 4, 7, 10, 11, 17, 19, and 20 are scored from 1 (strongly disagree) to 5

(strongly agree), while the other items are reverse-scored, from 1 (strongly agree) to 5 (strongly disagree) according to their meanings. A higher score on the AAS reflects greater concern for the welfare of animals. Examples of questions include: "4. Wild animals, such as mink and raccoons, should not be trapped and their skins made into fur coats"; "8. I think it is perfectly acceptable for cattle and dogs to be raised for human consumption"; "18. The production of inexpensive meat, eggs, and dairy products justifies maintaining animals under crowded conditions."

6.2.3 Statistical analysis

How ethical ideologies and their interaction with human demographics are associated with public attitudes toward animals in the Netherlands was analyzed with IBM SPSS 24 Statistical software (Armonk, NY, USA). Given that the data in this study were either normally distributed or converted to normal distribution by log10 transformation, and the Levene test showed homogeneity of variances, a multivariate analysis (MANOVA) was performed (after log10 transformation) to determine respondents' ethical ideologies and demographics that may be associated with their attitudes toward animals. In order to reduce type-I errors due to repeated testing, Fisher's procedure was applied in the analyses across three groups, and REGWQ correction was used wherever necessary to find the differences across more than three groups. The model for data responses included idealism, relativism, gender, age, highest level of education, place of residence, housing type, main source of inspiration, pet ownership and pet species, meat consumption, and frequency of vising zoos/aquariums. Only idealism, relativism, gender, and age were considered in this research, as idealism and relativism were the two variables targeted by our modelling. Gender and age were used to measure how demographics related to respondents' attitudes toward animals. Fisher's r-to-z transformation was performed wherever necessary to find the difference between two groups regarding correlations. In order to identify variables associated with respondents' attitudes toward animals, backward linear regression was carried out to relate responses regarding attitudes toward animals to demographics and other basic information, such as the main sources of spiritual inspiration, companion animal species and meat-eating frequency. An alpha value of 0.05 was used for variables to be entered into the models.

6.3 Results

EPQ

In this study, respondents' mean score for idealism was 7.27 (SD = 1.36), while the mean score for relativism was 6.07 (SD = 1.35). The scores for idealism and relativism in the current study were similar to the results of a recent survey conducted in China ($M_{idealism}$

= 7.26, *SD* = 1.21, $t_{(1008)}$ = 0.22, p = 0.83, Mrelativism = 6.07, *SD* = 1.33, $t_{(1008)}$ = 0.10, p = 0.92) (Su & Martens, 2017). We did not find any significant differences between male and female respondents regarding either idealism or relativism. The mean idealism score of middle-aged respondents (7.50 ± 1.28) was higher than that of young respondents (6.66 ± 1.25) and lower than that of older respondents (7.81 ± 1.26) (both $p < 0.05$). As for the score for relativism, the older respondents (6.39 ± 1.50) scored higher than the young (5.96 ± 1.90) and middle-aged ones (5.90 ± 1.34) (both $p < 0.01$). Situationists made up the largest share of participants (39.3%), followed by absolutists (38.7%) and exceptionists (16.8%). Subjectivists (5.1%) were the smallest group in the present study.

Do respondents' ethical ideologies and demographics relate to their attitudes toward animals?

Ethical ideologies: The multivariate test yielded a significant correlation between respondents' idealism and their attitudes toward animals (according to AAS and AIS scores). Respondents with higher scores for ethical idealism showed greater concern for animal welfare and for the specific animal welfare issues of "use of animals," "disrupting animal integrity," "killing animals," "compromising animal welfare," "experimenting on animals," "changing animals' genotypes," "harming animals to protect the environment," and "harming animals for social purposes" (Table 2). Absolutists and situationists showed greater moral concern for animal welfare than exceptionists and subjectivists. Yet we did not find any significant correlations between relativism and respondents' attitudes toward animals (Table 2).

Human demographics: Respondents' gender was significantly associated with their attitudes toward animals (according to AAS and AIS scores), as women showed greater concern for the welfare of animals than men (Table 2). This difference was also reflected by women's greater sensitivity to the treatment of animals, including "use of animals," "killing animals," "compromising animal welfare," "experimenting on animals," "changing animals' genotypes," "harming animals to protect the environment," and "harming animals for social purposes" (Table 2). Age was also associated with respondents' attitudes toward animals, but this was only reflected by the AIS score. Middle-aged respondents expressed greater concern for animal welfare and the specific animal welfare issues of "compromising animal welfare," "experimenting on animals," "changing animals' genotypes," and "harming animals for social purposes" than young and older respondents (Table 2).

Interaction between ethical ideologies and demographics

The interaction between relativism and age was not associated with respondents' attitudes toward animals (according to their AIS and AAS scores). However, the correlation between relativism and the acceptability of "killing animals" was stronger

Table 2. Summary of multivariate analysis of the effects of ethical idealism, ethical relativism, gender, and age on public attitudes toward animals (measured by Animal Attitude Scale [AAS] and Animal Issue Scale [AIS])

	Idealism (I)		Relativism(R)		Gender (G)		Age (A)		R×A		I×R×A	
	F	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*
AAS	12.46	< 0.01	2.11	0.15	26.89	< 0.01	2.78	0.06	1.29	0.28	3.69	0.03
AIS	31.86	< 0.01	0.16	0.69	23.72	< 0.01	3.66	0.03	0.97	0.38	0.50	0.61
Use of animals	3.80	0.05	0.34	0.56	3.95	0.05	1.12	0.33	0.47	0.63	2.90	0.06
Disrupting animal integrity	18.21	< 0.01	0.92	0.34	3.17	0.08	2.36	0.10	0.17	0.85	0.47	0.62
Killing animals	19.54	< 0.01	0.38	0.54	12.73	< 0.01	0.08	0.93	3.37	0.04	0.62	0.54
Compromising animal welfare	24.18	< 0.01	0.01	0.91	14.01	< 0.01	3.33	0.04	0.74	0.48	1.08	0.34
Experimenting on animals	14.39	< 0.01	0.09	0.76	13.71	< 0.01	3.22	0.04	1.11	0.33	0.09	0.91
Changing animals' genotypes	3.96	0.05	1.14	0.29	22.44	< 0.01	5.19	< 0.01	1.49	0.23	0.04	0.96
Harming animals to protect the environment	18.01	< 0.01	0.61	0.43	14.91	< 0.01	2.60	0.07	0.04	0.96	1.04	0.35
Harming animals for social purposes	25.92	< 0.01	0.06	0.81	4.86	0.03	9.55	< 0.01	0.46	0.63	0.10	0.91

Note: *df* (I) = 1; *df* (R) = 1; *df* (G) = 1; *df* (A) = 2; *df* (R×A) = 2; *df* (I×R×A) = 2. The two-way (I×A, I×R, I×G, R×G, G×A), three-way (I×R×G, I×G×A, R×G×A,) and four-way (I×R×G×A) interactions that were not significant were removed from the final analyses.

when middle-aged respondents were removed from the analysis (ethical relativism × age). We found that the idealism by relativism by age interaction was significantly associated with respondents' attitudes toward animals (only according to their AAS scores), with middle-aged absolutists showed the greatest concern for animal welfare, while young and older subjectivists showed the least concern for animal welfare (Table 2).

Main predictors of AIS and AAS scores

We considered a number of possible demographic variables that might relate to the AIS scores, from the information we collected from the Dutch respondents (see Table 3 for influential variables). According to the backward elimination multiple regression analysis, the AIS scores of respondents who considered their inspiration to come from Christianity were on average 14.46 points lower than those of respondents who did not. Female respondents' AIS scores were 11.43 points higher than those of their male equivalents. The AIS score of dog owners was 9.85 points higher than that of non-dog owners (Table 3).

Table 3. Important variables influencing the Animal Issue Scale (AIS) score in the Netherlands

	Unstandardized coefficients		Standardized coefficients		
Y: Attitudes toward animals (*df* = 79)	*B*	*SE*	Beta	*t*	*p*
(Constant)	103.95	19.08		5.45	0.00
X_1: What's your gender? Male (1); female (2)	11.43	3.99	0.31	2.86	0.01
X_2: What's your age? 19–44 years (1); 45 years and older (2)	3.34	2.51	0.15	1.33	0.19
X_3: What's your highest level of education? High school or lower (1); college/ technical school. university or above (2)	-1.09	1.57	-0.08	-0.70	0.49
X_4: Do you belong or donate to an organization concerned with improving the welfare of animals? Yes (1); no (2)	-0.76	4.81	-0.02	-0.16	0.88
X_5: Do you belong or donate to an organization concerned with conservation of the natural environment? Yes (1); no (2)	4.55	5.02	0.13	0.91	0.37
X_6: Do you belong or donate to an organization concerned with improving human rights or health? Yes (1); no (2)	0.93	4.32	0.03	0.22	0.83
X_7: What does your household look like? Single/couple without children (0); single/couple with children (1)	2.70	1.76	0.16	1.53	0.13
X_8: Is your current place of residence in an urban area (1); or a rural area (2)	4.77	3.89	0.13	1.23	0.23

Table 3. ***Continued***

Y: Attitudes toward animals (df = 79)	Unstandardized coefficients		Standardized coefficients		
	B	*SE*	Beta	*t*	*p*
X_9: In what sort of house do you live? Apartment or semi-detached house (1); detached house or villa (2)	10.41	5.91	0.21	1.76	0.08
X_{10}: Do you have a garden? Yes (1); no (2)	7.64	5.58	0.15	1.37	0.18
X_{11}: What is your main source of spiritual inspiration? Buddhism: no (0); yes (1)	-6.01	5.13	-0.14	-1.17	0.25
X_{12}: What is your main source of spiritual inspiration? Christianity: no (0); yes (1)	-14.46	4.88	-0.36	-2.96	0.01
X_{13}: What's your gross household income per month? Average or below the average income in the Netherlands (1); twice or more than twice the average income in the Netherlands (2)	0.01	1.32	0.00	0.01	0.99
X_{14}: What pets do you have? Cats: no (0); yes (1)	6.95	4.80	0.19	1.45	0.15
X_{15}: What pets do you have? Dogs: no (0); yes (1)	9.85	4.25	0.26	2.32	0.02
X_{16}: What pets do you have? Fish: no (0); yes (1)	-5.50	5.17	-0.13	-1.06	0.29
X_{17}: What pets do you have? Birds: no (0); yes (1)	-2.10	5.83	-0.04	-0.36	0.72
X_{18}: What pets do you have? Rodents: no (0); yes (1)	0.32	5.99	0.01	0.05	0.96
X_{19}: What pets do you have? Chickens, pigeon, geese: no (0); yes (1)	-10.52	10.90	-0.15	-0.97	0.34
X_{20}: What pets do you have? Ponies, horses: no (0); yes (1)	2.86	28.63	0.02	0.10	0.92
X_{21}: How often do you eat meat (including fish) every week? Once a week or never (1); 2 or more days a week (2)	-5.50	5.41	-0.12	-1.02	0.31
X_{22}: How often do you visit a zoo or aquarium? Once every six months or more (1); once every year or less (including never) (2)	-1.26	2.10	-0.08	-0.60	0.55

Note: "Standardized coefficients" refer to the partial effect of one predictor after adjusting for the others.

Based on the relationships between respondents' AAS scores and the possible influential factors (see Table 4), we found that the AAS scores of respondents whose main source of inspiration was Christianity was 10.42 points lower than those of respondents who did not report Christianity as their main source of inspiration. Female respondents' mean AAS score was 8.91 points higher than that of male respondents (Table 4).

Table 4. Important variables influencing the Animal Attitudes Scale (AAS) score in the Netherlands

	Unstandardized coefficients		Standardized coefficients		
Y: Attitudes toward animals (*df* = 79)	*B*	*SE*	Beta	*t*	*p*
(Constant)	71.03	15.67		4.53	0.00
X_1: What's your gender? Male (1); female (2)	8.91	3.28	0.33	2.72	0.01
X_2: What's your age? 19–44 years (1); 45 years and older (2)	-1.27	2.06	-0.08	-0.62	0.54
X_3: What's your highest level of education? High school or lower (1); college/ technical school. university or above (2)	-0.95	1.29	-0.09	-0.73	0.47
X_4: Do you belong or donate to an organization concerned with improving the welfare of animals? Yes (1); no (2)	-3.55	3.95	-0.13	-0.90	0.37
X_5: Do you belong or donate to an organization concerned with conservation of the natural environment? Yes (1); no (2)	3.32	4.12	0.13	0.81	0.42
X_6: Do you belong or donate to an organization concerned with improving human rights or health? Yes (1); no (2)	0.86	3.55	0.03	0.24	0.81
X_7: What does your household look like? Single/couple without children (0); single/couple with children (1)	1.24	1.45	0.10	0.86	0.39
X_8: Is your current place of residence in an urban area (1) - or a rural area (2)	0.15	3.19	0.01	0.05	0.96
X_9: In what sort of house do you live? Apartment or semi-detached house (1); detached house or villa (2)	6.63	4.85	0.18	1.37	0.18
X_{10}: Do you have a garden? Yes (1); no (2)	-1.83	4.58	-0.05	-0.40	0.69
X_{11}: What is your main source of spiritual inspiration? Buddhism: no (0); yes (1)	-0.63	4.21	-0.02	-0.15	0.88
X_{12}: What is your main source of spiritual inspiration? Christianity: no (0); yes (1)	-10.42	4.01	-0.35	-2.60	0.01
X_{13}: What's your gross household income per month? Average or below the average income in the Netherlands (1); twice or more than twice the average income in the Netherlands (2)	-0.61	1.08	-0.08	-0.57	0.57
X_{14}: What pets do you have? Cats: no (0); yes (1)	0.66	3.94	0.03	0.17	0.87
X_{15}: What pets do you have? Dogs: no (0); yes (1)	2.68	3.49	0.10	0.77	0.45
X_{16}: What pets do you have? Fish: no (0); yes (1)	-1.65	4.25	-0.05	-0.39	0.70
X_{17}: What pets do you have? Birds: no (0); yes (1)	-3.26	4.79	-0.09	-0.68	0.50

Table 4. ***Continued***

Y: Attitudes toward animals (df = 79)	Unstandardized coefficients		Standardized coefficients		
	B	*SE*	Beta	*t*	*p*
X_{18}: What pets do you have? Rodents: no (0); yes (1)	-3.54	4.92	-0.10	-0.72	0.48
X_{19}: What pets do you have? Chickens, pigeon, geese: no (0); yes (1)	-9.87	8.95	-0.20	-1.10	0.26
X_{20}: What pets do you have? Ponies, horses: no (0); yes (1)	14.40	23.51	0.12	0.61	0.54
X_{21}: How often do you eat meat (including fish) every week? Once a week or never (1); 2 or more days a week (2)	-6.34	4.44	-0.18	-1.43	0.16
X_{22}: How often do you visit a zoo or aquarium? Once every six months or more (1); once every year or less (including never) (2)	-0.32	1.73	-0.03	-0.19	0.85

Note: "Standardized coefficients" refer to the partial effect of one predictor after adjusting for the others.

6.4 Discussion

The aim of this Chapter was to investigate how ethical ideologies and their interaction with human demographics relate to attitudes toward animals, as well as whether the correlation between ethical ideologies and attitudes toward animals is the same in different countries. Our findings showed a significant correlation between idealism and attitudes toward animals, while no significant correlation was found between relativism and attitudes toward animals. This result parallels those of previous studies conducted in developed countries (Galvin & Herzog, 1992; Nickell & Herzog, 1996), while partly contrasting with a recent study conducted in China, which reported that public attitudes toward animals were positively associated with idealism and negatively with relativism (Su & Martens, 2017). Hence, our findings indicate that whereas the correlation between ethical idealism and attitudes toward animals appears to be similar in different countries, the correlation between ethical relativism and attitudes toward animals seems to differ between developed and developing countries.

Ethical ideology

Our results showed that respondents' concern for animal welfare was positively associated with their ethical idealism. The more individuals believed that positive behavior will lead to good consequences, the more they appreciated animals. This finding is in line with previous research showing that ethical idealism relates to attitudes toward animals in both developed (Bègue & Laine, 2017; Galvin & Herzog, 1992; Wuensch & Poteat, 1998)

and developing countries (Su & Martens, 2017). Considering that idealistic individuals are concerned about others' welfare and believe in the absolute value of moral standards based on their unselfish concern for others (Park, 2005), it is not surprising that greater concern for animal welfare has always gone together with a higher level of idealism. Idealistic individuals' belief that harming others is always avoidable may also apply to their concern for animals (Forsyth, 1992; Park, 2005).

We found that the correlation between ethical relativism and attitudes toward animals was not statistically significant, which confirms previous studies conducted in the United States (Galvin & Herzog, 1992; Nickell & Herzog, 1996). However, our result is inconsistent with a previous Chinese study, which demonstrated that the more individuals disagree with the existence of universal moral principles, the more they endorse the view that animals can be sacrificed for human and societal purposes (Su & Martens, 2017). This difference between China and Western countries might be accounted by their different cultural backgrounds. Although Chinese Confucianism, which is still influential in contemporary China, requires people to respect animals, it appears that animals are assumed to have value because they are resources to satisfy human needs (Blakeley, 2003). Therefore, Chinese peoples' awareness of the concept of "animal welfare" is considered to be low and they are considered to be more rational in explaining their attitudes toward animals. The economic policies in modern Chinese society may also contribute to individuals' relativist attitudes toward animals. Since 1987, economic success has become the central task of social development in China (Zhu & Feng, 2008). Individuals' awareness of animal welfare has been overlooked in the vigorous pursuit of technological innovation and quick profits. This has led to some Chinese people's more tolerant attitudes toward animal experiments, which inevitably involve animal suffering and the reduction of animal welfare. Therefore, it is plausible that some Chinese people think there are no universal principles regarding specific animal species, such as laboratory animals. Generally speaking, most people from developed countries are more aware of animal welfare and show great concern for animals (Friedmann, 2013; Martens et al., 2016; Pifer et al., 1994). Their attitudes toward animals may stem from their concern for animal welfare, rather than from a cost-benefit analysis. In those countries, the existence of animals might be regarded as more valuable than the benefits that they bring. As a result, the correlation between relativism and attitudes toward animals can be ignored.

Another interesting finding is that the majority of our respondents held absolutist or situationist ethical beliefs (i.e., high scores on idealism). Additionally, we confirmed that idealism is an important determinant of attitudes toward animals (Nickell & Herzog, 1996). Absolutists and situationists in the present study showed greater concern for animals than subjectivists and exceptionists, although the situationists scored higher on the relativism scale than exceptionists. One possible reason is that absolutists

and situationists are less likely to compromise on their values than subjectivists and exceptionists who view ethical judgement from a more relativistic perspective (Galvin & Herzog, 1992). For instance, subjectivists and exceptionists may consider that the costs of animal use (in terms of animal welfare) are justified by the benefits to humans, as they often base their attitude on ethical cost-benefit analyses (Wuensch et al., 2002). Accordingly, their attitudes toward animals are not as favorable as those of absolutists and situationists. This result can also be supported by a previous finding, which showed that idealism was more highly related to belief in caring as an ethical principle than relativism (Nickell & Herzog, 1996). Our findings confirm that the correlation between idealism and people's concern for animals was much stronger than that between relativism and concern for animals (Wuensch & Poteat, 1998). They also imply that idealists can have high scores on both idealism and relativism, but that idealists tend not to base their attitudes on cost-benefit analysis (Wuensch et al., 2002), which means that they question whether the alternative can lead to the best results, and reject absolute rules. This might explain idealists' greater concern for animals.

Human demographics and their interaction with ethical ideologies

Our results indicate that respondents' gender and age were independently related to their attitudes toward animals, although gender played a more important role in this relationship than age. We also confirmed that women show greater concern for animals than men (Bègue & Laine, 2017; Erlanger & Tsytsarev, 2012; Martens et al., 2016). This may be because women are socialized from birth in a caring and nurturing role, while men are brought up to be more utilitarian (Herzog, Betchart, & Pittman, 1991). This may mean that women's attitudes toward animals are characterized by humanistic orientation, whereas men's attitudes are more utilitarian and tend to be more "thing oriented" (Hills, 1989; Kellert & Berry, 1987). However, a previous Chinese study reported that gender was not related to attitudes toward animals (Su & Martens, 2017). Both Chinese women and men's deep-rooted idea that animals should be respected as an essential part of society may play a more important role in their attitudes toward animals than differences in personality between women and men. Hence, it is not surprising that gender failed to associate with attitudes toward animals in China.

The concept of animal welfare was first highlighted by ethological researchers at universities by the end of 1960s and 1970s in European countries (in China by the end of 1980s and 1990s) (Bayne, Ramachandra, Rivera, & Wang, 2015; Niggli, 2007), as a result of which age was strongly correlated with attitudes toward animals in both the Netherlands and China. Additionally, we found that middle-aged Dutch respondents showed the greatest moral concern for animals, which is inconsistent with previous findings from China, in which the young respondents showed greater concern for animals than middle-aged and older ones. Animal welfare as a new phenomenon in

China has attracted the attention of the younger generations, as a result of which they are more aware of it and express greater concern for it (Littlefair, 2006). In the Dutch sample examined in the present study, there were more middle-aged than younger and older respondents who belonged to or donated to organizations involved in improving animal welfare, which means that middle-aged respondents have more direct access to the knowledge about animals shared in their communities. We assume this may have contributed to their greater concern for animals.

Although we found no significant interactions between idealism and relativism, it appears that idealism and relativism coupled with age predicts a significant amount of variation in attitudes toward animals, indicating that middle-aged absolutists and situationists are likely to express a greater concern for animals.

Religion and pet ownership

In contrast to some recent studies, which reported that religion was not a significant predictor of public attitudes toward animals (and animal products) (Izmirli & Phillips, 2011; Phillips et al., 2012), our results demonstrate a significant negative correlation between Christianity as a source of inspiration and attitudes toward animals. Specifically, respondents who reported that inspiration source was Christianity showed less concern for animals than those who reported otherwise. This finding is partly in line with a previous study reporting negative correlations between concern for animal welfare and Christianity (Menache, 1997). Our results also demonstrate that respondents who owned a dog as their companion animal showed more concern for animal welfare. This result parallels a recent study by Martens et al. (2016), which demonstrated a strong attachment between companion dogs and their owners, suggesting that pet (in particular dog) ownership is an important predictor of public attitudes toward animals.

6.5 Conclusion and implications

The present study, as well as previous studies conducted in the United States, found that relativism is not associated with public attitudes toward animals, suggesting that views about whether universal moral principles exist or not do not influence Dutch and American people's attitudes toward animals. However, these findings are in contrast with a recent survey in China showing that relativism is negatively associated with public attitudes toward animals. We assume that this difference may relate to the generally greater awareness of animal welfare in developed countries against the poorer awareness in developing countries. These results also reveal that people from developing countries show more tolerant attitudes toward animal use than people from developed countries. Additionally, our research also confirmed that public attitudes toward animals were positively associated with idealism in both developed and developing countries

(Galvin & Herzog, 1992; Nickell & Herzog, 1996; Su & Martens, 2017). This finding implies that individuals who think their ethical behavior will always lead to positive consequences generally show greater concern for animals.

In addition to idealism and relativism, we also found significant correlations between public attitudes toward animals and demographics (gender and age), with gender showing a stronger correlation (Galvin & Herzog, 1992; Herzog et al., 2015; Herzog, 2007; Herzog et al., 1991). This finding is inconsistent with a previous finding from China showing that the relationship between human demographics and attitudes toward animals was significant for age but not for gender (Su & Martens, 2017). Here we have shown, by comparing attitudes toward animals among individuals from different countries, that idealism and age may be universally correlated with attitudes toward animals, while relativism and gender may not. We therefore predict that an understanding of individual ethical ideologies and their interaction with human demographics, from cultural and social perspectives, is vital to improving people's awareness of animal welfare in different countries.

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Chapter 7

The Ecological Paw Print (EPP) of companion dogs and cats

Based on: Martens, P., Su, B. & Deblomme, S. (2019). The Ecological Paw Print of Companion Dogs and Cats, *BioScience*, 69(6), 467-474.

Abstract

As an indicator of sustainable development, the Ecological Footprint (EF) has been successful in providing a basis for discussing the environmental impacts of human consumption. Humans are at the origin of numerous pollutant activities on Earth, and are the primary drivers of climate change. However, very little research has been conducted examining the environmental impacts of animals, especially companion animals. Often regarded as friends or family members by their owners, companion animals need significant amounts of food in order to sustain their daily energy requirement. The Ecological Paw Print (EPP) could therefore serve as a useful indicator for assessing the impacts of companion animals on the environment. Here, we explain the environmental impact of companion dogs and cats through their dietary EPP and greenhouse gas (GHG) emissions according to primary data we collected in China, the Netherlands and Japan, and discuss how to reduce companion dietary EPP and GHG emissions, in order to understand the sustainability of the relationship between companion animals and the environment.

Keywords

Ecological paw print, greenhouse gas emissions, environment, dogs, cats

7.1 The impact of dog and cat diets on the environment

Companion animals are part of human societies around the world (Amiot et al. 2016). Pets provide a host of benefits to people including companionship, improved mental and physical health, expanded social networks, and even benefitting child and teenage development (Beverland et al. 2008, Cutt et al. 2007, Okin 2017, Wood et al. 2005). Statistics describing companion animal numbers worldwide are scarce, and they fluctuate, but according to the data from the Vetnosis and The European Pet Food Industry Federation (FEDIAF), there were 223 million registered companion dogs and 220 million registered companion cats in the world in 2014. Dogs and cats are often regarded as family members, and most owners show great concern for their pet's wellbeing, including food and water requirements of their pet, living spaces, health conditions and even their pet's emotions and feelings (Flynn 2000, Martens et al. 2016, Su et al. 2018a). Providing complete nutrition during all stages of their lives is a common and effective way for owners to have caring and loving relationships with their animals (Fleeman and Owens 2007). Many owners feed their animals more nutrients than minimum recommendations, or give them ingredients that are suitable for human consumption (Fleeman and Owens 2007, Swanson et al. 2013). Given the sheer numbers of companion dogs and cats globally, and their potentially nutrient-rich diets, we have ample reason to suspect that resource consumption by companion animals is more serious than has been heretofore imagined. However, Okin (2017) indicated: "It could be argued that dogs and cats eat meat that humans cannot consume and which is simply a byproduct of production for human use, and therefore should not be counted as consumption beyond that of humans." But this is only partly true. For bone meal, an ingredient in most foods for cats and dogs, this is true; humans generally do not eat this. For other ingredients this is more complex. Some byproducts could be made suitable, after processing, for human consumption. Therefore, it is of vital importance to identify companion animals' resource consumption and environmental impacts, and simultaneously investigate how current pet food production systems can sustainably support their nutritional requirements.

The Ecological Footprint (EF) is a popular natural resource accounting tool that is used to measure environmental sustainability. Specifically, it is the total area of productive land and water required continuously to produce all resources consumed and to assimilate all waste produced, by a defined population, wherever on Earth that land is located (Csutora et al. 2009, Wackernagel and Rees 1998). The dietary Ecological Paw Print (EPP) is based on the EF, and measures how much biologically productive land is used for companion animals' food consumption. The diet of an animal greatly affects its EPP according to the animals' particular metabolic needs or dietary preferences, and the availability of resources (Swanson et al. 2013, Vale and Vale 2009). Meat-based diets require more energy and water, and therefore have far greater environmental impacts,

than plant-based diets (Okin 2017, Pimentel and Pimentel 2003, Reijnders and Soret 2003, Wirsenius et al. 2010). For example, in China, commercial pet dry food has higher percentages of animal meat products than human foods. Therefore, the dietary EPP and greenhouse gas (GHG) emissions of companion dogs relying on commercial dry food was found to be much higher than the dogs relying on human leftover foods (Su et al. 2018b). If we look at differences between countries – assuming all companion dogs and cats eat commercial dry food – then the dietary EPP of all companion dogs and cats in China equals the dietary EF of between 70 and 245 million Chinese people, in terms of home-made food (Su et al. 2018b). The carbon emissions resulting from the food consumption of these animals is equivalent to the emissions generated by the food consumption of between 34 and 107 million Chinese people (Su et al. 2018b). Meanwhile, in Japan, companion dogs and cats may consume between 3.6% to 15.6% of the food eaten by Japanese people, and through their consumption, Japanese companions release 2.5 to 10.7 million tons of GHG per year (Su and Martens 2018). In the US, the energy consumption of companion dogs and cats is approximately one-fifth of the US population's energy consumption, while animal meat product consumption by dogs and cats alone is responsible for up to 64 ± 16 million tons of methane and nitrous oxide (Okin 2017). Therefore, the individual and cumulative environmental impacts of the commercial dry food consumption by companion animals and the industries behind its manufacture are significant, considering the sheer volumes of planet-wide pet ownership (Hammerly and DuMont 2012).

Commercial pet food has become one of the most popular feeds for companion animals in recent decades, replacing human leftover food. Pet food industry is no longer a niche market. As demonstrated in previous studies, it has become an economic sector of substantial importance (Leenstra and Vellinga 2011), a commercial system of its own in many Western countries and a growing sector in developing countries. Attention must therefore also be given to commercial pet food production, if we wish to reduce the EPP of companion animals (of course, reducing impact could be accomplished via: changing pet ownership laws (limits to how many and types of pets people can own), better guidelines on pet feeding, etc. (see also next section)). However, the pet food industry is quite unique with regard to sustainability due to the fact that commercial pet food formulations are based on consumer demand (e.g. sufficient energy, complete nutrition, functional and balanced food) and often provide an excess of nutrients (Hughes 1995). There is furthermore a growing obesity trend among companion animals in Western societies because they are over-consuming and therefore potentially wasting resources. Both factors pose a significant barrier to the sustainable optimization of the pet food sector, and to pet ownership in general (Swanson et al. 2013). Since the number of companion animal owners is increasing, product sales are expected to grow in the near future, thus creating an increasing demand for pet food. Leenstra and Vellinga (2011) warn that this high demand is already beginning to exceed the offal available from

human meat and fish consumption that is used to make pet food. Meat used in pet foods as well as other plant-based ingredients are now competing with food suitable for human consumption. The sustainability of pet food industries, as both food producers and polluters, should therefore be seriously considered, as they are now contributing significantly to global climate change (Swanson et al. 2013). Given the growing concern for environmental sustainable development, the pet food industry should consider how to promote technological progress in pet food production.

The goal of this Chapter is to quantify the relationship between companion food consumption and associated environmental impacts. In the present study, we provide an overview of the individual and total companion dogs and cats' dietary EPP and GHG emissions in China, Japan and the Netherlands, according to primary data we collected from companion dog and cat owners in these countries. The framework, findings and recommendations in the present study can serve as a motivational platform for further research into the environmental impacts of companion animals, from a global perspective.

7.2 Calculations of ecological paw prints

To measure the EPP of dogs, Vale and Vale (2009) analysed the ingredients of one common UK dog food brand and assumed that the recommended portions indicated on the packaging represent the actual quantities fed to companion animals. Using the square meters of land needed to generate the previously converted dry grams into whole chicken or grains present in the product (taking into account specific water content), they obtained an EPP of 0.27 hectares for an average medium-sized dog (0.18 for small dogs and 0.36 for large dogs). They compared this to a dog having a completely omnivorous human diet and obtained an EPP of 0.48 ha/year. For cats, they used the same methodology to calculate the footprint of a one year supply of dry cat food, and obtained 0.3 ha/year. Vale and Vale also assessed the footprint of the packaging but concluded that it was too small an amount to be significant. For tinned cat food, they assumed 80% moisture and converted the protein content into its raw meat equivalent. Assuming a cat is fed one 400 grams tin daily for a year, they calculated a paw print of 0.84 ha/year for beef, 0.13 ha/year for all other livestock meats and 0.54 ha/year assuming fish meat.

Vale and Vale's (2009) results were published in numerous press articles (e.g. Alton 2009, Peeples 2009) and sparked an uproar among the media and from pet owners. The results of their study were later confirmed by John Barrett of the Stockholm Environment Institute (United Kingdom) in *New Scientist Magazine*. His calculations, based on his own data, found essentially the same (relatively high) EPP results, mainly due to the high carbon footprint of meat. Nevertheless, the accuracy of his and Vale &

Vale's calculations was criticized on different aspects: the overestimation of the number of calories a dog requires daily; calculations being based on data for human-made meat instead of meat by-products; and the omission of the footprints produced by processing the ingredients, the food manufacturing, the packaging, and transportation (Beynen 2015, Rastogi 2010, Ravilious 2009, Rushforth and Moreau 2013, William-Derry 2009). Moreover, Vale and Vale (2009) assumed that owners fed their companions exactly as recommended by the pet food industry; however, many households choose non-commercial diets, or complement their pets' diets with table leftovers.

Three studies were carried out in response to these criticisms. The first was conducted by Arizona State University, investigating the EPP for dry dog food. Authors used a hybrid Economic Input-Output LCA (life cycle assessment) to examine the supply chain and energy production associated with pet food manufacturing, within a particular factory (Rushforth and Moreau, 2013). The goal of this study was to respond to criticism of Vale and Vale's methodology. Using the protein content values for different livestock meats, they calculated the meat needed in order to match the protein levels required in a certain number of tons of pet food per year; then estimated land-use requirements, as well as the carbon and water footprint, for this quantity of meat. An interesting finding from Rushforth and Moreau (2013) is that using lean meat in dog-food was better – in terms of environmental impacts – than using offal, because its protein content more easily satisfies a dog's protein requirements. Additionally, they found dog-food manufacturing processes to have significantly high carbon footprints among all pet-food manufacturers. Along with careful selection of meat sources, they recommended alternative energy systems as possible methods to reduce the carbon footprint of industrially manufactured pet foods (Rushforth and Moreau 2013). In their results, they report a value of 1.06 hectares of land required for a pet food manufacturer to produce 1 ton of dog food, which is 11.72 m^2 per kilogram.

The second study was published by Wageningen Livestock Research (WUR) and focused on competition for food and space of cats, dogs and horses in the Netherlands. WUR's calculations were based on human-edible products, which might overestimate the EPP (Leenstra and Vellinga 2011) . However, the researchers did not include spillage or overfeeding, which usually compensates for these overestimations. Using data from relatively high crop yields of North Western Europe, Leenstra and Vellinga (2011) estimated a cat paw print of 0.1 hectares and a dog paw print of 0.2 hectares. They extrapolated these figures to pet ownership in the Netherlands and found that approximately 40% of all Dutch arable lands would be needed to produce the 82'000 hectares required for these pets' diets (Leenstra and Vellinga 2011).

The third study was conducted by the authors of this article and assessed the dietary EPP, as derived from the EF, and greenhouse gas (GHG) emissions of cats and dogs in China and Japan (Su and Martens 2018, Su et al. 2018b). Key determining factors

influencing these paw-prints included the average weight of cats and dogs in the sample, their diets (based on chicken and cereal) and daily quantities fed. The research assessed environmental impacts linked to pet ownership while improving further understanding of the nutritional requirements for cats and dogs, the pet food production and their impacts on the environment. The results of these studies showed that companion dogs (in particular large dogs) in China and Japan consumed more food resources than their actual needs, and therefore resulted in relatively high dietary EPP and huge GHG emissions. These findings indicate that overfeeding and food waste are a common phenomenon among companion animal (especially dog) owners in China and Japan.

In the present study, the method used to calculate the dietary EPP of average-sized companion dogs and cats in China, the Netherlands and Japan was also derived from the EF, often used to measure humanity's overall impact on nature, by analyzing six main categories of ecologically productive land areas: arable, grazing, forest, fishing, built-up and energy (Fu et al. 2015, Wackernagel and Rees 1998). Each of these six land-types has its own annual productivity and equivalence factor. In order to estimate and quantify the dietary EPP of companion animals regarding their commercial dry food, two materials of consumption (chicken and cereal) were identified as relevant in this study, and as a result, only the "arable" and "grazing" land categories are included (see section 7.3). In this research, we focus primarily on commercial dry food consumption, and the environmental impacts of average-sized companion dogs and cats. Individual and total companion dogs and cats' dietary EPP and GHG emissions in the Netherlands, together with the comparison of findings from China and Japan, were included in the present study.

7.3 Application of the ecological footprint (ecological paw print) analysis

The Ecological paw print (EPP) has been derived from the Ecological footprint (EF), which calculates the area of productive land needed to support the consumption of resources, and to dispose the waste that is generated, for a given population (Shanahan and Carlsson Kanyama 2005, Wackernagel and Rees 1998). EF is often used to measure humanity's overall impact on nature, by quantifying and analysing six main categories of ecologically productive areas including arable land, grazing land, forest land, fishing land, built-up land and energy land (Fu et al. 2015, Wackernagel and Rees 1998). Companion animals' dietary EPP was calculated based on per capita data of dog's and cat's consumption of commercial dry food. We presumed that the proteins and fats in this food were from Chicken, while the carbohydrates were from cereal (maize, wheat and rice). Therefore, only the arable and grazing land-types were considered in the present study.

The equation of per capita dietary EPP is as shown below (Du et al. 2006, Liu et al. 2017):

$$EPP_{dietary} = \sum_{i=1}^{n} r_i \times C_i / Y_i$$

Where,

i = the number of consumption items; r_i is equivalence factor; C_i = per capita consumption of item i (kg); Y_i = the annual average productivity in the world of item i (kg/ha).

To align the measurement units, the two land types should be converted using an equivalence factor (Table 1) (Liu et al. 2017, Wackernagel et al. 1999).

Table 1. The annual average productivity and equivalence factor of different land types

Items	Annual average productivity	Equivalence factor	Land type
Poultry	33	0.5	Grazing land
Cereal	2744	2.8	Arable land

We used the raw chicken and cereal in the calculation process, and the equations of the raw chicken and cereal are as shown below:

$$Chicken_{raw}\ (kg) = \frac{(protein_{commercial\ food} + fat_{commercial\ food})\% \times food\ consumption\ (kg)}{(protein_{raw\ chicken} + fat_{raw\ chicken})\%}$$

$$Cereal_{raw}(kg) = \frac{carbonhydrate_{commercial\ food}\% \times food\ consumption(kg)}{carbohydrate_{raw\ cereal}\%}$$

The average percentages of protein (17.33%) and fat (17.98%) in raw whole chicken and the percentage of carbohydrate (73.3%) in raw cereal were calculated according to the data from the Department of Agriculture, United States (USDA). We assume that the weights of protein and fat in raw chicken and the carbohydrates in raw cereal do not change during the process of industrial production (the conversion rate is one to one), which means that one unit of each item in raw chicken or cereal equate to one unit of commercial food.

Greenhouse gas (GHG) emissions

The greenhouse gas (GHG) emission is an indicator directly related to global warming and climate change (Francke and Castro 2013). In the present study, we mainly focused on companion dogs and cats' indirect GHG emissions from food consumption.

The per capita GHG emissions of companion animals are calculated as follows (Xu and Lan 2017):

$$\mathrm{GHG} = \sum I_i \times EF_i$$

Where,

i is the number of items of food inputs, I_i is the food inputs of item i (kg), EF_i is the GHG emission factor (kg CO_2/kg) (Table 2).

Table 2. Greenhouse gas emissions for the food commodities (Gerber et al. 2013, Nemecek et al. 2012)

Food category	GHG emissions (kg CO_2e/kg)
Poultry meat	5.40
Cereal	1.15
Maize	0.49
Wheat	0.58
Rice	2.38

Note: the GHG emission of cereal was the average score of maize, wheat and rice.

7.4 Three cases: China, Japan and the Netherlands

Basic information about the nutrients and calorie content of companion animals' commercial dry food in China, Japan and the Netherlands is presented in Table 3.

According to the data we collected from these three countries, we quantified individual and total companion dog and cat food consumption (Table 4).

The environmental impacts of companion dogs and cats in the Netherlands, Japan and China

We quantified companion dogs and cats' dietary EPP, GHG emissions and energy consumption according to their food consumption of commercial dry food in these three countries (i.e., the Netherlands, Japan and China). For China, the dietary EPP of companion dogs was calculated based on their consumption of leftover food and commercial dry food (chicken-based), which are the two most common pet food types

Table 3. Percentage of nutrients and calorie contents in commercial dry dog and cat food

	Dog			Cat		
	China	Japan	The Netherlands	China	Japan	The Netherlands
Protein (%)	25.21	25.67	24.70	29.15	26.00	33.18
Fat (%)	13.80	14.67	8.33	13.17	7.50	12.76
Ash (%)	9.23	8.00	6.25	8.39	8.00	7.70
Fiber (%)	3.72	3.83	2.33	4.66	6.25	3.58
Moisture (%)	10.44	10.00	13.44	8.75	10.00	10.12
Carbohydrate (%)	37.60	37.83	44.95	35.88	42.25	32.66
Calorie (kcal/kg)	3371.35	3533.3	3145.80	3395.50	3445.0	3389.00

Table 4. Companion animal numbers and their commercial dry food consumptions in three countries

	Dog			Cat		
	China	Japan	The Netherlands	China	Japan	The Netherlands
Per capita food consumption (kg/year)	48–243	19–123	61–247	20–34	18–31	20–33
Total numbers (million)	27.4	10.35	1.8	58.1	9.96	3.2
Total food consumption (million kg/ year)	1308–6656	194–1271	109–445	1168–1954	178–311	64–106

in China. Considering that companion cats are carnivores and not adapted to human food, the dietary EPP of companion cats was calculated only based on their consumption of commercial dry food (chicken-based). We did so because. companion dog and cat's main dietary source, leftovers from human food, has begun to be replaced by the better quality commercial pet food, which includes more animal products and contributes to more environmental impacts. These trends may aggravate the environmental impacts of food consumptions by companion animals and can increase the environmental burden of not only China but also the whole world. The dietary EPP of an average-sized dog in China was 0.82 to 4.19 ha. year^{-1}, while for a cat was 0.36 to 0.63 ha. year^{-1}. Given that China has a large companion dog and cat population; their total environmental impacts are undoubtedly significant. Specifically, if we assume that all companion dogs and cats eat commercial dry food in China, their dietary EPP is calculated to be between 43.4 and 151.4 million ha. year^{-1}, which is equivalent to the dietary EF of 72.3 to 252.3 million Chinese people in a year. GHG emissions from this dry-food consumption are

between 16.7 and 57.4 million tons per year. The dietary EPP of an average-sized dog in Japan was 0.33 to 2.19 ha. year^{-1}, while for a cat was 0.32 to 0.56 ha. year^{-1}. The dietary EPP of all companion dogs and cats in Japan lies between 6.6 and 28.3 million ha. year^{-1}, equivalent to the dietary EF of 4.62 to 19.79 million Japanese people. The GHG emissions from Japanese dog and cat food consumption were 2.52 to 10.70 million tons, which is equivalent to the GHG emissions resulting from the food consumption of between 1.17 and 4.95 million Japanese people. With regard to companion dogs and cats in the Netherlands, our results showed that the dietary EPP of an average-sized dog was 0.90 to 3.66 ha. year^{-1}, while for a cat, between 0.40 and 0.67 ha. year^{-1}. The dietary EPP of all companion dogs and cats in the Netherlands was 2.9 to 8.7 million ha. year^{-1}, which was equivalent to the whole EF of 0.50 to 1.51 million Dutch people. The GHG emissions from Dutch dog and cat food consumption was in the range of 1.09 to 3.28 million tons, which is equivalent to between 94 and 284 thousand Dutch peoples' GHG emissions regarding their total resource consumption.

Our results show that the dietary EPP of one companion dog relying on commercial dry food in the Netherlands or in China was around two times that of a dog relying on commercial dry food in Japan. Consequently, their GHG emissions and energy consumption were higher than their Japanese equivalents. China has the largest number of companion dogs among the three countries and the Netherlands has the least. Therefore, the dietary EPP, carbon emissions and energy consumption of all companion dogs in China were the largest, while these values in the Netherlands were the smallest (Table 5). With regard to cats, our results show that dietary EPP, GHG emissions and energy consumption per capita for companion cats are similar across the three countries. However, although per capita environmental impacts were similar, their total environmental impacts were quite

Table 5. The dietary ecological paw print (EPP) and greenhouse gas (GHG) emissions of companion dogs in the Netherlands, Japan and China

		EPP (ha)	GHG emission (ton)
Per capita average-sized dog	The Netherlands	0.90–3.66	0.349–1.424
	Japan	0.33–2.19	0.127–0.831
	China	0.82–4.19	0.313–1.592
Lifetime of one dog	The Netherlands	10.77–43.93	4.188–17.087
	Japan	4.01–26.28	1.522–9.972
	China	9.89–50.32	3.756–19.104
		(million ha)	(million ton)
Total dogs	The Netherlands	1.62–6.59	0.608–2.480
	Japan	3.40–22.70	1.312–8.596
	China	22.5–114.8	8.576–43.621

Note: An average-sized dog weights 10–20 kg.

different. The total companion cats in China, due to their greater numbers, consumed more resources and, to a large extent, contributed to greater environmental impact than companion cats in the Netherlands and Japan (Table 6).

Table 6. The dietary ecological paw print (EPP) and greenhouse gas (GHG) emissions of companion cats in the Netherlands, Japan and China

		EPP (ha)	GHG emission (ton)
Per capita average-sized cat	The Netherlands	0.40–0.67	0.150–0.251
	Japan	0.32–0.56	0.121–0.211
	China	0.36–0.63	0.141–0.237
Lifetime of one cat	The Netherlands	5.62–9.39	2.102–3.511
	Japan	4.46–7.80	1.693–2.959
	China	5.04–8.82	1.974–3.318
		(million ha)	(million ton)
Total cats	The Netherlands	1.28–2.14	0.480–0.803
	Japan	3.20–5.60	1.204–2.105
	China	20.90–36.60	8.192–13.770

Note: An average-sized cat weights 2–6 kg.

Additionally, we also found that many companion dogs in the Netherlands and China consumed more energy than their actual needs, while in all three countries the calorie intake of companion cats was sufficient to offset their energy requirements.

7.5 Reducing companion animals' dietary ecological paw print

The majority of studies in the literature which aim to analyse animal energy consumption and make policy recommendations often regard animal health as a key indicator (Bermingham et al. 2014, Bermingham et al. 2010, Fleeman and Owens 2007, Fowler et al. 2013, Linder and Freeman 2010, Nutrition 1971, Okin 2017). They generally confirm a positive correlation between energy consumption and an animal's health condition. These studies imply that animals consume a lot of energy (e.g. through meat consumption) and therefore more attention should be paid to reduce their energy intake and simultaneously safeguard their health and nutritional well-being (Collier et al. 1982, Mullis et al. 2015). The present study establishes a clear relationship between companion animal food consumption and environmental impacts by reviewing the data from three countries. It highlights a neglected predictor of environmental damage and develops a novel approach towards not only the relationship between a companion's energy intake and health condition but also the relationship between their food consumption and environmentally sustainable development.

However, in contrast to human diets, pet food products present a limited set of options, especially if companion animal owners' choices are limited to the pre-determined blends of ingredients used by manufacturers (Rushforth and Moreau 2013). Reducing the dietary EPP of companion animals becomes highly dependent on selecting which recipes and ingredients require less land, produce the least emissions and provide sufficient nutrients (Rushforth and Moreau 2013). This requires pet food industries to take responsibility for producing more sustainable pet food through product design and manufacturing processes (e.g., production facilities running on renewable energy or green supply chains) (Beynen 2015, Rushforth and Moreau 2013, Swanson et al. 2013). Moreover, increasing the bioavailability and digestibility of pet foods may also help to reduce food waste (Swanson et al. 2013).

Previous research has demonstrated that the protein content in animal-based products is around 11 times higher than that of plant-based products, meaning that pet food manufacturers can reach required protein content levels more efficiently if they use more animal products in pet food production (Swanson et al. 2013). However, the proteins found in meat also have a higher environmental impact than those found in plants and cereals (Swanson et al. 2013). Consuming fewer animal proteins or replacing them with plant-based proteins would thereby lower GHG emissions (Westhoek et al. 2011). Therefore, the first and most evident solution for dramatically reducing companion animals' dietary EPP is to adopt vegetarian or vegan diets. This alternative diet has generated an on-going and divisive debate, as it may not be the best possible path for maintaining an animal's health (or impossible given certain dietary needs – e.g. cats, that are obligate carnivores) while significantly reducing its dietary EPP. However, alternative diets do not have to mean a complete abstention from meat. The choice of the sources of protein offers a large potential for reductions depending on the selection of high or low impact meat (Nijdam et al. 2012). By preferring poultry or fish sources over beef, for instance, desirable protein quality and content can be achieved while lowering both the EPP and GHG emissions (Schwartz 2014, Vale and Vale 2009).

It has been shown that the prevalence of companion animal obesity increases in line with human obesity (German 2006, Morrison et al. 2014). Most large companion dogs in China, Japan and the Netherlands consume more energy than their actual needs to maintain normal activity, suggesting that overfeeding and food waste is commonplace among their owners. Maintaining ideal body weight and avoiding overfeeding nutrients in excess could diminish food waste and reduce dietary EPP and GHG emissions (Schwartz 2014, Swanson et al. 2013). Besides veterinarians, the pet food industry and relevant retailers could try to promote awareness of this salient fact by providing informative labelling. Improving the uniformity of food labels, and providing insight to customers as to the meaning of indications on labels, is strongly emphasized and could improve owners' knowledge on how to feed their animals (PBL 2013). Owners could be

encouraged to check labelling claims of nutritional adequacy, and to ask manufacturers what evidence they can provide in order to ensure nutritional soundness and consistency of their animals' diets (Knight and Leitsberger 2016). Aside from consumers choice, the selection of more sustainable suppliers for ingredient composition and selection may also increase pet food sustainability; for example, by opting for foods from crops using fewer fertilizers (Beynen 2015, Swanson et al. 2013).

Another option, raised by Rastogi (2010), is to recycle companion animal owners' (human) food that would otherwise be wasted, by processing it into pet food (providing it would entail the correct balance of nutrients). Broader efforts for reducing daily emissions, for instance by cycling to work, may also constitute a personal trade-off for pet owners, to balance their EF against the EPP of their companion animals (Rastogi 2010), although this may seem rather 'artifical'. Schwartz (2014) cites other simple solutions for reducing the environmental impacts of companion animals besides their diets. For example, disposing of a dog's excrement responsibly while in public could prevent animal waste from polluting water sources. Vale and Vale (2009) noted that pet food packaging is not such a significant issue for a pet's EPP as compared to their main recommendations: sharing a communal pet instead of owing an individual pet, adopting edible pets such as egg-laying hens, or simply owning smaller dogs and cats in general. All the solutions and strategies proposed by others and in this present study, some of them being more realistic than others, reaffirm the importance of the environmental impacts of pet food and any other resource consumption by companion animals.

7.6 Further consideration

Research shows that people with a pet are in general healthier than non-pet owners. Pets also increase the capacity for empathy and social contacts among children (which are useful characteristics for a healthy and happy life). Furthermore, people who are heavily involved in animal welfare appear to have more compassion for the problems of people (Amiot et al. 2016). However, on the other side, the negative environmental impacts of food consumption by companion animals are expected to grow worldwide in the near future (Okin 2017). Besides food, companion animals also need water, entertainment, healthcare, living space and many other resources and services, all of which dramatically affect their environmental impact. Therefore, a broader quantification of all companion animal resource consumptions (e.g., water footprint, health footprint) and waste production (e.g. faeces) should be considered in future studies. Furthermore, the environmental impact of other animal groups, such as farm animals, wild animals, zoo animals, working animals and laboratory animals are also interesting areas for further research. The present study was conducted according to data from the

Netherlands, China and Japan; further studies into the environmental impacts of other animal groups from global or cross-cultural perspectives also deserve more attention.

Animal products have greater environmental impact than plant-based products, and some researchers have quantified the different carbon/GHG emissions of meat and cereal. Therefore, quantifying the different impacts of animal and plant-based products consumed by companion animals in different countries should also be considered. Besides commercial dry food, companion animal owners feed their animals with canned food, home-made food and pure meat. Hence, another interesting avenue for further research would be to quantify companion animals dietary EPP regarding their exact daily food consumption. As Rushforth and Moreau (2013) suggest, further research might also explore comparisons of the contributions of pet ownership to various activities associated with society (e.g. dogs vs. cats).

Although animal companionship can benefit physiological, psychological as well as social aspects of the quality of human life, further knowledge building and awareness-raising is needed to enable cat and dog owners to acknowledge the environmental costs of owning pets. Providing a broader perspective, Swanson et al. (2013) argue that ensuring sustainable pet ownership includes meeting the current as well as future needs of pets in providing their appropriate nutrition. Consequently, assessing whether and how the pet food system as a whole can sustainably support the health and nutrition of the growing population of companion animals is of also significant importance in the near future (Swanson et al. 2013).

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FOR

Chapter 8

Determinants of animal protection policy. A cross-country empirical study

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Abstract

This Chapter aims to identify determinants of animal protection policies. Based on a review of relevant literature and borrowing concepts from environmental policy research, we suggest three broad factors to be positively related with stricter animal protection policies: economic development, democracy, and civil society. To test the influences of these factors, we estimate an ordered logistic regression model to explain policy variations between 48 countries. As dependent variable we use the Animal Protection Index, a country ranking based on policy strictness. As independent variables we use GDP per capita, Polity Score, Civic Activism Index, and number of animal protection organizations. Results suggest that countries with stronger democratic institutions and more civil society groups focused on animal protection are likely to have stricter animal protection policies. For economic development and broad civil society strength we do not find significant effects. Our analysis broadens the basis for future research of more detailed policy determinants and cross-country differences in animal protection.

Keywords

Animal protection, policy determinants, civil society, animal protection index

8.1 Introduction

Humans use animals for a wide variety of purposes, including food production, scientific experiments, companionship, and entertainment. The vast majority of those domesticated animals live on farms. In 2010, about 33 billion mammals and birds were used in the agricultural sector world-wide (FAO, 2013). There is no reliable estimate for fish used in aquaculture. It is estimated that at least 115 million animals are used annually for research purposes (Taylor, Gordon, Langley, & Higgins, 2008). An unaccounted-for number of animals are directly dependent on humans in private homes, zoos, and circuses. In addition, wild animals in natural habitats are profoundly influenced by human activities, like hunting or habitat destruction through land use change and pollution.

Concerns for animal well-being are partially grounded in an acknowledgement that animals of some species are sentient and even have higher cognitive capacity similar to humans. In the past decades that acknowledgement has been substantiated by evidence from multiple scientific disciplines such as zoology, psychology, and neuroscience (Jones, 2013). The precise demarcation line for various complex cognitive capacities is a matter of ongoing scientific debate, but it is widely recognized that all mammals and birds have the capacity to feel pain, fear, and distress. Today, often all vertebrate species, including amphibians and reptiles, are considered to be sentient (Proctor, 2012). A smaller number of animal species are considered to possess higher cognitive capacities like self-awareness. For example, common chimpanzees are able to recognize themselves in a mirror (Gallup, 1970), an ability most animal species seem to lack. Animal sentience has played a crucial role in different arguments in favor of better treatment of animals for their own sake, most prominently by Singer (1975) and Regan (1983). Without revisiting the arguments made in these and subsequent works, their common basis is the acknowledgement that many animals are sentient beings, and that they ought to be included in ethical and political considerations by virtue of being able to feel pain and discomfort.

Animal suffering has been linked to harm for humans. Intensive animal farming practices, such as high dosage of hormones and antibiotics used for beef production and agrochemicals used in feed production, have been found to pose a threat to human health (Chemnitz & Becheva, 2014). Animal agriculture also causes environmental degradation: for instance, emissions of methane and ammonia from livestock production contribute to global climate change (Gill, Smith, & Wilkinson, 2010).

Whether animal well-being is increased for human benefits or for the sake of animals themselves, several countries around the world have adopted policies to protect animals. Animal protection can be an issue for multiple policy sectors and thus be treated by different governmental departments, e.g. farm animals and fish fall within agriculture

and fishery policy, wild animals within environmental policy, and animals used for scientific experiments within research policy.

Modern animal protection policies have emerged with the establishment of anti-cruelty laws in the UK during the first half of the 19th century. Since then, legislation to protect animals has been enacted in most countries in Europe and North America, and some countries in other parts of the world. However, animal protection policies vary both with regard to their strictness, and the number of animals they cover. Policies range from anti-cruelty statutes, to banning of specific husbandry methods, and standards of conduct for breeding, husbandry, and slaughter.

Since the second half of the 20th century, animal protection rules have been included in international agreements, such as the World Organization for Animal Health (OIE), which is recognized as a reference organization of the World Trade Organization (WTO) and had 180 member states in 2014. In Europe, binding animal protection rules for certain farm animals have been enacted both by the Council of Europe and the European Union. Despite efforts to establish international rules for animal protection, considerable differences across countries and world regions remain.

8.2 Determinants of animal protection policy

In the context of animal protection, factors suggested to influence policy are mostly supported by anecdotal evidence. Few studies have attempted to systematically explore such determining factors. In this section, we briefly review those factors.

Economic development. There has been some research done to explain variations between countries' level of animal well-being by economic differences (Frank, 2008; Lombardini, Kosenius, Kulmala, & Lindroos, 2011). These studies attempt to explain differences in animal well-being, or welfare, not animal protection policies. Many of these studies draw from theoretical concepts about the relationship between environmental performance and economic growth, most notably the concept of the Kuznets Curve (Kuznets, 1955).

Kuznets (1955) first proposed an inverse U-shaped curve to describe the relationship between economic development and income inequality. His suggestion was that in a country's early stages of development, income inequality increases with economic growth until a tipping point is reached, after which further growth is accompanied by decreasing inequality.

The same relationship has been suggested to exist between economic growth and environmental performance (Yandle et al., 2004). The Environmental Kuznets Curve (EKC) represents an inverse U-shaped relationship between environmental degradation and economic growth (see Figure 1): Economic growth in early development stages

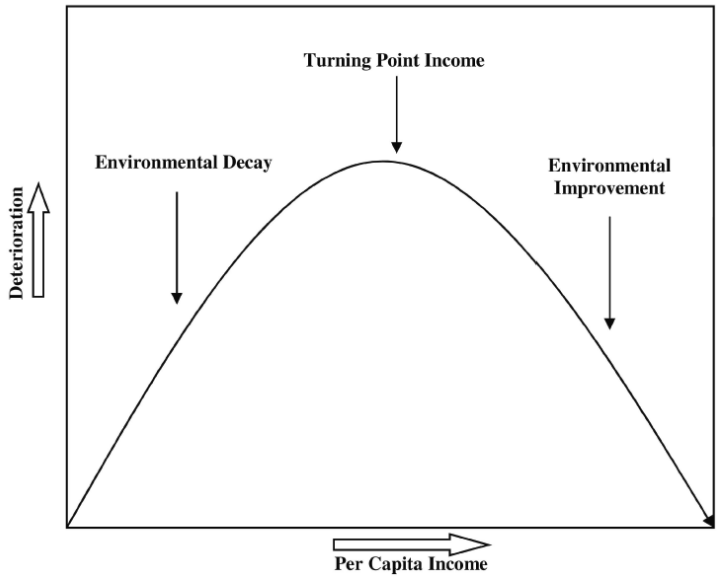


Figure 1. Environmental Kuznets Curve, stylized (Yandle, Bhattarai, & Vijayaraghavan, 2004).

leads to higher levels of environmental degradation until it reaches a peak, after which environmental degradation decreases.

Since the early 1990s there have been a large number of empirical studies testing if the EKC hypothesis holds in reality, with mixed results largely depending on what precise indicator is chosen for environmental degradation. For a review and critical analysis of the EKC literature see Caviglia-Harris, Chambers, and Kahn (2009) and Stern (2004).

Drawing on this research on the EKC, Frank (2008) explores the existence of an Animal Welfare Kuznets Curve (AWKC). To keep in line with Kuznets' original negative formulation – inequality instead of equality – the inverse U-shaped relationship hypothesized by the AWKC is between economic growth and animal harm. Initial economic growth would increase animal harm until a point is reached after which animal harm levels decrease.

To test the AWKC, Frank (2008) looks at various indicators for animal well-being, but most of them reflect the numbers of animals used for purposes harmful to animals, such as meat production or laboratory research. Frank (2008) concludes that his empirical findings regarding the existence of an AWKC are mixed, with evidence for its existence being strongest for companion animals. However, only data from the US is used to test the AWKC for companion animals. Frank (2008) states that if public concern is the major driver for decreasing animal harm, then the observed decrease in harm levels of companion animals compared to other animals could be explained by stronger public

concern for them, maybe due to the emotional bond between companion animals and their owners. He did not find similarly decreasing levels of harm for farm animals.

Lombardini et al. (2011), aiming to test the AWKC for farm animals in Finland, come to a similar conclusion. They did not find a decrease or absolute maximum in the annual number of farm animals slaughtered from 1975 to 2008, a period during which Finland's GDP per capita roughly doubled.

Morris (2013) acknowledges the mixed evidence for the AWKC found by Frank (2008) and the mixed results for the EKC. Drawing on research on animal well-being in New Zealand and research linking human social welfare and environmental protection to greater income equality, Morris (2013) explores if a similar link exists for animal well-being and income equality. Correlating different indicators for animal well-being and income equality, he finds a positive relationship between animal well-being and income equality. Morris (2013) acknowledges that his finding could plausibly be reflecting that societies that promote income distribution may also generally be fairer societies that also promote better treatment of animals.

In the same study, Morris (2013) also considers differences in animal protection policies across 22 high-income countries. As an indicator of animal protection policy strictness, countries are scored points based on existing bans or phase-outs of certain husbandry and production practices considered particularly harmful to animals. This protective regulation score was found to be positively correlated to higher equality levels, indicated by lower Gini coefficients. However, with more comprehensive scoring of state-level legislation in the US, this relationship between protective regulation and income equality could not be found.

Democracy. We suggest democracy as a second factor influencing animal protection policies. We hypothesize that more democratic countries have stricter policies to protect animals. While there are no notable studies on the effect of democracy on animal protection, the relationship between democracy and environmental protection has been subject of several studies.

In their analysis of the effects that different levels of democracy have on environmental degradation, Li and Reuveny (2006) find a consistent effect: Higher levels of democracy lead to less environmental degradation, even when controlling for several variables that have been suggested to also influence environmental performance, such as income per capita and population density. Fiorino (2011) reviews the political science literature on the relationship between environmental performance and democracy, stating:

> *It does seem reasonable to conclude that – broadly speaking – democracies are more capable of responding to environmental issues and managing them effectively than autocratic regimes. […] To the extent that they promote political*

> *stability, responsive institutions, the rule of law, and other aspects of strong governance, democracies may be in a better position to deliver environmental quality to their citizens.* (Fiorino, 2011, p. 377)

Frank (2008) suggests that public concern for animals is linked to the activity of animal protection organizations which in turn influences policy. He suggests that public concern for both animals and the environment is driven by altruistic attitudes. More specifically, if animals are seen as part of the natural environment, concern for their well-being might increase when concern for the natural environment increases. Reviewing multiple surveys of altruistic values and attitudes towards the environment, Dietz, Fitzgerald, and Shwom (2005) find that people with strong concern for non-human animals also have a strong concern for the natural environment. Following Fiorino (2011) in his assessment of the association between regime-type and environmental protection policy, we similarly expect that democratic countries have stronger animal protection policies, because they tend to offer better opportunities for political mobilization, are more responsive to their citizens, and exhibit stronger rule of law.

Civil society and animal protection organizations. Rowen and Bosen (2005) track changes in animal protection rules in US federal and state level legislation between 1950 and 2003 and link them to the evolution of the animal protection movement. They note that US non-governmental animal protection organizations, as part of the broader social movement, have invested considerable resources into lobbying for changes in legislation toward animal protection. Increased frequency of state referendums initiated by animal protection organizations is attributed to growing political influence and media exposure of the animal protection movement. Fraser (2008) makes a similar observation for protection of farm animals, noting that animal protection organizations have played a key role in drawing public attention, encouraging reform, and funding research and action on the issue. Fraser further suggests that differences in animal protection policy strictness between industrial and developing countries could be the result of the latter lacking a well-developed animal protection movement (Fraser, 2008).

In the context of classifying differences in animal protection policies across countries, Irwin (2003) notes that in industrial and developing countries different issues are dominating in civil society. Whereas in industrial countries issues concerning companion animals drive the activity of many animal protection organizations, in developing countries wildlife and farm animal issues are more salient.

One study comparing animal protection legislation in Latin America, Asia, and Africa concludes that while increased presence of animal protection organizations in those regions can help to raise issue awareness, socio-economic and cultural factors also play a major role in introducing and enforcing animal protection legislation (Trent, Edwards, Felt, & O'Meara, 2005).

It should be noted that of the five studies analyzing animal protection legislation and civil society influence referenced above, all authors are affiliated with the Humane Society International or the Humane Society of the United States, one of the largest animal protection organizations, and their studies are published by the Human Society Press. This is not to say that their findings are not credible. Rather, it is indicative of how little research has been done on these issues at universities and independent research institutes.

8.3 Methods

As we have seen, academic research on factors influencing animal protection policies falls roughly in two categories. One explores the linkage between economic development, animal well-being, and animal protection. The other explores the influence of civil society, and more specifically animal protection organizations, on animal protection legislation.

While the results of studies on the relationship between economic development, animal well-being (Frank, 2008; Lombardini et al., 2011), and animal protection policy (Morris, 2013) seem mixed, we assume an overall positive relationship between economic development and animal protection policy to be tested in our subsequent analysis. Thus, our first hypothesis:

H1: Countries with higher levels of economic development have stronger animal protection policies in place.

Following Fiorino (2011) in his assessment of regime-type influencing environmental protection policy, we expect similarly that democratic countries have stronger animal protection policies, because they tend to offer better opportunities for political mobilization, are more responsive to their citizens, and exhibit stronger rule of law. This leads us to our second hypothesis:

H2: Countries with higher levels of democracy have stronger animal protection policies in place.

With regard to the role of civil society and NGOs, research on animal protection policy (Fraser, 2008; Rowan & Rosen, 2005; Trent et al., 2005) suggests that increased civil society strength and NGO involvement lead to stricter policy outputs. This leads us to our third hypothesis:

H3: Countries with stronger civil society have stronger animal protection policies in place.

We hypothesize that all three factors together – economic development, level of democracy, civil society – determine a country's animal protection policy to a large

degree. Table 1 gives an overview on the data used for our statistical analysis, which will be explained below.

Table 1. Details of data used

Variables	Data type	Explanation	Source
API	Ordinal	Animal Protection Index, reflecting the extent to which countries' policies protect animals	WAP (2014)
GDP	Continuous	GDP per capita, 2013 PPP in 1,000 USD	IMF (2014)
PLT	Ordinal	Polity Score, composite index of countries' democratic and autocratic institutional characteristics	Marshall and Jaggers (2014)
CIV	Ordinal	Civic Activism Index, based on countries' civil society characteristics and surveys of public political participation	ISD (2013)
APO	Continuous	Animal protection organizations per 10,000 km^2	WorldAnimalNet (2015)

8.3.1 Animal Protection Index

For our dependent variable we use the Animal Protection Index (API), published for the first time in 2014 by World Animal Protection, a civil society group (WAP, 2014). API is a composite index aiming to reflect to what extent a country's policies and legislation offer protection for animals and improve their welfare. Countries are qualitatively assessed by experts based on fifteen indicators grouped into five themes. Countries are scored for each indicator and overall within seven bands from A to G, with A representing the highest and G the lowest level of protection.

Both the presence of specific animal protection policies and legislation as well as the structure of enforcement mechanisms are assessed. Also included are barriers toward effective animal protection such as cultural customs regarding animals, and regulatory traditions. As such, API reflects countries' policies, regulations, and customs with regard to animal protection. API does not reflect what the actual outcomes with regard to animal well-being of those policies are. This is appropriate for our goal to investigate the determinants of policy, since outcome may be influenced by factors that are not connected to policy making. Furthermore, using outcomes as proxy for policy neglects potential time lags between a policy action and its impact.

The API covers 50 countries (see Figure 2). Countries are selected from the largest producers of meat, eggs, and dairy products. Possibly, this is done to account for countries where the largest numbers of animals are used by humans, indicating relevance

for animal protection. However, this criterion is likely to disproportionately exclude least developed countries and countries with small populations where animals-based production volumes are low.



Figure 2. Countries covered by the Animal Protection Index.

8.3.2 GDP per capita

As a measure of economic development we use GDP per capita based on purchasing power parity (PPP) in 2013 from the International Monetary Fund (IMF, 2014). GDP per capita captures the monetary value of all goods produced and services provided in a country divided by its population. A scatter plot between GDP per capita and API is shown in Figure 3. The first visual impression is in line with a positive relationship between the two variables.

However, there are considerable shortcomings of GDP as a measure of economic development. For one, GDP measures all economic output equally, irrespective of the purpose, quality of the goods produced, or services provided. GDP counts any monetized activity, even activity that is destructive to public health, like cigarettes, or to the environment, like clearing rainforest. Also, GDP does not take non-monetized economic activity into account, such as volunteer services or family child-care. And of course GDP does not give any indication of economic inequality or the composition of an economy.

But while there are considerable shortcomings with GDP as a measure of economic performance, let alone of social well-being, it is still useful. For all practical purposes, GDP data is available for nearly every country and its measurement method is relatively consistent. Additionally, its narrow scope can actually be beneficial if researchers want to disentangle effects of different economic factors.

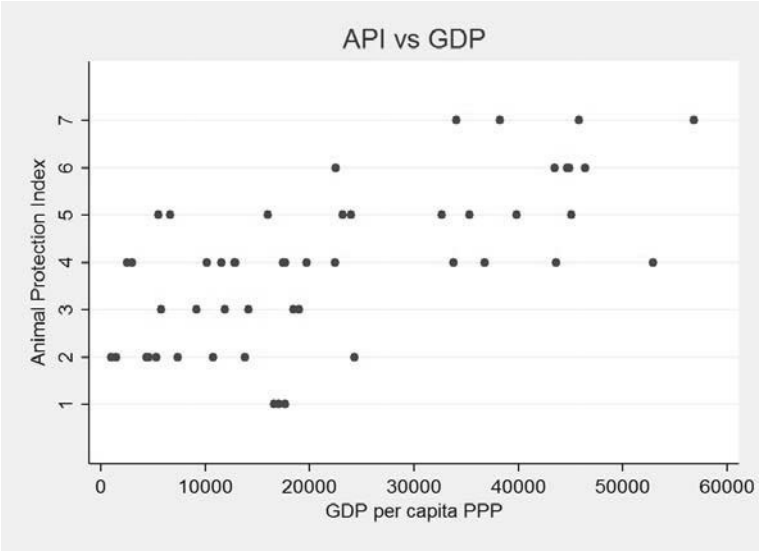


Figure 3. Scatter plot of GDP per capita and Animal Protection Index.

8.3.3 Polity Score

As a measure of regime type we use the Polity Score from the Polity IV Project (Marshall & Jaggers, 2014). It ranges from -10 (full autocracy) to +10 (full democracy). The Polity Score is based on expert judgments about countries' levels of institutionalized autocracy and democracy. Criteria for the scoring include competitiveness of political participation, selection of the political executive, and constraints to executive authority. We should note that each country is initially separately scored for autocratic and democratic characteristics and given both an Autocracy Score and Democracy Score each between 0 and 10. The combined Polity Score is calculated by subtracting the Autocracy Score from the Democracy Score, thus gaining a single value between -10 and 10. This means that the same Polity Score can be reached by different combinations of autocratic and democratic characteristics.

Our selected group of countries leans heavily towards the democratic side of the spectrum (see Figure 4). Thirty-three countries are mostly democratic, defined by some authors (Fearon & Laitin, 2003; Li & Reuveny, 2006) as having a Polity Score of six or above. In contrast, only five of our countries are mostly autocratic, defined as having a Polity Score of -6 or below. The median score is 9. However, the distribution of the full Polity Score dataset, which covers 166 countries, is also skewed towards the democratic end of the spectrum, although, with a median score of 7, less so than our group of countries.

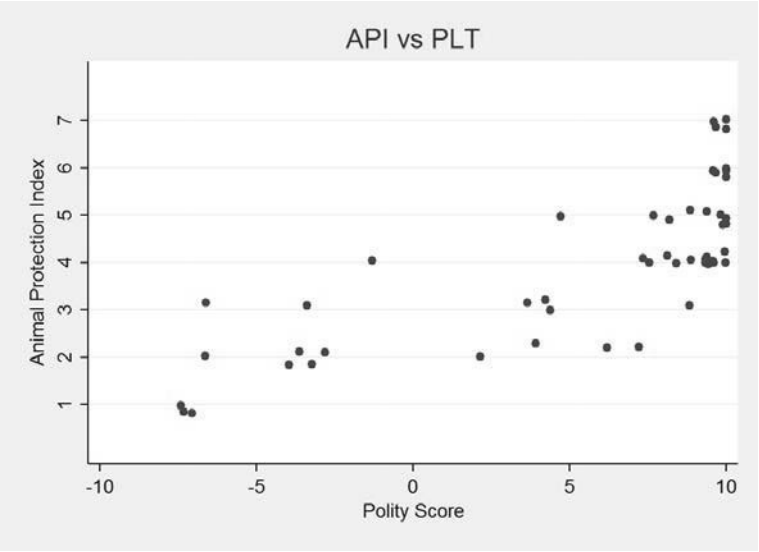


Figure 4. Scatter plot of Polity Score and Animal Protection Index. Points are slightly displaced to reveal clusters.

8.3.4 Civic Activism Index

To reflect how active and engaged civil society is on a broad level, we use the Civic Activism Index from the Indices of Social Development Database (ISD, 2013). This composite index combines measures of size and activity of the NGO sector with survey results about coverage and use of news media, and reported willingness to participate in different forms of political protest (e.g. demonstrations, petitions). The composite index is scaled between 0 and 1. Figure 5 shows a scatter plot of the Civil Activism Index and API. For convenience, we multiply each value of the Civil Activism index by 100. When discussing our analysis results in the next section, this will make the interpretations of the results more intuitive.

8.3.5 Animal protection organizations per area

While the Civic Activism Index is useful as a broad indication of civil society activity, it does not distinguish between different policy sectors. A country may have a vibrant civil society overall, but next to no civic engagement on the topic of animal protection.

To account for more narrow civil society with regard to animal protection we use the number of animal protection organizations as registered in the WorldAnimalNet Directory (WorldAnimalNet, 2015). The directory lists offices of animal protection organizations by country. Any NGO can be included as long as its work is directly related to animal protection. Over 17,000 organizations in over 130 countries are listed.

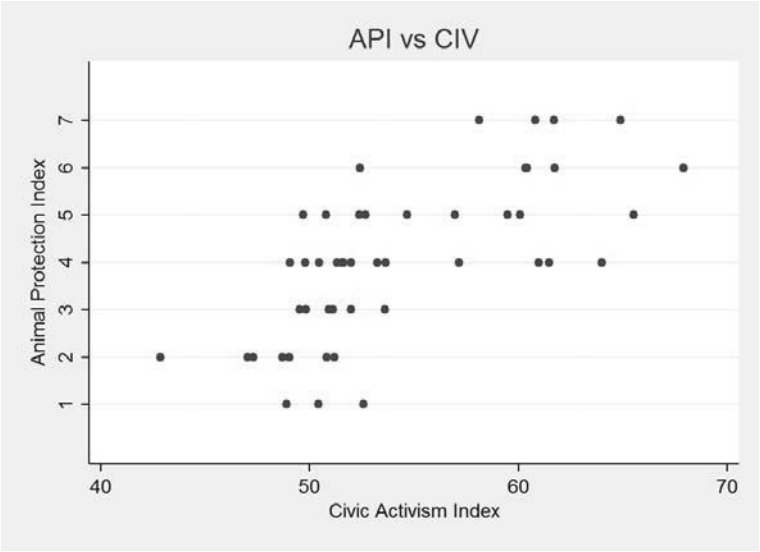


Figure 5. Scatter plot of Civic Activism Index and Animal Protection Index.

However, comparing the total numbers across countries can be problematic due to the counting method. Initially, the directory was created to provide a resource for activists and citizens to look up where the nearest animal protection organization is located. For that purpose, different office locations of the same organization are counted separately and figure into the total numbers per country. This poses a challenge for comparing the numbers across countries. For one, in countries with a larger geographic area, like Canada or Australia, organizations are more likely to have more office locations, everything else being equal. For organizations providing animal shelters, for example, it is plausible that they may maintain multiple locations in order to provide their services in different cities and regions. To account for differences between country areas we use the number of animal protection organizations per country area.

A scatter plot (Figure 6a) of API and animal protection organization (APOs) per 10,000 km^2 shows that in a few countries there are many more organizations per area than in most others in our group of countries. The Netherlands (86) have by far the most organizations per 10,000 km^2. UK (37), Germany (35), and Switzerland (31) follow. The initial visual impression suggests a non-linear relationship, possibly better described with a logarithmic function. However, this impression could be caused by the few countries with high APO per area count. But even when neglecting the large APOs per area values and zooming into the lower values, the visual impression does not change fundamentally (see Figure 6b).

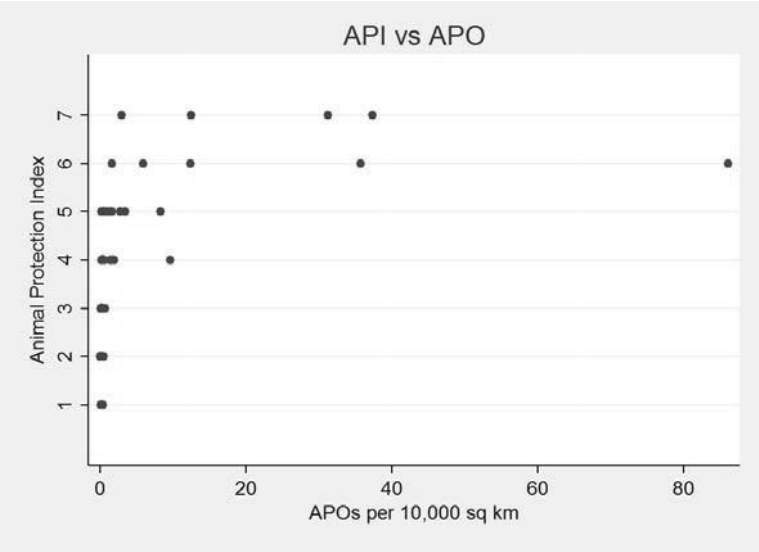


Figure 6a. Scatter plot of APOs per 10,000 km² and Animal Protection Index.

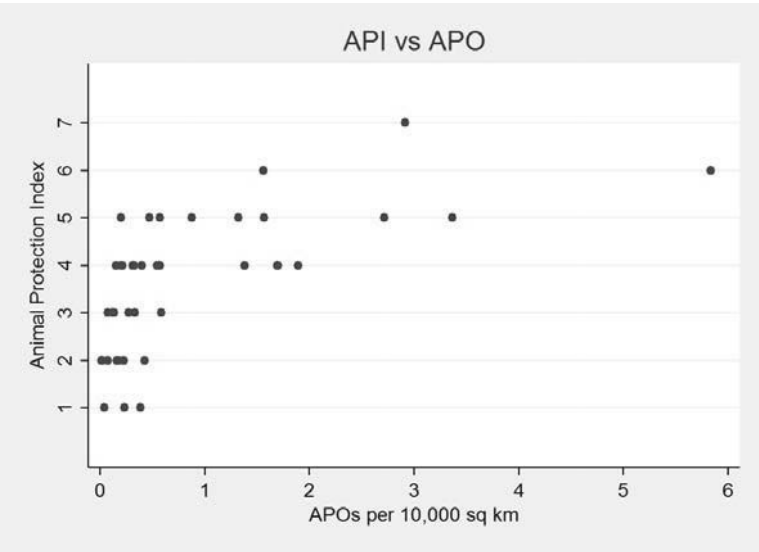


Figure 6b. Scatter plot of APOs per 10,000 km² and Animal Protection Index (x-axis interval 0–6).

Conceptually, this relationship could reflect a diminishing marginal impact animal protection organizations have on policy outputs. It seems plausible that in a country with very low APO activity, an additional organization can have a strong impact on policy, e.g. by increasing awareness about the issue of animal protection among largely oblivious officials and the public. In contrast, in a country with already high APO

activity, an additional organization conceivably has much less of an impact since issue salience is high to begin with. For our analysis in the next section, we will log-transform the number of animal protection organizations per area to the base of two and call it *lbAPO*: $lbAPO = log_2(APO)$

Figure 7 shows a scatter plot of API and lbAPO. We will see that choosing the binary logarithm will make the interpretation of our statistical results more intuitive.

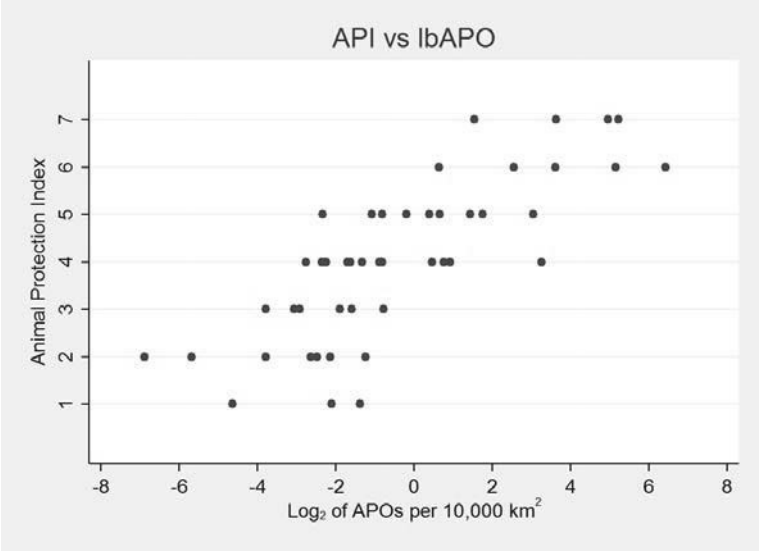


Figure 7. Scatter plot of the binary logarithm of animal protection organisations per area and Animal Protection Index.

In two countries from our sample, Myanmar and Niger, there are no APOs registered. When log-transforming the number of APOs per area, both countries are subsequently excluded from our analysis because one cannot log-transform a zero value. For the remaining 48 countries, summary statistics for all variables are shown in Table 2. To sum up, our data set contains cross-sectional data for 48 countries (Table 2). Our dependent variable API is ordinal, consisting of seven categories (A, B, C, D, E, F, G) which have a natural ordering from highest (A) to lowest (G) level of protection.

Because our dependent variable API is ordinal, with potentially uneven distances between categories, we cannot use linear regression models, like Ordinary Least Squares, which require the dependent variable to be continuous and unbound. Instead, we use ordered logistic regression to estimate the effect of our independent variables on our dependent variable (Agresti, 1996; Long, 1997).

Table 2. Descriptive statistics of variables

Variable	*N*	Mean	Median	*SD*	Min	Max
API	48	4.04	4	1.64	1	7
GDP (per capita, in 1,000 USD)	48	22.9	18.1	15.3	1.5	56.8
PLT	48	5.6	9	5.9	-7	10
CIV	48	54.3	52.2	5.7	42.8	67.9
lbAPO ($\log_2$ of APOs/10,000 km^2)	48	-0.39	-0.87	2.98	-6.90	6.43

Ordered logistic regression (also called ordinal logit regression) is similar to binary logistic regression. The latter allows for a dependent variable with only two categories.

In linear regression models, dependent and independent variables are linked by a linear function. In logistic regression models, this link function is called *logit*. If the dependent variable is binary, e.g. has only two categories 0 and 1, the logit can be interpreted as the natural logarithm of the odds of being in category 1 compared to category 0. The odds are the proportion between the probability for being in category 1 (p) and the probability for being in category 0 ($1\text{-}p$). For each combination of values of independent variables there is a certain probability of falling into one of the two categories.

$$logit(p) = \ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \cdots + \beta_i x_i$$

In logistic regression models, regression coefficients represent the effect a one-unit increase of the independent variable has on the logarithmic odds of being in category 1, holding all other variables constant. The effect on the odds can be expressed as an odds ratio, i.e. the ratio of the odds after and before the one-unit increase. If an odds ratio is larger than one, a one-unit increase in the independent variable increases the odds of falling into category 1. If an odds ratio is exactly one, the odds do not change. If an odds ratio is smaller than one, a one-unit increase in the independent variable decreases the odds of falling into category 1.

Ordered logistic regression models are based on the principles of binary logistic regression. This allows for a dependent variable with multiple categories which have a meaningful order, like the API. Odds are calculated based on cumulative probabilities for each category. With multiple response categories, a regression coefficient of an independent variable represents the effect of a one-unit increase on the odds of falling into or above a higher response category. For our model, we assume proportional odds, i.e. that the effect of the independent variable change on the odds is constant across response categories.

8.4 Results

We run an ordered logistic regression with API as dependent variable, and GDP, PLT, CIV, and lbAPO as independent variables, and later reduce the model stepwise. We call this configuration of variables our *base model*. Table 3 shows these results. Here, we report both the regression coefficients β and the odds ratios. In subsequent tables we will only refer to odds ratios. Recall that for a one-unit increase in the independent variable, the relation between β and odds ratio is:

$$Oddsratio = \exp(\beta)$$

Table 3. Results from ordered logistic regression with API as dependent variable, base model

	Base model	
	β	Odds Ratio
GDP (Gross Domestic Product)	-0.052 (0.055)	0.95 (0.05)
PLT (Polity Score)	0.367*** (0.096)	1.44*** (0.14)
CIV (Civic Activism Index)	0.151 (0.149)	1.16 (0.17)
lbAPO (Animal protection organizations)	0.645*** (0.169)	1.91*** (0.32)
LR chi-square	69.23***	
ρ^2	0.39	
N	48	

Standard errors in parenthesis.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ (two-tailed).
Likelihood ratio chi-square test with 4 degrees of freedom.
McFadden's ρ^2 (pseudo R^2).

Of our four independent variables, only the estimated coefficients of PLT and lbAPO are significant at the 1% level. Estimated coefficients of GDP and CIV are not significant at any common significance level.

The likelihood ratio chi-square test statistic is significant at the 1% level, indicating that at least one coefficient of our independent variables is different from zero. McFadden's ρ^2 is an indicator of the model's predictive power, intended to mimic the R^2 goodness-of-fit measure from linear regression models, which is why it is sometimes called pseudo R^2 (McFadden, 1973). It compares the predictive power of the current model over a model without any independent variable (constant-only model). However, the utility of ρ^2 is contested, especially with regard to its absolute value. A value between 0.2 and 0.4 is considered to indicate a good model fit (Louviere, Hensher, & Swait, 2000). In the following, we will use ρ^2 primarily to compare predictive powers between different nested models.

In our base model only two out of four independent variables show significant estimated odds ratios. Table 4 shows results from our base model compared to three other models, in which GDP and CIV are excluded stepwise in turn.

Table 4. Results from ordered logistic regression with API as dependent variable

	Base model	Model_2	Model_3	Slim model
GDP	0.95 (0.05)	1.00 (0.03)		
PLT	1.44*** (0.14)	1.45*** (0.14)	1.42*** (0.13)	1.44*** (0.13)
CIV	1.16 (0.17)		1.03 (0.08)	
lbAPO	1.91*** (0.32)	1.94*** (0.33)	1.87*** (0.31)	1.92*** (0.29)
LR chi-square	69.23***	68.19***	68.34***	68.17***
ρ^2	0.39	0.39	0.39	0.39
N	48	48	48	48

Odds ratios are shown for independent variables.
Standard errors in parenthesis.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

In none of the four nested models are the estimated odds ratios of GDP or CIV significant at the 10% level. In contrast, estimated odds ratios of both PLT and lbAPO are significant at the 1% level in all models. Both the likelihood ratio chi-square test and McFadden's ρ^2 barely vary across all four models. When excluding both GDP and CIV in our slim model ρ^2 stays the same. Including these two variables does not add to the predictive power of our model.

The estimated odds ratios of PLT and lbAPO are similar across models. In the base model we estimate that a one-unit increase in PLT increases the odds of a country being in a higher API category by 44%, holding other variables constant. A one-unit increase in lbAPO is estimated to increase the odds of being in a higher API category by 91%, holding other variables constant. Recall that lbAPO is the binary logarithm of the number of animal protection organizations per area. The binary logarithm of a specific APO value is the power to which the number 2 must be raised to get that APO value. Thus, a one-unit increase in lbAPO equals a doubling of APO. Assuming that country areas stay constant we can interpret the odds ratio of lbAPO as follows: Doubling the number of animal protection organizations in a country is estimated to increase the odds of being in a higher API category by 91% (slim model), holding PLT constant.

Our model predicts that a country with a PLT of -10 (fully autocratic) has a probability of 33% to fall into the lowest API category G, and a probability of 56% of falling into the second lowest category F. The cumulative probability of falling into category F or lower is 89%, the sum of those two probabilities, assuming lbAPO is constant at its mean.

To check if we misspecified the model, either by choosing the wrong link function or choosing the wrong set of independent variables, we apply a link test, which simply runs an ordered logistic regression with the initially predicted values and their squares as independent variables and API as dependent variable. With API as dependent variable, both our base model and slim model pass the link test, indicating that our model is not misspecified. We also checked if the proportional-odds assumption is violated. Results from the approximate likelihood ratio test (Wolfe & Gould, 1998) do not indicate that the proportional-odds assumption is violated in any of our models.

If some of our independent variables are strongly correlated with each other, this can lead to inflated standard errors and influence our judgments about the significance of estimated coefficients. As a first step to detect potential multi-collinearity we look at the correlation coefficients between independent variables. A simple correlation matrix is shown in Table 5.

Table 5. Correlation coefficients of independent variables

	GDP	PLT	CIV	lbAPO
GDP	1.00			
PLT	0.53	1.00		
CIV	0.93	0.58	1.00	
lbAPO	0.72	0.57	0.74	1.00

The high correlation coefficient value (0.93) between GDP and CIV gives cause for concern. To further check for multi-collinearity we calculate the variance inflation factors (VIF), reported in Table 6 for different model configurations. VIF is an indicator of the extent to which multi-collinearity is causing standard errors to inflate. There are different rules of thumb on which VIF value is acceptable in the statistical literature, ranging at least from 4 to 30 (O'Brien, 2007). To see if multi-collinearity markedly influenced our regression results, we can drop GDP or CIV from the model. Recall that we did this already to check if estimated coefficients of GDP and CIV stay insignificant when doing our analysis in the previous section, with the results that with either of the two variables excluded (Table 4, Model_2 and Model_3), the standard error of the remaining variable is lower, but estimated coefficients remain insignificant.

In our slim model the correlation matrix and VIF do not suggest multi-collinearity between PLT and lbAPO. We can conclude that our analysis is not markedly limited by multi-collinearity.

Table 6. Variance Inflation Factors (VIF) of independent variables in different model configurations

	Base model	Model_2	Model_3	Slim model
GDP	8.12	2.19		
PLT	1.65	1.55	1.63	1.48
CIV	9.02		2.44	
lbAPO	2.43	2.35	2.37	1.48

8.5 Discussion and conclusions

Based on the results of our statistical analysis we can draw mixed conclusions about our hypotheses formulated in the previous section. With regard to our first hypothesis, we fail to show that economic development, as indicated by GDP per capita, is a determinant of animal protection policy when controlling for level of democracy and civil society strength. A country's odds of having stricter animal protection policies are not significantly affected by its per capita income.

The second hypothesis is supported by our analysis. Increasing a country's level of democracy, as indicated by the Polity Score, increases its odds of having stricter animal protection policies.

The third hypothesis concerned civil society. Here the results are mixed. We fail to show that broad public political engagement, as indicated by the Civic Activism Index, is related to animal protection policies. However, for the presence of civil society organizations more narrowly focused on animal protection, our results do suggest a significant relationship. A larger number of animal protection organizations in a country is associated with higher odds of having stricter animal protection policies. As these organizations do mobilize and inform people regarding unsustainable interactions with animals, this likely diffuses to protection policies as well.

We have to be cautious when we compare the extent of influence between level of democracy and the number of animal protection organizations. For one, our log-transformed APO variable indicates a marginal diminishing effect on animal protection policy. Such an effect is not found for the Polity Score (log-transforming the Polity Score does not increase the predictive power of our model).

Also, while increasing the level of democracy is related to stricter animal protection policies, the measure we applied in our analysis suggests that there is a ceiling. A country cannot become infinitely more democratic. The Polity Score has a maximum value of 10, indicating fully democratic institutional characteristics and absence of autocratic institutional characteristics. This ceiling is not just hypothetical. Seventeen countries, more than a third of the countries in our study, exhibit this highest level of democracy.

In contrast, the number of animal protection organizations in a country is, at least hypothetically, not limited upwards.

Does our analysis suggest that neither economic development nor broad civil society have any influence on animal protection policies? Not necessarily. Although we found no significant association between these two variables with animal protection policies when accounting for level of democracy and number of animal protection organizations, there are other reasons why we might have failed to detect such effects with our model. For instance, GDP per capita might not capture the true effect of economic development on animal protection policies. One of our reasons for including economic development as an explanatory variable, following Frank (2008), was the suggestion that animal protection policy could be seen as a "luxury good", for which public demand is higher in affluent countries where more basic demands for life satisfaction are met. In a country with large GDP but high income inequality, a sizeable part of the population may struggle to meet such basic demands for life satisfaction, which would diminish overall public demand for stricter animal protection policy. GDP per capita, though, measures only overall economic output not income inequality, and thus may not adequately reflect the effect of public demand for policies.

In addition to such conceptual limitations, there is evidence suggesting that maximum likelihood estimation techniques, such as the ordered logistic regression model we used, with more than two independent variables and a small N similar to ours, are prone to making Type II errors. A Type II error occurs when one fails to reject the null hypothesis although the null hypothesis is false (Hart & Clark, 1999). In our case this implies that our analysis might have missed a significant relationship between GDP per capita, CIV, and API. We thus should be extremely cautious in dismissing those two dependent variables.

To account for civil society strength with specific regard to animal protection, we chose as variable the number of animal protection organizations per country area. There are several potential issues with this variable choice.

Activities of animal protection organizations are diverse and include, among others, political advocacy, public awareness raising, provision of animal shelters, promotion of vegetarian and vegan diets, and conservation of natural habitats. Arguably, the impact of different activities on public policy varies widely. For example, it seems plausible that a political advocacy group which dedicates all its efforts on lobbying for stricter animal protection legislation has more influence on policy outputs than an organization maintaining shelters for abandoned pets, everything else being equal. But in our data we do not distinguish between them, which could bias our results.

A similar challenge concerns the extent to which an organization focuses its work on animal protection. With our APO variable we do not differentiate between an

organization solely committed to animal protection, and one for which animal protection is just a peripheral goal. Examples of two such different organizations included in the WorldAnimalNet directory are PETA (People for the Ethical Treatment of Animals), which exclusively works on animal protection, and WWF (World Wide Fund for Nature), which identifies animal protection as part of their broader efforts on issues like climate change, nature conservation, and sustainability. In addition, with our data we fail to account for differences between organizations' financial resources, staff, and membership.

Future research on policy impacts of animal protection organizations would benefit from distinguishing between organizations' activities, issue focus, and resources. This could be done by categorizing organizations from the WorldAnimalNet directory accordingly. With our goal to include as many countries as possible, this was beyond the scope of our study.

While we did not make any organization-based adjustment to the number of animal protection organizations, we did adjust for countries' area size. This adjustment was motivated by the fact that our raw data from the WorldAnimalNet directory counts each office location of even the same organization separately, thus inflating total numbers in larger sized countries. We already mentioned that this effect – more locations in larger countries – is arguably more pronounced for some organizations than for others. For animal shelter organizations, for example, it makes more sense to maintain multiple locations in order to provide their services in different cities and regions. The same cannot necessarily be said for an organization lobbying for national legislation. In light of this, our adjustment for country area is likely to bias our results depending on the distribution of organization types within countries. Another complication is that the assumed effect of different area size is unlikely to be linear.

Notwithstanding such conceptual and methodological limitations of our study, there are some broad conclusions to be drawn. For actors who seek to increase the level of animal protection provided by government policies, our study has some broad implications. The very plain conclusion that the activity of animal protection organizations does seem to make a difference for government policy is worth noting. The fact that countries included in our analysis almost all have large livestock industries indicates that civil society can impact policy even if opposed by considerable business interests (assuming that stricter animal protection policies are by and large opposed by producers of animal products).

International actors, such as activist groups or organizations seeking to provide funding for national advocacy groups, might increase their impact on policy if they direct their efforts towards more democratic countries. Assuming that in the short and medium term, a single organization probably cannot significantly change a country's regime

characteristics, it is reasonable to focus on strengthening civil society activity on the issue of animal protection if one wants to influence policies. However, our analysis suggests that increasing civil society activity has diminishing marginal impacts. Thus, targeting countries with strong democratic institutions but a relatively underdeveloped civil society sector with regard to animal protection seems to be a promising approach. The present state of policy strictness should of course also be taken into consideration, with a focus on countries where there is large room for improvement. Some countries included in our analysis which fit that description are Turkey, India, and Peru. Turkey's Animal Protection Index stands at E, the third lowest out of seven categories. Its Polity Score of nine indicates strong democratic institutions. Yet with only 21 animal protection organizations, Turkey ranks in the bottom third of our country group for narrow civil society strength.

Improving and expanding the Animal Protection Index can increase its utility for future research. A more transparent methodology would enable scrutiny and improvements. Capturing the actual implementation and enforcement component of existing policies would give a more complete picture of policy strictness and help assess effectiveness of policies beyond mere commitment. Of course this would still fall short of measuring actual outcomes with regard to animal well-being. For that purpose, animal based indicators are needed.

Apart from this wish list, researchers can use the API in its current iteration to analyze policies specific to certain types of animal use. With sub-indicators from the API as dependent variables, analysis of policy outputs with a specific focus on different types of animals, e.g. farm animals, is possible. In many countries, animal protection is usually not one unified piece in a government policy portfolio, but rather is divided among different departments and by the different purposes animals are used for, e.g. in Germany the Ministry of Agriculture is responsible for farm animals, and the Ministry of Research for animals used for scientific experiments. Research by Frank (2008) hinted in the direction that the effects of economic development on animal well-being are markedly different for farm animals and companion animals.

When economic development serves as a proxy for unobserved variables such as satisfaction of basic needs or administrative capacity, care should be taken to use an economic indicator that reflects the unobserved variables as accurately as possible. When feasible, direct measurement of the variable of interest is preferred. For cross-country studies, such as ours, multi-country surveys would greatly increase the evidence base for assessing the impact of public opinion, attitudes, and issue salience on animal protection policies. The World Values Survey sporadically included questions related to animals in past surveys. Regular inclusion in repeated waves covering different countries would both improve the base data for cross-section analysis, and enable time series and panel data analysis.

Parsing our other independent variables can also be a beneficial approach. Organizations registered in the WorldAnimalNet directory could be categorized by their primary activity (e.g. education, political advocacy), resources (e.g. number of national staff, funding), and issue focus. Variables not included in our analysis are also worth exploring. Institutional factors other than political regime-type might play a role, for example different regulatory models of the relationship between governments and industries (e.g. consensual versus adversarial).

Animal protection policy remains an under-explored field and there are several promising directions, some of which we have sketched here, which future research can explore. With this study we hope to have contributed to broadening the basis for such research.

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Chapter 9

Discussion and conclusions

"Anthropomorphism, the idea that we project our emotions onto other species, is not the issue; it's anthropodenial, thinking we differ from other animals, that is worrisome."

– Frans de Waal

Our relations with animals clearly have consequences for both animals and for humans. These consequences range from physical to psychological. The goal of this thesis was to first highlight that our relationships with animals – particularly pets – are a central element of human life. To this end, we first discussed how human-animal relations have shaped the perception and attribution of emotions to cats and dogs. Next, we analyzed human perception towards different aspects of our interaction with them. We then bring a broader perspective to these by presenting the broader environmental implications of having a pet, and how our policies related to animals are being shaped. Our aim was to highlight human-animal relations as a field of research that merits continued theoretical and empirical attention from a diversity of scientific disciplines, and to provide a basis for new research directions.

We started this thesis by investigating which of ten posited emotions companion animal owners' assign to their companion cat or dog. The results suggested that companion animal owners were willing to attribute all posited basic and complex emotions to their animals, with increased attachment levels positively correlating with increased willingness to attribute four out of six basic emotions and all four complex emotions. All participants were highly attached to their companion animal. Dog owners were more attached to their dogs than cat owners were to their cat, independent of animal characteristics such as gender and age. Cat owners were more attached to a male cat than to a female cat. Female owners showed stronger attachment to their companion animal than male owners and the older the person, the lower the attachment score while the lower education and income, the higher the attachment score was.

The question still remains if the owners' claims regarding the emotions of their companion animals can be taken as a source of evidence or dismissed as anthropomorphic projections. We also demonstrated that to get a complete picture of how an animal feels, we typically need to take a look at the full body - meaning head (eyes, ears, whiskers and mouth) and body (tail, attitude, size and angle). In order to get the full image, the whole body is to thus be viewed, as well as the context in which the picture is taken. In conclusion, we noted that the emotions of dogs and cats are rather difficult to determine and instruments to measure them are not yet available. Moreover, the individual facial expressions of the diverse breeds may differ importantly, within and between breeds.

Still, understanding when, why and how the general public attributes emotional states to animals is very important, since the recognition of emotions in animals will be of great help in improving animal welfare. More research is now required to reveal the

mechanisms underlying the process of recognition of emotions in pets and attunement of emotions between owners and their pets. Furthering the understanding of the capacity for emotions and the range of emotions that animals experience will be invaluable if environments are to be created in which animals and their emotions are noticed and respected and optimal animal welfare can be addressed.

We continued the elaboration of our understanding of our interaction with animals by studying attitudes towards animals measured by two validated indicators in both adults and young adults. Results from the study showed that women demonstrated more concern and empathy for animals than men did. Sustainable relationships with animals needs would need a decisive shift towards more connection, generosity and care. Not only that, the change in mentalities and ideologies would also require to view the world from a more inclusive perspective, where humans are not distinct from but part of a larger whole, as opposed to seeing the outside world through the habitual human centred lens. In today's industrial world, our connection to animals is rather limited and mostly reduced to interactions with pets and/or zoo animals, but we also see that people from developing countries show more tolerant attitudes towards 'the use' of animals than people from developed countries. These two avenues have thus become the main ones used to connect with the animal world. In this sense, they ought to be reinforced in creative ways if we wish to increase knowledge of and appreciation for wildlife and to a larger extent all other domestic animals.

In the same line of thought, it is necessary to think of entirely new ways humans can relate to their pets and other animal species; ways wherein the animals are respected and cared for in alignment with a concern for the environment. Indeed, the impacts of pet keeping are usually overlooked and have not yet caught much attention when in fact it may be an unsustainable practice. Pets being very popular in our societies, they are often looked upon in a positive light, whereas there may also be environmental consequences of pet keeping. The considerable number of pets around the world today leaves a substantial mark on the environment in terms of: meat consumption, waste accumulation and biodiversity loss due to pets hunting and disturbing wildlife. We have shown that the negative environmental impacts of food consumption by companion animals are expected to grow worldwide in the near future. However, besides food, companion animals also need water, entertainment, healthcare, living space and many other resources and services, all of which dramatically affect their environmental impact. Therefore, a broader quantification of all companion animal resource consumptions (e.g., water footprint, health footprint) and waste production (e.g. feces) should be considered in future studies. Furthermore, the environmental impact of other animal groups, like farm animals, wild animals, zoo animals, working animals and laboratory animals are also interesting areas for further research. We need to think creatively about new ways humans and animal can connect together in a space where all can benefit from are some of society's future challenges.

Although the animals we surround ourselves with have an ecological pawprint, a contributing factor to positive attitudes is visits to zoos or aquariums. Informal learning experiences outside of school whether it be with field trips or a visit to the zoo are highly valuable to increase student's knowledge of the natural world and decreasing the power of myths as well as negative feelings surrounding certain animal species. In the best of the worlds, zoos should aim to replicate the animal's natural environments as much as possible both for the animal's sake and that of education. Indeed, children gain knowledge and a lot of appreciation for the environment and the different species living there when they are learning outside of the classroom settings and in direct contact with nature and wildlife. Children do not commonly have a very well developed understanding of biodiversity yet they are naturally curious; it is thus all the more important for them to understand wildlife and natural history on a meaningful level in sensory based ways especially so as to improve their outlook on different animal species. For these reasons it makes more sense to let them experience first-hand, gain familiarity with and see nature in all its different aspects which a book or lecture cannot do. These learning experiences should pay particular attention to less popular animal species (pests, predators) and help children understand about the importance of each species in the ecosystem. Over the past decades a growing number of zoos have jumped on the education wagon and strive to promote conservation, educate their public or are also a space for scientific research. It is all the more important to continue in that direction and inspire other zoological gardens to shift their agenda from that of a purely entertainment industry to a place where humans are able to connect to the animal world in an intimate yet respectful way. An understanding of an animal's specific role in the environment enhances positive attitudes towards that animal and zoos can provide this opportunity to their visitors

Lastly, with rising meat consumption demands across the world, the resulting environmental damage (biodiversity loss, overexploitation of natural resources increased greenhouse gas emissions from livestock, deforestation and desertification, water and ecosystem acidification) is also pushing more and more people to adopt a vegetarian diet today. Meat eating is certainly not exclusive to animal welfare; in the end it is just a question of responsibility, honesty, empathy and respect for all those who share the same planet. And it is the role of society to educate younger generations on which values to honour.

To explore this societies' role further, we analyzed what determinants had any influence on animal protection policies. Although we found no significant association between economic development with animal protection policies, animal protection policy could be seen as a "luxury good", for which public demand is higher in affluent countries where more basic demands for life satisfaction are met. The number of animal protection organizations per country did appear to be important. Activities of animal protection organizations are diverse and include, among others, political advocacy, public awareness

raising, provision of animal shelters, promotion of vegetarian and vegan diets, and conservation of natural habitats. Arguably, the impact of different activities on public policy varies widely. However, the very plain conclusion that the activity of animal protection organizations does seem to make a difference for government policy is worth noting. The fact that countries included in our analysis almost all have large livestock industries indicates that civil society can impact policy even if opposed by considerable business interests (assuming that stricter animal protection policies are by and large opposed by producers of animal products). International actors, such as activist groups or organizations seeking to provide funding for national advocacy groups, might increase their impact on policy if they direct their efforts towards more democratic countries. Assuming that in the short and medium term, a single organization probably cannot significantly change a country's regime characteristics, it is reasonable to focus on strengthening civil society activity on the issue of animal protection if one wants to influence policies.

While the focus of this thesis is on human-pet relations, highlighting the 'special' status of pets in human lives, the ways in which humans relate to animals more broadly remains an important focus for investigation. Tackling this broader view of human-animal relations requires a different type of approach. Specifically, understanding human-animal relations as an *intergroup* topic allows for this broader understanding. In many cases, animals may be viewed as an outgroup (i.e., a group one does not belong to) in the same way that members of other cultures, religions, or nationalities are regarded as outgroups. From this starting point, the psychological research on intergroup relations and "us" vs. "them" dynamics becomes relevant to understanding human-animal relations. Sometimes, too, animals themselves are the resources that humans hunt and kill. Meat-eating is a longstanding human behavior. Meat is an important source of protein and calories, although with current agricultural practices, it needs far more water and land than a comparable amount of vegetables or grain. Despite the popularity of meat, preferences for which animals are considered appropriate for consumption vary considerably. This is evident in the shocked reactions of those from the western world when people from other cultures put their beloved pets like dogs and cats on the menu. Denying animals human characteristics (e.g., consciousness and the capacity to think) and their individuality are concrete strategies that allow us to distance ourselves from animals prior to harming and exploiting them.

Other factors that are well-established within the tradition of research on intergroup relations can also be applied to human-animal relations. For instance, perceiving similarities between humans and animals can lead to a perception of relatedness with them, also triggering empathy toward animals as well as an increased desire to protect their rights. Similarly, the tendency to anthropomorphize animals – which involves assigning them human-like characteristics, such as emotions and cognitions – has

been associated with greater concerns for their welfare. In sum, adopting an intergroup perspective to human-animal relations provides important insights into the broader nature of our relationships with animals and the conditions under which these relations are likely to be harmonious vs. conflictual and exploitative. This wider-lens approach hence has the potential to identify the factors leading to more vs. less speciesism, and to pave the way to social interventions that are likely to foster mutually beneficial relations between animals and humans. Furthermore, that the nature of our relationships with animals also has broader consequences for human-human relations. According to anthropologist Lévi-Strauss (1966), by "thinking with" animals and investigating how we interact toward other species, we can also gain insights into human nature and understand human societies in new ways. These questions will become increasingly important to tackle as we (humans) are confronted with progressively scarce resources due to human overpopulation, and as we need to make decisions about how to distribute these resources between both humans *and* animals.

Afterthought

Even though we are at the forefront of animal welfare in Europe and America, there is still much to be gained. But here, too, the situation is often far from ideal. As far as I am concerned, sustainability revolves around how committed people are to the world in which they live. Animals are often ignored in this discussion. Time to change this.

However, 'human-animal' research in the context of sustainable development is still in its infancy, and it does not provide us with all the answers. Still it is an outstanding sustainability issue that deserves fullest attention form an inter- and transdisciplinary perspective. It will also provide the necessary non-human elements to the sustainability discussion, and will provide a platform for the public debate.

I think we – as scientist – should be more outspoken when we see that our relationship with our natural environment and the animals within has changed dramatically – causing many undesirable effects as well. For example, more and more animals are kept closely together in unsanitary or overly hygienic (antibiotics, etc.) conditions to satisfy the rising demand for animal protein of densely populated megacities. The need for space and raw materials perpetuates the encroachment on animal habitats like rainforests, which, in turn, brings more humans in contact with more exotic animal species. Add to that frequent international travel – both human and animal – and it's excellent conditions for zoonosis. See the recent COVID-19 pandemic. It does oblige scientists to take more responsibility, especially at times when many signals in nature and society are red.

With the point of view of moving forward to a more sustainable world, we should become more 'scientivistic'. Scientivists are people that are engaged in a systematic activity to acquire knowledge (the 'science part'), to promote, impede, or direct societal change (the 'activist part'). Scientivism can take a wide range of forms from writing letters to newspapers or politicians, to economic activism, such as boycotts, sit-ins etc. Scientivists are not afraid of interfering with legitimized procedures and official politics when science shows this would be needed.

On the other hand, scientivists must be aware that their actions may increase the risk of scientific results inappropriately being used into social discourses and in the media. This might lead to situations where, for instance, researchers find themselves unwittingly "supporting" an application of the generated knowledge they might strongly disagree with. It is, therefore, not a 'job' (as for most of us 'being a scientist' is), but rather an 'attitude'. An attitude that may be urgently to move forward to a more sustainable society. As in this era of social media, opportunities for scientivists will increase as we speak.

However, by the end of the day, the solution is greater respect for animals and nature: moving away from industrial livestock farming, deforestation, wet markets, etc. My

own contribution to science, together with many international scientists, is studying the complexity and interactions between human, animals and nature. I hope this thesis does provide a fruitful contribution to this.

Appendix I

Questionnaire The Emotions of Pets

Scientists more or less agree that emotions in humans act as a "mental guide" and affect our behavior. Emotions like fear, sadness and joy tell us which situations are good for us and which are bad. As a result of an emotion people react to a certain situation and may adapt their behavior. Emotions are therefore important for our functioning. Research has identified six basic emotions: anger, happiness, sadness, disgust, fear and surprise.

From an evolutionary point of view there seem to be no reason to assume that this would work differently in animals. However, it is difficult to determine whether they experience emotions in the same way as humans. It is not always clear what an animal feels, and you can easily be wrong in judging the nature and strength of their feelings. Yet in everyday life emotions are regularly assigned to animals. We might therefore assume that animals 'use' their emotions to adjust their behavior to a certain situation. Emotions are important for their functioning.

Through this survey we want to gain insights into how pet owners assign specific emotions to their pets based on facial expression, body posture, and sounds (barking, meowing, growling, etc.). We also want to know how the emotions of the owner and pet synchronize, in other words, looking at whether your pet tunes his/her emotions to those of you (or vice versa, for example, being sad/happy or angry simultaneously).

We would like to ask you (preferably the main carer – i.e. the person that devotes most time to the pet (walking the dog, feeding the cat, etc.)) to complete this questionnaire regarding the behaviour of your cat and/or dog and their emotions, and if possible, to send us a picture of your pet expressing one of the emotions mentioned above. This should take no longer than about 10 minutes of your time. By participating, we hope you receive personal satisfaction that you were part of a study to improve the lives of animals, and you may understand your own pet a little more afterwards. Of course, all information you provide will be kept completely confidential. Personal information will not be released to or viewed by anyone other than the researchers involved in this project. Results of this study will not include your name or any other identifying characteristics – unless you give permission for that.

I. Personal details

Please give us some of information about you, your house and your family. This information is kept strictly confidential.

1. What is your birth-year? (e.g. 1968)
2. What is your sex? Female/Male
3. What is the highest level of schooling you have completed?
   a. No education
   b. Less than grade 12
   c. High school
   d. College or technical school
   e. University
   f. No answer
   g. Other
4. Do you belong or donate to an organization or charity involved in or concerned with:
   a. Improving the welfare of animals Yes/No
   b. Conservation of the natural environment Yes/No
   c. Improving human rights or health Yes/No
5. Are you vegetarian/vegan? Yes/No
6. How does your household look like?
   a. Single without children
   b. Single with children
   c. Married/living with partner without children
   d. Married/living with partner with children
   e. Other
7. In what sort of house do you live?
   a. Apartment/flat
   b. Semi-detached house
   c. Detached house
8. Do you have a garden? Yes/No
9. What is your occupation?
   a. Liberal profession
   b. Employed
   c. Retired
   d. Student-scholarship
   e. Social welfare
   f. No answer
   g. Other

10. Is religion/spirituality important in your life? Yes/No /No answer

11. If your answer is yes, then what is your main source of inspiration (Multiple answers possible)?
    a. Christianity
    b. Judaism
    c. Islam
    d. Buddhism
    e. Taoism
    f. Other

12. What is your gross household income per month?
    a. Below the minimum wage in your country
    b. The minimum wage in your country
    c. The average income in your country
    d. About twice the average income in your country
    e. More than twice the average income in your country
    f. No answer

13. Where is your current residence place?
    a. Urban areas (a geographical area constituting a city or town)
    b. Rural areas (an area outside of cities and towns)

2. Your pet and its emotions

14. Do you own a dog or cat?
    If you have more than one dog/cat, please fill in the questions for the pet you have longest first.

    Mark only one oval.
    - Dog Skip to question 15.
    - Cat Skip to question 31.

Dog

Answer these questions if you own a dog.

15. What is the breed of your dog? (leave blank if unknown)
    _____

16. What is the sex of your dog? Male/Female

17. Is your dog neutered (fixed)? This applies for both male and female dogs Yes/No

18. How big is your dog?
    a. Small (less than 10 kg)
    b. Medium (10–25 kg)
    c. Large (more than 25 kg)

19. How old is your dog?
    a. Less than 5 years
    b. 5 to 10 years
    c. 10 years or over

20. How would you rate the health of your dog? Good/Fair/Bad

21. How often have you visited the vet on average per year with your dog?
    a. Never
    b. Once or twice per year
    c. More than twice per year

22. On average, how often do you go for a walk with your dog each day?
    a. Twice or less
    b. Between two and four times
    c. Over four times

23. About how many minutes per day do you go for a walk with your dog?
    a. Less than 1 hour
    b. Between 1–2 hours
    c. More than 2 hours

24. How often do you feed your dog each day?
    a. Once
    b. Twice
    c. More than twice

25. On average, how many grams of food per kg body weight do you give your dog each day? (e.g., if your dog weights about 10 kg, and you give him 100 grams, the answer is 10 grams)
    a. Less than 10 grams per kg bodyweight
    b. Between 10 and 25 grams per kg bodyweight
    c. More than 25 grams per kg bodyweight
    d. No idea

26. On average, how often do you brush your dog?
    a. Once or more times each day
    b. Once or more times each week
    c. Once or more times each month

27. Is your dog friendly to strangers?
    a. Yes
    b. No
    c. Sometimes yes/sometimes no

28. Can your dog stay alone at home? Yes/No

29. Where does your dog sleep?
(Multiple answers possible)
Check all that apply
    a. Kitchen
    b. Living room
    c. Bedroom
    d. Garage/basement/barn
    e. Hall
    f. Other

30. Who is taking care of your dog when you are (temporarily) not around?
(Multiple answers possible)
Check all that apply
    a. Shelter or kennel
    b. Neighbors, friends or family
    c. Other

Cat

Answer these questions if you own a cat.

31. What is the breed of your cat? (leave blank if unknown)
_____

32. What is the sex of your cat? Male/Female

33. Is your cat neutered (fixed)? This applies for both male and female cats Yes/No

34. How old is your cat?
    a. Less than 5 years
    b. Between 5 and 10 years
    c. 10 years or over

35. How would you rate the health of your cat? Good/Fair/Bad

36. How often have you visited the vet on average per year with your cat?
    a. Never
    b. Once or twice per year
    c. More than twice per year

37. How often does your cat go outside?
    a. Never
    b. Can go outside whole day
    c. Can go outside during daytime
    d. Can go outside during night time
    e. Only goes outside when someone is at home

38. How often do you feed your cat each day?
    a. Once
    b. Twice
    c. More than twice

39. On average, how many grams of food do you give your cat each day?
    a. Less than 50 grams
    b. Between 50 and 100 grams
    c. More than 100 grams
    d. No idea

40. How often is the litter changed?
    a. Multiple times per day
    b. Every day
    c. Multiple times per week
    d. Once per week
    e. I do not have a litter

41. Does your cat sit frequently on your lap?
    a. Never
    b. Every day
    c. Several times per week

42. Where does your cat sleep?
    (Multiple answers possible)
    Check all that apply
    a. Kitchen
    b. Living room
    c. Bedroom
    d. Garage/basement/barn
    e. Other

43. Who is taking care of your cat when you are (temporarily) not around?
    (Multiple answers possible)
    a. Check all that apply
    b. Shelter or kennel
    c. Neighbors, friend or family
    d. Other

You and your pet

44. Are you the main carer of the pet? Yes/No
    The main carer is the person that devotes most time to the pet (walking the dog, feeding the cat, etc.)

45. Do you have other pets? Yes/No

46. How many years do you own your pet?
    a. Less than 1 year
    b. 1 to 5 years
    c. 5 to 10 years
    d. More than 10 years

47. Why did you get your pet?
    (Multiple answers possible)
    Check all that apply
    a. For myself
    b. For the kids
    c. For my job
    d. Other

Interactions between you and your pet

48. How do you and your pet go along?
    Mark only one oval per row.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
My pet can make me laugh					
I have lot of fun with my pet					
My pet makes me feel important					
I have warm feelings when I think about my pet					
I like to spend a lot of time with my pet					
My pet loves me					
My pet misses me when I am gone					
I like to talk to my pet about things that are important to me					
I like to talk to my pet					
My pet understands my feelings					
I can tell secrets to my pet					
Sometimes my only friend is my pet					
My pet loves me no matter what					

49. How do you and your pet go along?
Mark only one oval per row.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
One of my favorite things to do is to spend time with my pet					
My pet is an important part of my family					
My pet understands what I say					
I would be very upset if something happened to my pet					
I try to protect my pet					
I keep pictures of my pet					
My pet stays close to me when I am upset					
My pet has feelings					
I think about my pet when we are not together					
I miss my pet when I am not around					
My pet is important to me					
I am proud of my pet					

50. Does your pet communicate with you?
Mark only one oval per row.

	Never	Sometimes	Often
By meowing or barking			
By means of body language (posture)			
By touching you (with head/legs)			
By scratching (against a door, for example)			
By looking at you			
By sniffing/recognizing your smell			

51. Do you like watching your pet? Yes/No

52. Do you like touching your pet? Yes/No

53. I consider my relationship with my pet to be: Bad/Normal/Good

54. Can you tell your pet is ill by its smell? Yes/No/Don't know

55. Do you sometimes attribute human characteristics to your pet? Yes/No

56. Do you think you look like your pet?
(Multiple answers possible)
Check all that apply.
    a. In behaviour
    b. In appearance
    c. Other
    d. No

57. Do you like taking care of your pet? Yes/No

Your pet and its emotions

58. Did you ever see these emotions expressed by your pet?
Mark only one oval per row.

	Never	Sometimes	Often	No idea
Anger				
Joy				
Sadness				
Disgust				
Fear				
Surprise				
Shame				
Jealousy				
Disappointment				
Compassion				

59. Do you think that these emotions are caused by the behavior of yourself (or your housemates), in other words, do you directly affect the behavior of your pet?
Mark only one oval per row.

	Never	Sometimes	Often	No idea
Anger				
Joy				
Sadness				
Disgust				
Fear				
Surprise				
Shame				
Jealousy				
Disappointment				
Compassion				

60. Can you describe in a few words/phases your pet's character?

_____
_____
_____
_____

Recognizing your pet's emotions

We do understand that the following request may be somewhat more difficult to carry out and takes some more time. Nevertheless, as this is an essential part of the research, we would appreciate your cooperation. You will help us to understand the emotions of our pets better and thus improve their welfare.

We would like to ask you to take a picture / multiple photos of your pet (or take a picture/movie from the past) if you recognize any of the emotions from the previous questions by your pet:

a. Anger
b. Joy
c. Sadness
d. Disgust
e. Fear
f. Surprise
g. Shame
h. Jealousy
i. Disappointment
j. Compassion

We would appreciate if you could email the picture(s) to us:
AnimalWise2@gmail.com

Could you also briefly explain why you think your pet feels this emotion (certain body language, facial expression)?

Can you briefly describe in the e-mail why you think this situation occurred?

61. If you have submitted a photo, may we use it in possible publications and/or post it on the Internet (e.g. Facebook)?
    (Of course, your privacy is guaranteed)
    Mark only one oval.
    a. Yes
    b. No
    c. 'Yes' in publications/ 'No' on the Internet
    d. 'Yes' on Internet / 'No' in publications
    e. I did not submit a picture

Appendix 2

Bonferroni tests

Age dog

Dependent variable	(I) age dog	(J) age dog	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Anger	Less than 5 years	5–10 years	-0.138*	0.052	0.024	-0.26	-0.01
		10 years and over	-0.139	0.066	0.107	-0.3	0.02
	5–10 years	Less than 5 years	0.138*	0.052	0.024	0.01	0.26
		10 years and over	-0.001	0.068	1	-0.16	0.16
	10 years and over	Less than 5 years	0.139	0.066	0.107	-0.02	0.3
		5–10 years	0.001	0.068	1	-0.16	0.16
Joy	Less than 5 years	5–10 years	-0.014	0.012	0.742	-0.04	0.01
		10 years and over	-0.004	0.015	1	-0.04	0.03
	5–10 years	Less than 5 years	0.014	0.012	0.742	-0.01	0.04
		10 years and over	0.01	0.015	1	-0.03	0.05
	10 years and over	Less than 5 years	0.004	0.015	1	-0.03	0.04
		5–10 years	-0.01	0.015	1	-0.05	0.03
Sadness	Less than 5 years	5–10 years	-0.115	0.052	0.087	-0.24	0.01
		10 years and over	-0.175*	0.066	0.023	-0.33	-0.02
	5–10 years	Less than 5 years	0.115	0.052	0.087	-0.01	0.24
		10 years and over	-0.061	0.068	1	-0.22	0.1
	10 years and over	Less than 5 years	0.175*	0.066	0.023	0.02	0.33
		5–10 years	0.061	0.068	1	-0.1	0.22
Disgust	Less than 5 years	5–10 years	-0.119	0.057	0.114	-0.26	0.02
		10 years and over	-0.078	0.073	0.866	-0.25	0.1
	5–10 years	Less than 5 years	0.119	0.057	0.114	-0.02	0.26
		10 years and over	0.042	0.075	1	-0.14	0.22
	10 years and over	Less than 5 years	0.078	0.073	0.866	-0.1	0.25
		5–10 years	-0.042	0.075	1	-0.22	0.14

Age dog

Dependent variable	(I) age dog	(J) age dog	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Fear	Less than 5 years	5–10 years	0.024	0.045	1	-0.08	0.13
		10 years and over	0.07	0.057	0.659	-0.07	0.21
	5–10 years	Less than 5 years	-0.024	0.045	1	-0.13	0.08
		10 years and over	0.046	0.059	1	-0.1	0.19
	10 years and over	Less than 5 years	-0.07	0.057	0.659	-0.21	0.07
		5–10 years	-0.046	0.059	1	-0.19	0.1
Surprise	Less than 5 years	5–10 years	0.108	0.054	0.133	-0.02	0.24
		10 years and over	0.12	0.068	0.236	-0.04	0.28
	5–10 years	Less than 5 years	-0.108	0.054	0.133	-0.24	0.02
		10 years and over	0.012	0.071	1	-0.16	0.18
	10 years and over	Less than 5 years	-0.12	0.068	0.236	-0.28	0.04
		5–10 years	-0.012	0.071	1	-0.18	0.16
Shame	Less than 5 years	5–10 years	-0.044	0.054	1	-0.17	0.09
		10 years and over	-0.063	0.07	1	-0.23	0.11
	5–10 years	Less than 5 years	0.044	0.054	1	-0.09	0.17
		10 years and over	-0.019	0.072	1	-0.19	0.15
	10 years and over	Less than 5 years	0.063	0.07	1	-0.11	0.23
		5–10 years	0.019	0.072	1	-0.15	0.19
Jealousy	Less than 5 years	5–10 years	-0.087	0.063	0.493	-0.24	0.06
		10 years and over	-0.033	0.08	1	-0.22	0.16
	5–10 years	Less than 5 years	0.087	0.063	0.493	-0.06	0.24
		10 years and over	0.054	0.082	1	-0.14	0.25
	10 years and over	Less than 5 years	0.033	0.08	1	-0.16	0.22
		5–10 years	-0.054	0.082	1	-0.25	0.14

Age dog

Dependent variable	(I) age dog	(J) age dog	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Disappointment	Less than 5 years	5–10 years	-0.072	0.051	0.46	-0.19	0.05
		10 years and over	-0.240*	0.065	0.001	-0.4	-0.08
	5–10 years	Less than 5 years	0.072	0.051	0.46	-0.05	0.19
		10 years and over	-0.167*	0.067	0.038	-0.33	-0.01
	10 years and over	Less than 5 years	0.240*	0.065	0.001	0.08	0.4
		5–10 years	0.167*	0.067	0.038	0.01	0.33
Compassion	Less than 5 years	5–10 years	-0.018	0.065	1	-0.18	0.14
		10 years and over	-0.087	0.085	0.935	-0.29	0.12
	5–10 years	Less than 5 years	0.018	0.065	1	-0.14	0.18
		10 years and over	-0.068	0.088	1	-0.28	0.14
	10 years and over	Less than 5 years	0.087	0.085	0.935	-0.12	0.29
		5–10 years	0.068	0.088	1	-0.14	0.28

* The mean difference is significant at the 0.05 level.

Age cat

Dependent variable	(I) age cat	(J) age cat?	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Anger	Less than 5 years	5–10 years	-0.056	0.065	1	-0.21	0.1
		10 years and over	0.036	0.066	1	-0.12	0.19
	5–10 years	Less than 5 years	0.056	0.065	1	-0.1	0.21
		10 years and over	0.092	0.067	0.523	-0.07	0.25
	10 years and over	Less than 5 years	-0.036	0.066	1	-0.19	0.12
		5–10 years	-0.092	0.067	0.523	-0.25	0.07
Joy	Less than 5 years	5–10 years	0.182*	0.057	0.005	0.04	0.32
		10 years and over	0.159*	0.058	0.02	0.02	0.3
	5–10 years	Less than 5 years	-0.182*	0.057	0.005	-0.32	-0.04
		10 years and over	-0.023	0.06	1	-0.17	0.12
	10 years and over	Less than 5 years	-0.159*	0.058	0.02	-0.3	-0.02
		5–10 years	0.023	0.06	1	-0.12	0.17
Sadness	Less than 5 years	5–10 years	-0.094	0.073	0.608	-0.27	0.08
		10 years and over	-0.071	0.074	1	-0.25	0.11
	5–10 years	Less than 5 years	0.094	0.073	0.608	-0.08	0.27
		10 years and over	0.022	0.076	1	-0.16	0.2
	10 years and over	Less than 5 years	0.071	0.074	1	-0.11	0.25
		5–10 years	-0.022	0.076	1	-0.2	0.16
Disgust	Less than 5 years	5–10 years	-0.126	0.07	0.223	-0.3	0.04
		10 years and over	-0.148	0.072	0.12	-0.32	0.02
	5–10 years	Less than 5 years	0.126	0.07	0.223	-0.04	0.3
		10 years and over	-0.022	0.074	1	-0.2	0.16
	10 years and over	Less than 5 years	0.148	0.072	0.12	-0.02	0.32
		5–10 years	0.022	0.074	1	-0.16	0.2

Age cat

Dependent variable	(I) age cat	(J) age cat?	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Fear	Less than 5 years	5–10 years	-0.069	0.055	0.629	-0.2	0.06
		10 years and over	-0.035	0.056	1	-0.17	0.1
	5–10 years	Less than 5 years	0.069	0.055	0.629	-0.06	0.2
		10 years and over	0.034	0.057	1	-0.1	0.17
	10 years and over	Less than 5 years	0.035	0.056	1	-0.1	0.17
		5–10 years	-0.034	0.057	1	-0.17	0.1
Surprise	Less than 5 years	5–10 years	0.095	0.078	0.672	-0.09	0.28
		10 years and over	0.262*	0.08	0.004	0.07	0.46
	5–10 years	Less than 5 years	-0.095	0.078	0.672	-0.28	0.09
		10 years and over	0.167	0.083	0.133	-0.03	0.37
	10 years and over	Less than 5 years	-0.262*	0.08	0.004	-0.46	-0.07
		5–10 years	-0.167	0.083	0.133	-0.37	0.03
Shame	Less than 5 years	5–10 years	0.08	0.068	0.731	-0.08	0.24
		10 years and over	-0.031	0.069	1	-0.2	0.13
	5–10 years	Less than 5 years	-0.08	0.068	0.731	-0.24	0.08
		10 years and over	-0.11	0.071	0.357	-0.28	0.06
	10 years and over	Less than 5 years	0.031	0.069	1	-0.13	0.2
		5–10 years	0.11	0.071	0.357	-0.06	0.28
Jealousy	Less than 5 years	5–10 years	0.084	0.087	0.998	-0.12	0.29
		10 years and over	0.085	0.087	0.991	-0.12	0.29
	5–10 years	Less than 5 years	-0.084	0.087	0.998	-0.29	0.12
		10 years and over	0.001	0.09	1	-0.21	0.22
	10 years and over	Less than 5 years	-0.085	0.087	0.991	-0.29	0.12
		5–10 years	-0.001	0.09	1	-0.22	0.21

Age cat

Dependent variable	(I) age cat	(J) age cat?	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Disappointment	Less than 5 years	5–10 years	0.034	0.075	1	-0.15	0.22
		10 years and over	0.028	0.076	1	-0.16	0.21
	5–10 years	Less than 5 years	-0.034	0.075	1	-0.22	0.15
		10 years and over	-0.007	0.078	1	-0.19	0.18
	10 years and over	Less than 5 years	-0.028	0.076	1	-0.21	0.16
		5–10 years	0.007	0.078	1	-0.18	0.19
Compassion	Less than 5 years	5–10 years	0.069	0.071	1	-0.1	0.24
		10 years and over	0.071	0.072	0.975	-0.1	0.24
	5–10 years	Less than 5 years	-0.069	0.071	1	-0.24	0.1
		10 years and over	0.002	0.075	1	-0.18	0.18
	10 years and over	Less than 5 years	-0.071	0.072	0.975	-0.24	0.1
		5–10 years	-0.002	0.075	1	-0.18	0.18

* The mean difference is significant at the 0.05 level.

Appendix 3

Questionnaire
Humans-Animal Interactions

Through this international survey we want to gain insight in the way people treat and interact with animals in their direct environment. We would like to ask you to complete this questionnaire regarding your observations of attitudes towards and interactions with the animals around you. We will ask questions about your views about animals in captivity, animals in the wild, farm- and companion animals, as well as questions about your food preferences and some other personal details.

All the information you provide will be kept completely confidential. Your personal information will not be released to or viewed by anyone other than the researchers involved in this project. Results of this study will not include your name or any other identifying characteristics – unless you give permission for that.

Thank you very much for your cooperation!

I. Personal details

1. What is your birth-year? (e.g. 1968)
2. What is your sex? Female/Male
3. In what country do you live?
4. What is the highest level of schooling you have completed?
   a. No education
   b. Less than grade 12
   c. High school
   d. College or technical school
   e. University
   f. No answer
   g. Other
5. Do you belong or donate to an organization or charity involved in or concerned with:
   a. Improving the welfare of animals Yes/No
   b. Conservation of the natural environment Yes/No
   c. Improving human rights or health Yes/No
6. How does your household look like?
   a. Single without children
   b. Single with children
   c. Married/living with partner without children
   d. Married/living with partner with children
   e. Other
7. Where is your current residence place?
   a. Urban areas (a geographical area constituting a city or town)
   b. Rural areas (an area outside of cities and towns)
8. In what sort of house do you live?
   a. Apartment/flat
   b. Semi-detached house
   c. Detached house
9. Do you have a garden? Yes/No
10. What is your occupation?
    a. Liberal profession
    b. Employed
    c. Retired
    d. Student-scholarship
    e. Social welfare
    f. No answer
    g. Other

11. Is religion/spirituality important in your life? Yes/No

12. If your answer is yes, then what is your main source of inspiration (Multiple answers possible)?
    a. Buddhism
    b. Judaism
    c. Islam
    d. Christianity
    e. Taoism
    f. Other

13. What is your gross household income per month?
    a. Below the minimum wage in your country
    b. The minimum wage in your country
    c. The average income in your country
    d. About twice the average income in your country
    e. More than twice the average income in your country
    f. No answer

14. Do you own a pet? Yes/No

15. If yes, what pet do you have (Multiple answers possible)?
    a. Cat(s)
    b. Dog(s)
    c. Fish
    d. Birds
    e. Reptiles
    f. Rodents
    g. Chickens, pigeon, geese (or other poultry)
    h. Ponies, horses
    i. Other: ...
    j. No, I do not have a pet

16. How often do you eat meat (including fish) every week?
    a. I do not eat meat, I am a vegetarian/vegan
    b. Once a week
    c. 2–3 days a week
    d. 4–6 days a week
    e. Every day

17. How often do you visit a zoo or aquarium?
    a. Once a month
    b. Once every six month
    c. Once every year
    d. Once two years or more than two years
    e. Never

2. The Ethics Position Questionnaire

Please indicate if you agree or disagree with the following items. Each represents a commonly held opinion and there are no right or wrong answers. We are interested in your reaction to such matters of opinion. Rate your reaction to each statement by:

1 = Completely disagree
2 = Largely disagree
3 = Moderately disagree
4 = Slightly disagree
5 = Neither agree nor disagree
6 = Slightly agree
7 = Moderately agree
8 = Largely agree
9 = Completely agree

1. People should make certain that their actions never intentionally harm another even to a small degree.
2. Risks to another should never be tolerated, irrespective of how small the risks might be.
3. The existence of potential harm to others is always wrong, irrespective of the benefits to be gained.
4. One should never psychologically or physically harm another person.
5. One should not perform an action which might in any way threaten the dignity and welfare of another individual.
6. If an action could harm an innocent other, then it should not be done.
7. Deciding whether or not to perform an act by balancing the positive consequences of the act against the negative consequences of the act is immoral.
8. The dignity and welfare of the people should be the most important concern in any society.
9. It is never necessary to sacrifice the welfare of others.
10. Moral behaviors are actions that closely match ideals of the most "perfect" action.
11. There are no ethical principles that are so important that they should be a part of any code of ethics.
12. What is ethical varies from one situation and society to another.
13. Moral standards should be seen as being individualistic; what one person considers to be moral may be judged to be immoral by another person.
14. Different types of morality cannot be compared as to "rightness."

15. Questions of what is ethical for everyone can never be resolved since what is moral or immoral is up to the individual.
16. Moral standards are simply personal rules that indicate how a person should behave, and are not be be applied in making judgments of others.
17. Ethical considerations in interpersonal relations are so complex that individuals should be allowed to formulate their own individual codes.
18. Rigidly codifying an ethical position that prevents certain types of actions could stand in the way of better human relations and adjustment.
19. No rule concerning lying can be formulated; whether a lie is permissible or not permissible totally depends upon the situation.
20. Whether a lie is judged to be moral or immoral depends upon the circumstances surrounding the action.

3. Animal issue (AI) questions

Please rate the questions below on the following scale:

1. Extremely unacceptable; 2. Unacceptable; 3. Normal; 4. Acceptable; 5. Extremely acceptable

3.1: Use of animals

1. Keeping animals for the production of food or clothing
2. Keeping animals as pets
3. Keeping animals for the education of the public in zoos, wildlife parks, etc.
4. Using animals for work
5. Using animals for entertainment or sports

3.2: Animal integrity

6. Operations on animals to improve their health
7. Decoration of animals, such as dyeing or cutting their hair for aesthetic reasons
8. De-sexing by hormone implants
9. Removal of a body part, such as tail docking or de-clawing
10. Marking animals by branding or ear notching
11. Removal of dead tissue, such as hair/wool removal or foot trimming

3.3: Killing animals

12. Killing young animals that are dependent on their parents
13 Allowing animals to experience pain during slaughter
14. Using animals for products after their natural death

15. Killing animals when they are seriously injured or ill
16. Euthanising healthy and unwanted pets because of overpopulation

3.4: Animal welfare

17. Depriving animals of their needs for food and water
18. Depriving animals of an appropriate environment to rest, including shelter
19. Inflicting pain, injury or disease on animals
20. Not providing sufficient space, proper facilities and company needed for animals
21. Subjecting animals to conditions and treatment which cause mental suffering

3.5: Experimentation on animals

22. Observing animal behaviour in an experiment
23. Experiments to improve animal welfare or health
24. Medical experiments using animals to improve human health
25. Testing cosmetics or household products on animals
26. Operating on living animals for the benefits of human medicine research

3.6: Changes in animals' genotypes

27. Increasing animals' reproductive or productive capabilities by genetic changes, e.g. cows producing more milk
28. Increasing animals' health or disease resistance by genetic changes
29. Creating farm animals that are more profitable because they feel happy with little stimulation and have little desire to be active
30. Genetic selection of pet animals, such as dogs and cats, to increase their rarity, potential for showing or pedigree value
31. Genetic modification of crops grown for animal foods

3.7: Animals and the environment

32. Killing animals because they are not native to the area where they live
33. Killing wild animals to stop the spread of diseases that could affect humans
34. Controlling wildlife populations by killing
35. Controlling animal populations by sterilisation
36. Destroying the habitat of endangered animal species
37. Destroying the habitat of non-endangered animal species to develop and promote urbanisation or crops to feed humans

3.8: Societal attitudes towards animals

38. Sacrifice of animals in religious rites
39. Considering some animal species as sacred or good luck symbols or totems
40. Considering some animal species as evil or bad luck
41. Parents displaying cruel treatment of animals in front of their children

42. Inflicting pain or injury on animals as part of cultural traditions
43. Cloning animals for human benefit

4. Animal Attitude Scale

Please judge the propositions below.

Animal Attitude Scale	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1. It is morally wrong to hunt wild animals just for sport.					
2. I do not think that there is anything wrong with using animals in medical research.					
3. There should be extremely stiff penalties including jail sentences for people who participate in cock-fighting.					
4. Wild animals, such as mink and raccoons, should not be trapped and their skins made into fur coats.					
5. There is nothing morally wrong with hunting wild animals for food or a better living for poor people.					
6. I think people who object to raising animals for meat are too sentimental.					
7. Much of the scientific research done with animals is unnecessary and cruel.					
8. I think it is perfectly acceptable for cattle and dogs to be raised for human consumption.					
9. Basically, humans have the right to use animals as we see fit.					
10. The slaughter of whales and dolphins should be immediately stopped even if it means some people will be put out of work.					
11. I sometimes get upset when I see wild animals in cages at zoos.					

Animal Attitude Scale	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
12. In general, I think that human economic gain is more important than setting aside more land for wildlife.					
13. Too much fuss is made over the welfare of animals these days when there are many human problems that need to be solved.					
14. Breeding animals for their skins is a legitimate use of animals.					
15. Some aspects of biology can only be learned through dissecting preserved animals, such as cats.					
16. Continued research with animals will be necessary if we are to ever conquer diseases such as cancer, heart disease and AIDS.					
17. It is unethical to breed purebred dogs for pets when millions of dogs are killed in animal shelters each year.					
18. The production of inexpensive meat, eggs, and dairy products justifies maintaining animals under crowded conditions.					
19. The use of animals, such as rabbits, for testing the safety of cosmetics and household products is unnecessary and should be stopped.					
20. The use of animals in rodeos and circuses is cruel.					

"I think we should be more outspoken when we see the detrimental effects of our activities to the natural environment and the animals within. In this thesis, without claiming to cover the full complexity, I explore the relationships between human and non-human animals. This ranges from our bound with close companions like cats and dogs, to public attitudes towards exotic animals living far way or in zoos. I also argue that animal welfare should be central in the sustainability debate: what I term 'sustanimalism' (in Dutch, the combination of 'dieren' (animals), and 'duurzaamheid' (sustainability) leads to the neologism 'dierzaamheid'). More respect for animals and nature is key to a sustainable society." – Pim Martens



Pim Martens is passionate to bring sustainable change in our relationship with nature and the animals we live with. This professor of 'Sustanimalism' has a PhD in Applied Mathematics ánd Anthrozoology (this thesis). He is a scientivist and founder of AnimalWise, a 'think and do tank' integrating scientific knowledge with animal advocacy.

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