Human-Animal Relationships: Exploring human concern for animals

DISSERTATION

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By

Kelly Ann George, M.A.

Graduate Program in Environment & Natural Resources

The Ohio State University

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Dissertation Committee:

Jeremy T. Bruskotter, Advisor

Steven J. Moeller

Robyn S. Wilson

Abstract

Humans and non-human animals have an intertwined evolutionary history. Since our earliest understanding of human existence to contemporary time, animals have played an essential role in our survival and vice versa. Recognizing the importance of this relationship, the changes witnessed through time, and the potential for change in the future may prove vital for decisions that society will face affecting these relationships. Thus, the overall objective of this dissertation was to analyze human-animal relationships, in particular the growing concern for animal welfare. Chapter 1 offers a short introduction to my personal interests and why I came to this research objective. Chapter 2 offers a review of the literature pertaining to the later chapters. The review consists of three basic areas: 1) animal and human characteristics that influence the human-animal relationship; 2) concerns regarding contemporary human-animal relationships; and 3) the potential to affect change in current and future human-animal relationships. Chapter 3 explores the aspect of a shift in societal concern for animal welfare using a national survey to measure the change in attitudes toward specific animal species over the past three decades. Results of this survey suggest an increase in concern, demonstrated by the increase in positive attitudes toward most species; including significant positive increases in five either historically stigmatized or perceived dangerous species (e.g. bats, sharks, vultures, wolves and coyotes). This shift may be explained, in part, by a societal shift in value orientations from a domination orientation,

consumptive in nature, toward a mutualism orientation, appreciative in nature. Chapter 4 uses this explanation to further explore potential mechanisms that motivate concern for animals. Using student populations in two academic disciplines with seemingly competing value orientations (i.e. Animal Sciences and Environment & Natural Resources), an electronic survey was administered to identify potential mechanisms, measuring empathy, value orientation, attitudes toward the treatment of animals, and behaviors based on concern for animals. Results suggest the student populations are more similar than expected, largely with mutualistic value orientation. Empathy was rejected as a direct proximate mechanism, while animal value orientation, measured here for the first time using animals other than wildlife, appeared to be a good predictor of attitudes toward the treatment of animals, as well as behaviors based on concern for animals. Chapter 5 extends these findings further by considering if experiential learning affects attitudes toward animal conditioning practices, i.e. practices potentially contentious in nature. Using a course taught in the Department of Animal Sciences which offers students hands-on experience with animal conditioning practices, a pre-/posttest methodology was employed to measure attitudes toward these practices. Overall results suggest that experiential learning related to animal conditioning practices resulted in changes in attitudes toward these practices. Lastly, Chapter 6 offers a summary and interpretation of the results found during this research program. The chapter concludes by introducing future research opportunities in the area of human-animal relationships.

This dissertation in dedicated to my family – those still with me and those that have already moved beyond this life. I love you all!

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Vita

1985.....Franklin Heights H.S.

2009.....B.A. Arts and Sciences, The Ohio State University

2011.....M.A. Geography, The Ohio State University

2006 to present .....Lecturer, Department of Animal Sciences, The Ohio State University

Publications

George, K.A., Slagle, K.M., Wilson, R.S., Moeller, S.J. and Bruskotter, J.T. (2016). Changes in attitudes toward animals in the United States from 1978 to 2014. *Biological Conservation, 201*, 237-242.

Fields of Study

Major Field: Environment and Natural Resources

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction – bridging work and study

As a non-traditional student one challenge, as well as advantage, I have is to bridge my work and study interests. In my current position as a Lecturer in the Department of Animal Sciences, I teach about human-animal relationships. You may wonder why studying this relationship is important or even useful. Clifton Flynn, Professor of Sociology at the University of South Carolina Upstate argues that "understanding the way we think about and treat other animals says something about who we are." Or as Hal Herzog (2010) states, we (i.e. anthrozoologists or scientists in the field of human-animal studies) all "believe that our interactions with other species are an important component of human life and hope that our research might make the lives of animals better" (p. 17). I would add to Herzog's statement by including the hope to make the lives of humans better as well. Ergo, I help students explore the historical past, current condition, and potential future of these relationships. I challenge students to consider how these relationships differ depending on species, and why. I have them reflect on their current relationships with animals and identify the benefits and costs incurred, as well as recognize aspects of the relationship they would like to change, and again why. I encourage students to consider the potential or at least perceived obstacles hindering these changes and explore possible methods to address these challenges. I also emphasize the human influence on human-animal relationships, not to promote

anthropocentrism, but rather to acknowledge that humans possess the power to make change.

Personally exploring the same questions I present to students has led me down an interesting academic path, creating a symbiotic relationship between my work and study. I too began pondering how and why our relationships with non-human species formed. I wondered which factors, both human and the non-human, influenced our current relationships. I considered which aspects of the human-animal relationship most concerned me. I challenged myself to better understand how to potentially affect these identified concerns, recognizing that human-animal relationships are inevitable but the manner in which we interact is not predetermined.

This line of inquiry began during my undergraduate degree and led me to complete a Master of Arts degree in Geography. When I share this with others usually the first question is why Geography. It's actually quite simple; I wanted to explore human development and the potential geographical effect on the human-animal relationship. My master's thesis explored the societal underpinnings for the paradigm shift found in zoological parks from the traditional intensively managed park to the more recent focus of natural settings and extensive management found in open-range style parks that began to appear in the late 1970's and early 80's. My research included a qualitative study using five parks covering three geographic areas (i.e. Columbus Zoo & Aquarium and The Wilds in the U.S., Orana Zoological Park in New Zealand, and Dublin Zoo and Fota Wildlife Park in Ireland). I collected data through personal interviews with park personnel, as well as visitor observation and document comparison, such as funding

structure, land acquisition, proclaimed mission, animal collection numbers and species choice, and animal space provisions. My findings implicated a shift in societal values, with park personnel and the zoological community demonstrating more concern for the animals in their care, as well as a shift to a species conservation focus.

Completing my master's motivated me to further research the questions I had been contemplating regarding the human-animal relationship. I wanted to move beyond animals found in zoos and think about the human-animal relationship in general. Again, as an instructor in Animal Sciences, I felt compelled to consider all animals and their place in society. I thought very purposefully about how companion animals, animals on farm, animals in research facilities, and wildlife, all with seemingly different roles in society, are in fact so interconnected. I wondered what impact this interconnection may possibly have on human-animal relationships. I was curious how humans make decisions and if/how that affected our relationships. This curiosity led me to pursue a PhD in the School of Environment and Natural Resources.

Chapter 2: Literature review

My investigation started with improving my comprehension of the scientific literature related to my original questions regarding the human-animal relationship. That is, which factors (both human and animal) influence our relationships, what are my individual concerns and more broadly societal concerns, if any, with current human-animal relationships, and is it possible to affect change regarding these concerns. I will address each of these in turn.

2.1 Factors influencing the human-animal relationship

Numerous factors from both the human and the animal influence the human-animal relationship. Animal characteristics, physical, cognitive and behavioral, often cause discrimination in the human attitude towards a particular species (Burghardt and Herzog, 1989; Driscoll, 1992; Kellert and Berry, 1980). Herzog and Burghardt (1988) describe the tendency for juvenile animals to evoke "baby releasers" within the human, arousing our innate parental instincts, what Serpell (2003) refers to as the "cute response." Austrian ethologist Konrad Lorenz identified the similar physical characteristics which juvenile mammals and infant humans possess - large eyes, large cranial expanse, and short stubby limbs. Similarity in juvenile mammal and human behaviors, such as awkwardness and dependency on parent, as well as vocalizations such as cries and whimpers, which at least give the illusion that humans understand the

communication effort being presented by the animal, also influence our positive attitudes toward those species (Herzog and Burghardt, 1988). Conversely, animals that do not possess these characteristics (e.g. reptiles and invertebrates) or that represent potential threats to humans, either currently or evolutionarily induce negative attitudes toward those species (Kellert and Berry, 1980; Kellert and Wilson, 1995). Furthermore, phylogenetic distance plays a role in the human relationship with animals; that is animals that are close phylogenetically to humans versus those animals distant, invoke stronger positive affect toward those particular species (Serpell, 2004).

Human characteristics also influence the human-animal relationship. Age, gender, residence (i.e. urban versus rural), and experience with animals are amongst the typical variables measured. Kellert and Berry (1987) found males had significantly higher knowledge of animals than females, while females demonstrated significantly stronger emotional attachments toward animals. Herzog and colleagues (1991) also found significant differences in gender, with females seeming more concerned about animal welfare issues and more comfortable touching other species. Other differences include women being more involved in animal activism and men found to be more likely engaged in recreational hunting (Herzog, 2007). Age has also been reported to affect the human view of animals, with younger people (< 25 years of age) demonstrating primary interest and a strong affection for individual animals, particularly pets, as well as having a highly significant protectionist concern for animals (Driscoll, 1992; Furnham and Pinder, 1990; Kellert and Berry, 1980). Knight and colleagues (2004) investigated an assortment of human characteristics, including age, gender, experience of animals, vegetarianism,

political stance, and living area. Their findings suggest that gender and vegetarianism, combined with belief in animal mind, explain up to 37% of the variance in attitudes toward animal use.

Kellert (1983) describes human perceptions of animals to contain three components: *cognitive*, the knowledge and factual understanding of animals; *evaluative*, beliefs and values associated with animals; and *affective*, refers to the feelings and emotions humans attach to animals. Kellert's description of human perceptions of animals aligns well with attitude theory, which suggests that attitudes toward a specific object are comprised of three parts: cognitive, conative (or behavioral), and affective (Eagly & Chaiken, 1993). In an attempt to quantify human perceptions of animals, Driscoll (1995) conducted a survey consisting of 33 species of animals. Respondents were to rate each species presented on the following six dimensions: useful-useless; smart-stupid; responsive-unresponsive; lovable-unlovable; safe-dangerous; and important-unimportant. Respondents consisted of the co-workers, family, and friends of students enrolled in a research survey course. Driscoll's data resulted in three distinct clusters of species – those that are useful to humans, those that are charismatic (i.e. smart, important, loveable, and responsive), and those that are perceived as dangerous to humans. Driscoll's three species clusters could be loosely linked to Kellert's components: evaluative, affective and cognitive, respectively. That is, humans evaluate the usefulness of animals to society (e.g. domestic animals as a food source), humans have an affective response towards animals based on charisma (e.g. having a more positive attitude towards dogs than swans), and humans determine animals as dangerous to humans via the beliefs

established about the animal (e.g. predators have the potential to harm me or others that I am concerned about).

2.2 Concerns with contemporary human-animal relationships

Human health has historically been a concern for people interested in the human-animal relationship. The fields of veterinary medicine and public health continue to focus on this area and have witnessed an increase in enrollment (Patterson Neubert, 2010). Initiatives such as *zooeyia*, the examination of the positive benefits to human health from interacting with animals (Hodgson and Darling, 2011), have materialized in the literature. The benefits and risks to human health associated with our relationships to animals is truly a necessary and legitimate concern to be investigated. However, when I consider contemporary human-animal relationships, the concern that rises to the top is the benefits and risks to animal health; therefore this is the area I will address in this review.

David Mellor (2016) acknowledges that the human-animal relationship can "have marked effects on animal welfare" (p. 16). He describes this effect as follows:

> Good welfare-related knowledge, skills, attitudes and behavior towards animals, including bonding with them, can enhance their welfare, fitness and biological performance and help to ensure that animals have lives that are worth living, *i.e.,* lives where they can and do avail themselves of opportunities to have positive experiences (p. 16).

Mellor's explanation is an attempt to expand the current commonly accepted definitions of animal welfare. Over approximately the past four decades, scholars interested in

animal welfare have debated over a common definition. The roots of this debate lie in the concern for animals produced for food, and the establishment of the *five freedoms*, determining that animals should be: free from hunger and thirst; free from discomfort; free from pain, injury or disease; free to express natural behavior; and free from fear and distress (Brambell Committee, 1965). Later the concept of animal welfare was described as an individual's "states as regards its attempts to cope with its environment" (Broom, 1991, p. 4168). Thus a measurement of animal welfare is how well an individual animal has coped both mentally and physically with either its captive or wild environment (Broom, 1991). An integrative model of animal welfare was later introduced by David Fraser (2008), describing three approaches, which can and do overlap: health and biological functioning, affective state, and natural living. This understanding of animal welfare led to the comprehensive definition commonly used:

> Animal welfare means how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well-nourished, safe, able to express innate behavior, and if it is not suffering from unpleasant states such as pain, fear, and distress. Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling and humane slaughter/killing (OIE, 2008).

An important aspect of animal welfare is that it is not something a human bestows onto an individual animal; rather it refers to a characteristic of an individual animal as it experiences the environment in which it lives (Keeling et al., 2011); that is, as Mellor

(2016) stated, animals can and do avail themselves of opportunities to have positive experiences.

Vast amounts of scientific research focused on animal welfare now fill volumes of peer-reviewed journals. Research in this area includes work in both the bio-physical and social sciences, respectively addressing the animal and human components of the human-animal relationship (Hemsworth et al., 2009). As discussed in the previous section, the human component research includes an examination of human characteristics that potentially affect attitudes toward animal welfare. However, to this point, research have yet to determine if societal concern for animals is on the rise; nor has research explored in any depth the mechanisms that potentially motivate concern. These two questions will be further explored in chapters three and four. Chapter three will examine societal concern for animals using a national survey to measure attitudes toward specific species, comparing our data to that of the national survey conducted by Kellert in 1978. Chapter four will attempt to identify the mechanism(s) underpinning our attitudes toward concern for animals, using a survey instrument distributed to a population of students in two different academic disciplines, representing seemingly opposing views.

2.3 Affecting changes in level of concern for animals

Understanding behavior and the potential to affect changes in behavior have been the goals of countless studies (see Ajzen & Fishbein, 1980; Manfredo et al., 1997; Whittaker et al., 2006 as examples). These studies agree that our decisions to behave in a particular manner extend from our values. Values are developed through socialization

and are defined as few, slow changing, and enduring (Homer & Kahle, 1988; Rokeach, 1973). The socialization process also influences the manner in which we orient our values, meaning it is possible for two people to value the same "object," for example a pig, but depending on their influences, the two people may orient their value for the pig differently – one may value the pig for the potential of consumptive product it could provide while the other may value the pig for the level of intelligence and ingenuity it displays. Both orientations may lead to concern for the animal well-being but the reason for the concern is quite different. The work of Manfredo and colleagues (2009) identified these two distinct orientations as *domination*, consumptive in orientation, and *mutualism*, appreciative in orientation, with life forms having rights like humans as part of an extended family, and deserving of care and compassion. Values and the way an individual orients them transcend our cognitive processing, influencing our attitudes toward a given object (Fulton et al., 1996; Homer & Kahle, 1988). As already described, attitudes contain a cognitive, affective, and conative component. Heberlein (2012) states three principles to help better understand attitudes: 1) attitudes tend toward consistency, but they are not always consistent; assuming consistency in attitudes without data can be misleading; 2) attitudes based on direct experience have more beliefs and greater stability; direct experience can change attitudes; and 3) attitudes tied to our identities tend to be more emotional and difficult to change; they can, however, change as our identities and roles change. So, in general, attitudes are formed through personal experience and are used to efficiently evaluate (good vs. bad) an object (e.g., thing, animal, idea, etc.) and can change as individual identities and roles change. It should also be noted that context

plays a role in our attitudes toward an object. We can form multiple attitudes about the same object (Smith & Mackie 2007). For example, we may have a positive attitude toward the care and welfare of laboratory rats; yet, care very little regarding the welfare of sewer rats. Or, we may consider a pot-bellied pig to be a member of our family and therefore protect it from harm while also holding a positive attitude toward the consumption of pork. These seemingly conflicting attitudes toward the same object (i.e., rat and pig) demonstrate the complexity of attitudes and the need for additional research to better understand how attitudes are formed and used. Chapter five will explore attitudes toward potentially contentious animal management practices and the effect that personal experience has on these attitudes.

Chapter 3: Changes in attitudes toward animals in the United States from 1978 to 2014

3.1 Abstract

More than three decades ago, Stephen Kellert surveyed > 3,000 Americans to gain a better understanding of their attitudes toward wildlife. We used a web-based questionnaire to survey a nationally representative sample of 1,287 U.S. residents, replicating 26 single-item measures of attitudes toward animals from Kellert's study. Attitudes toward all animals were remarkably similar in 1978 and 2014. The average change in rank was 2.1 (of 26), and species mean scores from 1978 and 2014 correlated at $r = 0.95$. Americans' attitudes toward eight species exhibited substantive differences (Cohen's $d > 0.4$). The greatest differences were for historically stigmatized species (e.g. bats, sharks, vultures, wolves and coyotes)—attitudes in 2014 were significantly more positive for these species. The majority of respondents reported positive attitudes toward wolves and coyotes, and the proportion of people reporting positive attitudes toward these species increased by 42 and 47%, respectively. The differences in attitudes witnessed in this study may be indicative of growing concern for the welfare of animals – both wild and domestic.

3.2 Introduction

Citing the recent acceleration in anthropogenic impacts on earth's systems, some scholars argue we have entered a new geological epoch dubbed the "Anthropocene" (Steffan et al., 2015), marked by a sixth mass extinction (Barnosky et al., 2011). Indeed, recent estimates suggest that the Earth could lose half of its biodiversity by the year 2100 if negative human impacts are not reduced (Bellard et al., 2012). A major driver of anthropogenic impacts is competition for resources to support a growing human population—now projected to reach 9 billion by the year 2050 (Food and Agriculture Organization, 2013). Supporting 9 billion people will require significantly increasing the productivity of the agricultural sectors (crops, livestock, forestry and fisheries), which is likely to lead to further loss and modification of habitat and the loss of biodiversity (Matson et al., 1997). Moreover, it is commonly understood that feeding 9 billion people will require substantial intensification of agricultural production, which has met with public opposition in the area of agricultural animal production due to the growing concern for animal welfare (Broom et al., 2013). The onset of the Anthropocene epoch thus highlights a growing tension between three important societal goals: (1) the need to increase agricultural production to feed growing human populations, (2) the desire to conserve biodiversity for current and future generations, and (3) an apparent expansion in concern for the welfare of wild and domestic animals.

Though the conflict between agricultural production and biodiversity is well established (e.g., Young et al., 2007; Henle et al., 2008), the connection to animal welfare has received comparably little attention (see Pinker, 2011 for an exception). Animal

welfare refers to "how an animal is coping with the conditions in which it lives" (OIE 2015), and a variety of evidence suggests that public concern for animal welfare in Europe and North America is increasing (Pinker 2011). Increased public concern is indicated, for example, by the public desire for the ethical production of meat and eggs, which has led major retailers to demand specific animal production methods from their suppliers (e.g. McDonald's plans to switch to cage-free eggs over the next decade). Other examples include the recent public attention garnered by the killing of "Cecil the lion" (Nelson et al. 2016) and Feld Entertainment's decision to remove elephant performers from the Ringling Brothers and Barnum & Bailey Circus due to a "mood shift among consumers" (Davis, 2015). Additionally, documentaries such as "Blackfish" led SeaWorld to end its orca breeding program, as well as its orca theatrical performances. Finally, the dramatic rise in the use and success of ballot initiatives to protect wildlife from practices such as trapping in recent decades (Minnis, 1998; Pacelle, 1998) suggests that people are increasingly concerned with the welfare of these animals.

However, while such anecdotes make a compelling case that concern for animal welfare is on the rise, surprisingly little empirical research addresses changes in concern for animal welfare over time. Perhaps the most direct evidence comes from a now three-decades old study that examined how animals were depicted in the U.S. news media over time (i.e., from 1900 to 1976); in that study, Kellert and Westervelt (1983) found the prevalence of "utilitarian" depictions (those that emphasized material value of animals) decreased substantially over this period, while so-called "humanistic" depictions (those expressing affection for animals) increased following World War II. More recently,

research on wildlife values in the U.S. suggests a shift away from a "domination" orientation, which emphasizes mastery over nature/wildlife, to a more "mutualist" orientation, which emphasizes harmony, care-taking and empathy (Manfredo et al., 2003, Manfredo et al., 2009). Manfredo et al. (2009) explain this shift in light of Inglehart's research on societal value shift, which suggests social and economic development has driven a shift from "materialist" goals – those emphasizing the attainment of basic needs – toward "post-materialist" (or "self-expression") goals that emphasize the transcendence of basic needs and greater concern for others (Inglehart 1997, Inglehart & Welzel 2005). Yet, direct assessments of concern for animals over time are lacking.

One means of assessing changes in concern for animals is by comparing data on attitudes toward animals over time (e.g. Williams et al., 2002; Bruskotter et al., 2007; Majić & Bath 2010). Attitude theory suggests that attitudes toward a specific entity are comprised of three component parts: cognitive, conative (or behavioral), and affective (Eagly & Chaiken, 1993). In the context of animal welfare, we anticipate that a person holding positive attitudes toward a specific species is more likely to have higher concern for that species' welfare (an affective response) and, in turn, respond with judgments, decisions and behavior that reflect this concern (Taylor & Signal, 2005). Indeed, research on attitudes toward wildlife generally indicates that attitudes toward species are strongly correlated with support for species restoration (Bright & Manfredo, 1996; Wilson & Bruskotter 2009; however, see Kaczensky et al., 2004 for contradictory findings) and animal management practices that have direct bearing on the welfare of individual animals (Bruskotter et al., 2009; Slagle et al., 2012). Likewise, animal welfare research

shows a moderate to strong correlation (r = 0.33 – 0.54) between attitudes toward animals and empathetic concern for animals generally (Taylor & Signal 2005; Apostol et al. 2013). Hence we surmise that attitudes toward species are a good general indicator of concern for the welfare of that species.

In 1978, in one of the first studies of its kind, Kellert and Berry surveyed more than 3,000 Americans about their knowledge of and attitudes toward a wide variety of wild and domestic animals (Kellert and Berry, 1980; Kellert 1985a). The species ranged from domestic/companion to game and predatory species, and included a variety of taxa (i.e., reptiles, fish, birds, mammals, and invertebrates). These species were chosen such that they varied based upon their general attractiveness, as well as their ability to harm humans. Kellert found that domestic dogs, horses and swans were among the *most* liked animals, while rat, mosquito and cockroach were among the *least* liked (Table 1).

Table 1. Americans' Attitudes toward 26 Animals as Measured in 1978 and 2014

	Means		**Standard Dev.**		**Sample Size**		**Cohen's**
Animal	**2014**	**1978**	**2014**	**1978**	**2014**	**1978**	**d**
Dog	1.78	1.70	1.05	0.980	561	2445	0.08
Butterfly	1.86	2.04	1.01	1.010	558	2441	0.18
Eagle	1.94	2.29	1.12	1.340	577	2430	0.29
Horse	2.13	1.79	1.08	0.850	557	2423	0.35
Robin	2.19	1.99	1.07	1.020	548	2413	0.19
Elephant	2.30	2.63	1.15	1.310	591	2397	0.27
Cat	2.33	2.74	1.55	1.700	583	2386	0.25
Turtle	2.45	2.69	1.11	1.280	579	2388	0.20
Swan	**2.47**	**1.97**	**1.26**	**0.980**	**587**	**2410**	**0.45**
Ladybug	2.49	2.78	1.39	1.490	544	2403	0.20
Salmon	2.57	2.26	1.32	1.110	614	2440	0.25

Continued

Table 1 continued

Trout	2.59	2.12	1.33	1.040	607	2402	0.39
Wolf	**3.10**	**3.98**	**1.64**	**1.860**	**1276**	**2374**	**0.50**
Coyote	**3.34**	**4.02**	**1.67**	**1.700**	**1270**	**2431**	**0.40**
Raccoon	**3.47**	**2.80**	**1.64**	**1.500**	**583**	**2426**	**0.43**
Lizard	3.52	4.13	1.61	1.850	598	2426	0.35
Crow	3.68	4.06	1.54	1.670	618	2411	0.24
Vulture	**3.86**	**4.91**	**1.53**	**1.650**	**553**	**2402**	**0.66**
Shark	**3.90**	**4.82**	**1.70**	**1.770**	**593**	**2420**	**0.53**
Bat	**3.95**	**5.35**	**1.88**	**1.690**	**553**	**2219**	**0.78**
Skunk	4.42	4.42	1.73	1.930	609	2358	0.00
Rattlesnake	5.04	5.66	1.76	1.580	589	2409	0.37
Wasp	5.40	5.68	1.62	1.460	572	2392	0.18
Rat	**5.55**	**6.26**	**1.53**	**1.180**	**562**	**2379**	**0.53**
Cockroach	6.11	6.45	1.33	1.000	621	2388	0.29
Mosquito	6.12	6.27	1.36	1.060	619	2368	0.13

Least liked species includes neutral or midpoint (4) on a 1 (strongly like) to 7 (strongly dislike) scale.

Note: Species in bold exhibit substantive differences (i.e., Cohen's d > 0.40) between 1978 and 2014 data.

Likewise, predator species were not well-liked at the time; out of 33 species presented to participants, wolves and coyotes ranked 21 and 22 respectively, demonstrating Americans' disfavor of predatory species. Kellert's study, originally funded by the U.S. Fish and Wildlife Services, led to a variety of papers, including a well-known typology of animal attitudes (e.g., Kellert, 1984 and Kellert, 1985b) that is still cited in both the conservation (Zinn & Pierce, 2002) and human-animal relations literature (Serpell, 2004). However, more than three decades have passed since the publication of Kellert's (1985a) study on attitudes toward animals without replication, offering an opportunity to reassess U.S. residents' attitudes toward animals and determine if and how they have changed.

3.3 Methods

Researchers collected data via an online survey of a nationally-representative sample, accessed through the GfK group (formerly Knowledge Networks). GfK currently uses address-based sampling (ABS) to recruit and maintain online panel members. GfK switched to ABS from random digit dialing (RDD) to reflect the changes in society telephony, and combat long-term declines in response rates (see Curtain et al., 2005). A key advantage of GfK's KnowledgePanel over traditional ABS sampling is greater representation of U.S. households, especially historically undersampled groups (The GfK Group 2013). Samples are drawn from KnowledgePanel using a probability proportional to size weighted sampling approach designed to ensure that each sample can reliably represent the U.S. population. Post-hoc weights were created using data from 2009—2011 American Community Survey, conducted by the United States Census Bureau (www.census.gov/acs/), as benchmarks. Weights were applied to the overall sample in all subsequent analyses. Specifically, weights were developed based upon 7 demographic variables, including: respondent age, race/ethnicity, level of education, household income, census region, metropolitan area residence, and whether or not respondent had household access to the Internet.

The survey was conducted using the Qualtrics platform over the course of 11 days in February, 2014. GfK contacted a total of 2,020 respondents, resulting in 1,287 completions, for an overall response rate of 64%. This sampling approach provides less than a 4% margin of error at the 99% confidence level for the weighted sample (Vaske, 2008; see pp.179-182).

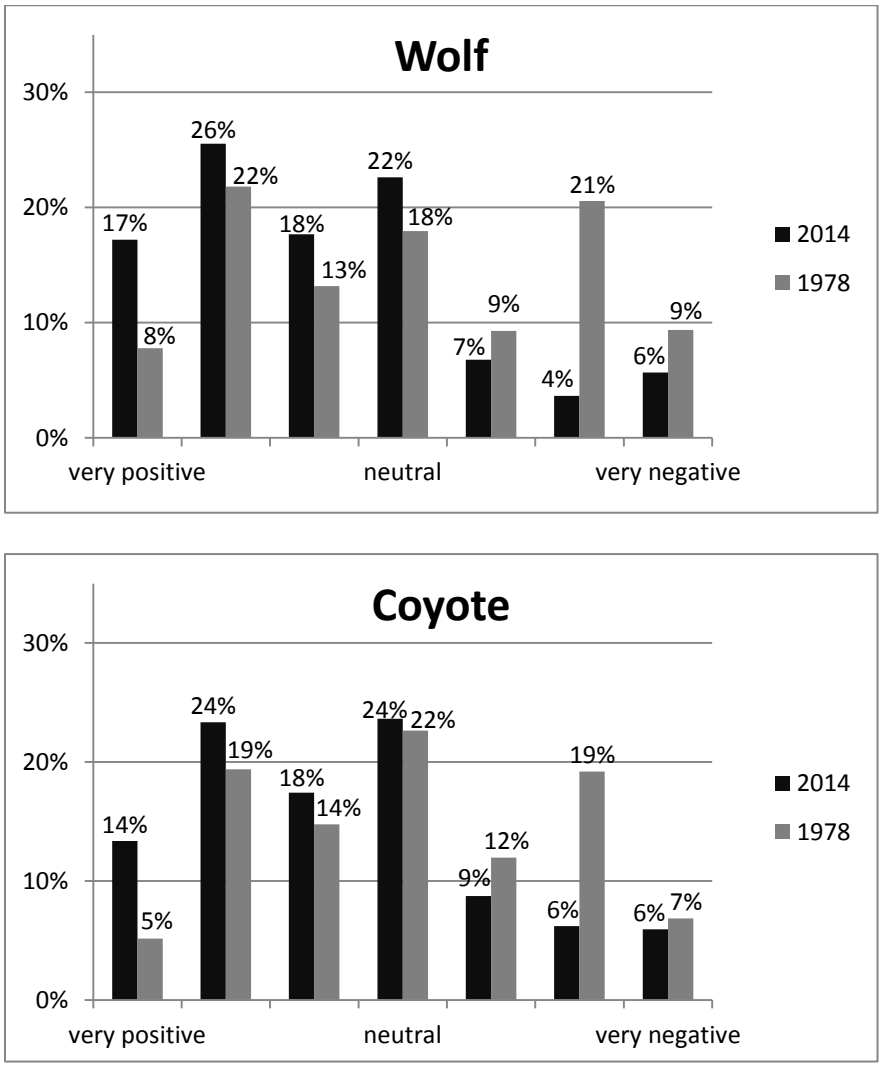
To maximize comparability, our questionnaire replicated 26 species items used by Kellert and colleagues to assess attitudes toward animals in the original 1978 survey. (See Appendix A for illustration of survey instrument.) One additional item, assessing attitudes toward cougar/mountain lion was also included. To minimize ordering effects the presentation of all response items was randomized. Consistent with the original study, attitude towards animals were measured using a bi-polar response scale ranging from 1 (strongly like) to 7 (strongly dislike). All respondents rated their like/dislike for wolf, coyote, and cougar/mountain lion. To reduce response burden and survey length, respondents were assigned random subsets of 11 of the remaining species listed in Table 1, such that each respondent rated like/dislike for a total of 14 species. Missing values were dropped from analyses. The weighted means for each species in 2014 were compared to the means reported for each species in the 1978 survey (Kellert & Berry, 1980) using independent sample t-tests in Microsoft Excel (Microsoft 2010). Because large sample sizes can inflate statistical significance, we used Cohen's d to gauge the relative size of the effect (Cohen, 1988). We calculated species rank by ordering species based upon their mean attitude scores; rank ranged from 1 (most liked) to 26 (least liked).

3.4 Results

Attitudes toward animals were quite similar across the two studies (Table 1). The average absolute mean difference across all 26 species was 0.48 on scales ranging from 1 (strongly like) to 7 (strongly dislike), the average change in rank was 2.1 (of 26), and mean scores for species correlated between the studies at $r = 0.95$. Nevertheless, from

1978 to 2014, there were substantive differences in public attitudes toward eight species (Cohen's $d \geq 0.4$). Attitudes toward four species, which are sometimes regarded as harmful or unattractive, were substantially more positive ($d \geq 0.4$) in the current study. Specifically, 2014 respondents reported more positive attitudes toward bats, sharks, vultures, and rats than 1978 respondents. Likewise, attitudes toward two mammalian carnivores (i.e., wolves and coyotes) were substantially more positive ($d \geq 0.4$) in 2014 than 1978. The proportion of respondents reporting positive attitudes toward wolves increased by 42% and the proportion reporting positive attitudes toward coyotes increased by 47% (Figure 1). The average mean change for all 6 species exhibiting an increase in positive attitudes was 0.94 on a 7-point scale. Conversely, the proportion of respondents reporting positive attitudes toward two animals— raccoons and swans— decreased by 41% and 21% respectively, with an average mean change of - 0.59 (Table 1).

Figure 1. U.S. Resident's Attitudes toward Wolves and Coyotes: 1978 (*n*=3107) & 2014 (*n*=1270)

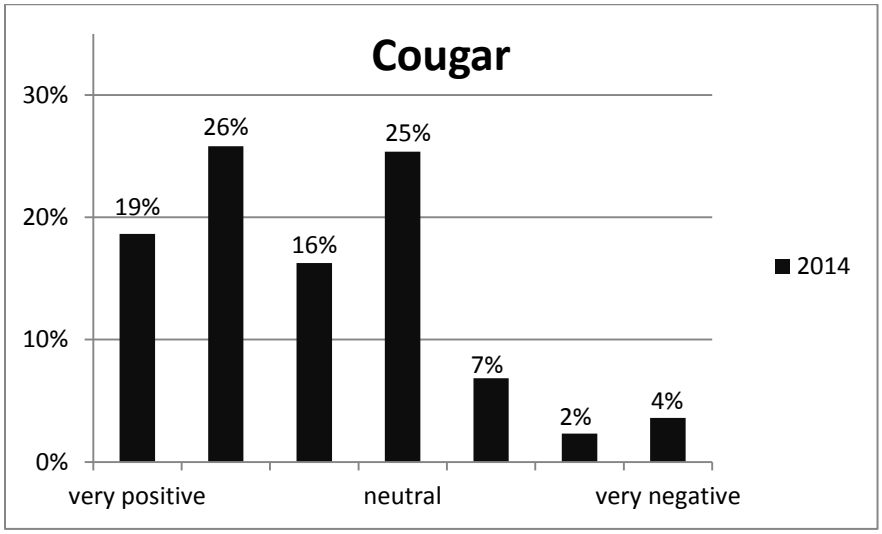


Least liked species includes neutral or midpoint (4) on a 1 (strongly like) to 7 (strongly dislike) scale.

Additionally, we measured attitudes toward cougar, a large-bodied predator found in North and South America that has witnessed a recent range expansion in parts of the United States (LaRue et al., 2012). Sixty-one percent of respondents reported a positive

attitude toward the cougar (Figure 2). This is the first time data on this species has been published at the national level.

Figure 2. U.S. Resident's Attitudes toward Cougars 2014 (n=1270)



No data for cougar preference were collected in 1978.
Least liked species includes neutral or midpoint (4) on a 1 (strongly like) to 7 (strongly dislike) scale.

Following Kellert (1985a), we ranked (i.e., ordered) animals based on mean attitudinal scores. We found a positive change in rank for eagles (Δ+5), cats (Δ+4), butterflies (Δ+3), elephants (Δ+3), turtle (Δ+2), ladybug (Δ+2), vulture (Δ+2), wolf (Δ+1), coyote (Δ+1), lizard (Δ+1), bat (Δ+1), and cockroach (Δ+1), while swan (Δ-6), trout (Δ-6), salmon (Δ-4), skunk (Δ-3), horse (Δ-2), raccoon (Δ-2), robin (Δ-1), crow (Δ-1), and mosquito (Δ-1) all witnessed negative rank changes (Table 2).

Table 2. Rank Changes in American's Attitudes toward Animals Scores Measured in 1978 and 2014

2014 Rank	Species	Δ Rank	2014 Rank	Species	Δ Rank
1	Dog	0	14	Coyote	1
2	Butterfly	3	15	Raccoon	-2
3	Eagle	5	16	Lizard	1
4	Horse	-2	17	Crow	-1
5	Robin	-1	18	Vulture	2
6	Elephant	3	19	Shark	0
7	Cat	4	20	Bat	1
8	Turtle	2	21	Skunk	-3
9	Swan	-6	22	Rattlesnake	0
10	Ladybug	2	23	Wasp	0
11	Salmon	-4	24	Rat	0
12	Trout	-6	25	Cockroach	1
13	Wolf	1	26	Mosquito	-1

Positive Δ Rank indicates a move up in rank in 2014 compared to 1978. Negative Δ Rank indicates a move down in rank in 2014 compared to 1978. Zero Δ Rank indicates no change.

3.5 Discussion

Despite three and a half decades of elapsed time between studies, attitudes toward animals were generally similar across the studies. However, public attitudes toward six of the eight animals were substantively more positive in 2014 than 1978. To the extent that these attitudinal indicators represent concern for animals generally, these data suggest that concern for animal welfare could be increasing in the United States. Importantly, attitudes toward domestic animals (i.e., horses, dogs, cats) did not change substantively; rather, substantive changes in scores were limited to wildlife. Our study was limited, however, in that it included only common companion animals, as opposed to domestic livestock. Nevertheless, the consistency in attitudes toward domestic animals may

indicate that concern for domestic animals was already high when the first study was conducted. Indeed, public policy regarding the care and management of domestic animals had already been in place for more than a decade at the time of the first survey (the U.S. Animal Welfare Act was signed into law in 1966); while policy evidence (in the form of ballot measures) demonstrating public concern for the individual well-being of wildlife does not appear until the 1990s (Pacelle, 1998).

The work of Manfredo and colleagues (Manfredo et al., 2003; Manfredo et al., 2009; Teel & Manfredo, 2010) provides a plausible explanation for why concern may be increasing. These researchers suggest that the ways in which Americans value wildlife are shifting away from mastery or domination orientation toward "mutualist" orientations, whereby wildlife are viewed "as part of an extended family, and deserving of caring and compassion" (Manfredo et al., 2009:412). Following the work of Inglehart and colleagues (Inglehart, 1997; Inglehart & Welzel, 2005) they attribute this shift to social forces related to modernization; specifically, they hypothesize that increasing levels of urbanization, income and education within societies are changing the way societies value and utilize wildlife. If social forces such as modernization are changing the way in which people value animals generally, then we might expect Americans' concern for both wild and domestic animals to increase with modernization (i.e., rising levels of education, urbanization and income). However, Manfredo and colleagues' work is focused on wildlife. In contrast with their findings, sociological research on concern for animals used in agriculture indicates neither education nor income are associated with concern when other factors are controlled—though childhood residency in rural areas is

negatively associated with concern (Deemer & Lobao, 2011). Interestingly, these researchers also found that concern was negatively related to religiosity (measured as church attendance), and positively associated with support for economic equality and tolerance for social outgroups. Although they differ with Manfredo and colleagues about the causes of changes in concern for animal welfare, both groups of researchers expect concern to increase in the future. Our data provide some initial support for the idea that concern, as indicated by attitudes, has increased.

Because our methods differed from Kellert's, some caution is warranted in interpreting differences between 1978 and 2014 respondents. Specifically, while Kellert's 1978 survey used personal interviews, we used a web-based, self-administered questionnaire. Our decision to deviate from Kellert's method was made, in part, because of the labor and costs associated with personal interviews, but also because electronic administration offered other advantages, such as the ability to present response items randomly, thus reducing the potential for ordering effects (Bowling, 2005; Dillman, 2011). Furthermore, GfK ABS methodology entails similar requirements to Kellert's probability random sample approach, but with the added advantage of having less social desirability bias than an in-person or telephone interview. These methodological choices increase our confidence that our data accurately reflect Americans' views about animals. Indeed, recent analyses indicate that probability-based internet samples provide results that can more accurately reflect populations than RDD phone surveys (Yeager et al., 2011). Nevertheless, we are unable to rule out that some of the differences observed

between the studies could be explained by methodological differences, as opposed to real change in attitudes over time.

The results of the current study also add to the complexity of already inconsistent findings in the literature on attitudes toward predators, where there is the most longitudinal research on attitudes toward animals (Williams et al., 2002; Ericsson & Heberlein, 2003; Karlsson & Sjöström, 2007; Houston et al., 2010; Majic & Bath, 2010). Studies on attitudes toward wolves exhibit particularly inconsistent results. Some suggest that attitudes toward wolves have remained relatively stable (e.g., Williams et al., 2002; Bruskotter et al. 2007), while others show that hunters and residents who live within wolves' range have become more negative (e.g., Treves et al., 2013; Ericsson & Heberlein, 2003), while still others have shown less polarization (i.e., increased prevalence of neutral attitudes) over time (see Majic & Bath 2010). In contrast to prior longitudinal research, where the focus has been predominantly on rural residents who live in wolf-occupied areas (e.g., Treves et al., 2013) or hunters (e.g., Ericsson & Heberlein, 2003), our research examined attitudes of the American public *in toto*, the vast majority of whom do not participate in hunting (Cordell, 2012) and reside in urban settings. Indeed, the U.S. Census Bureau (2014) now estimates that more than four in five of Americans reside in urban areas. Importantly, existing evidence suggest urban residence is associated with positive attitudes toward wolves (Williams et al., 2002); likewise, Manfredo and colleagues have found that urbanization is associated with greater prevalence of mutualism value orientations,and decreased levels of domination orientations (Manfredo et al., 2009), and Kendall et al. (2006) found that rural residency

is negatively associated with concern for animals used in agriculture. Although attitudes toward wolves may indeed be increasingly negative among residents of the areas wolves occupy (especially those negatively impacted by wolves; e.g., hunters, ranchers) (see Treves et al., 2013), our data suggest these changes are not detectable at the national level. Given that (a) the vast majority of the U.S. population lives in urbanized settings, (b) these settings are associated with positive attitudes toward wolves, and (c) urbanization is a hypothesized driver of both value shift and shift in concern for agricultural animals, it is therefore reasonable to conclude that any increased negativity in wolf-occupied areas may be "drowned out" because the areas wolves occupy in the United States are generally remote, and human population densities in these areas are extremely low (see: Bruskotter et al., 2014).

Jackman and Rutberg (2015) reported an increase in acceptance of coyotes in Cape Cod, Massachusetts, U.S. between the years of 2005 and 2012. The increase in positive attitudes toward coyotes found in the current study is consistent with their finding. Coyotes, in contrast to wolves, are often found in urban environments (Gehrt et al., 2009), increasing the chance for human-coyote interactions and potential conflict. However, research indicates that coyotes reduce the potential for negative conflict with humans by traveling through the urban matrix late at night when the risk of contact with humans is lowest (Gehrt et al., 2009; Gese et al., 2012). Thus, although coyotes and humans coexist in the same geographic space, most humans have little experience with these animals. Coyotes' behavioral avoidance of humans in urbanized setting may have contributed to the increase in positive attitudes toward this species.

Positive attitudes were also recorded for four other species: the bat, rat, vulture and shark. Again, all four of these species have been historically stigmatized, however, the past 30 years have also allowed for an increase in scientific study and dissemination of information about these species. As an example, in Peter Benchley's 1974 bestselling novel *Jaws,* as well as the films that followed, sharks were portrayed as a threat to human life, leading to an explosion of public interest and scientific research. The current study of American attitudes mirrors an increase in positive attitudes toward sharks in the U.K., where 64% of respondents reported positive attitudes toward sharks, expressing scientific and ecological interest among their reasons (Friedrich et al., 2014). Similarly, increased public concern and legislative actions regarding animals used in scientific research (Baumans, 2004; Pinker, 2011), might help explain why attitudes toward rats have become more positive. The increased exposure and attention given to these animals—and especially, instances of poor treatment of these animals—may contribute to increased empathy and positive attitudes. Furthermore, the popularization of science-based programming (e.g., Animal Planet and the National Geographic channel), combined with societal shift toward more mutualistic value orientations, could account for the increases in positive attitudes toward animals witnessed in this study. However, we caution the reader that our ideas about potential mechanisms are purely speculative and require future study to determine which mechanisms are driving these changes. The increases in positive attitudes toward wildlife demonstrated by this study could lead to increased support for species conservation activities. Given that attitudes toward companion animals remained very positive over time, we also expect continued support for policies

aimed at promoting the welfare of these animals, as evidenced by the continual updating and strengthening of the U.S. Animal Welfare Act (USDA, 2013).

Potential explanations for increased negative attitudes toward raccoons and swans are more challenging. The U.S. Fish and Wildlife Service recognizes raccoons as a common, urban nuisance species, and the United States Department of Agriculture (USDA) recognizes raccoons as a common crop predator. With increased urbanization in the U.S., human-raccoon conflict is on the rise (Barden et al. 1993). Conflicts include the invasion of and significant damage to human structures (Prange et al., 2003), as well as threats to human health via zoonotic diseases such as *Baylisascaris procyonis*, a large intestinal roundworm (Page et al. 2005). Herzog and Burghardt (1988) have shown that direct experience with an animal affects individuals' attitude towards that animal; thus we would expect negative attitudes toward raccoons to increase as a result of increased exposure bringing the possibility for negative interactions. Swans are not generally seen as urban nuisance animals, but mute swans are not native to the U.S. and are generally considered invasive in many areas throughout the U.S., possibly contributing to the increase in negative attitudes (Garćia-Llorente et al., 2008). However, this is only one possible explanation. Our use of the common name (i.e., "swans") to maintain repetition integrity of the 1978 study does not allow us to determine which species of the genus *Cygnus* is salient for respondents in the U.S. Although each of these explanations for attitude changes is plausible, a limitation to the current study is the lack of data to support the speculations regarding the underpinning mechanisms of attitudinal change. It is recommended that future research examine these mechanisms.

3.6 Conclusion

Research generally indicates that attitudes toward animals are useful for explaining public support for various animal management practices and policies (e.g., Bruskotter et al., 2009; Sponarski et al., 2015). Likewise, understanding changes in attitudes toward animals may help us to better understand the changing nature of human-animal relationships. Shifts in attitudes toward animals, as well as concern for animal welfare generally, are likely to impact how societies negotiate the trade-offs between conservation, agricultural productivity and animal welfare in the future. Increases in positive attitudes toward predators may foretell increased support for efforts to conserve these species, and support for policies that explicitly consider their welfare (e.g., bans on management practices generally seen as inhumane). Increases in positive attitudes toward predators could also signal increases in social conflicts surrounding their management, especially in areas where these species are abundant or where conflicts with predators are increasing (Treves et al., 2013).

Furthermore, consistent positive attitudes toward companion animals, coupled with continued growth in populations of these animals, may be contributing to both conservation and animal welfare crises. One recent study estimated that free-ranging domestic cats alone kill 1.3-4.0 billion birds and 6.3-22.3 billion mammals annually (Loss et al., 2013) negatively affecting the conservation of bird species and the potential of compromised welfare for the free-ranging cats. Currently, millions of cats and dogs are

relinquished annually to U.S. animal shelters (New Jr. et al., 2000), while untold numbers are simply abandoned, highlighting the ongoing animal welfare crisis.

Finally, although our study did not measure attitudes toward animals used in agricultural production, other evidence demonstrates high levels of public concern for their welfare (Deemer & Lobao, 2011; Pinker, 2011). Concern for the welfare of production animals may lead to policy that promotes more natural living conditions (e.g., moving livestock from confined facilities to open pastures); however, this may make livestock more vulnerable to predation, exacerbating the existing tension between concern for wildlife and domestic livestock.

Future studies that assess concern for production animals relative to wildlife species of conservation concern, as well as support for policies directed at conservation and animal welfare may be useful for understanding how individuals negotiate these tradeoffs. Ultimately, research suggests the public is increasingly skeptical regarding both the means used to manage wildlife (Slagle et al., in press), and the justifications provided for their management (Decker et al., 2015; Responsive Management/National Shooting Sports Foundation. 2008). Similarly, the rise in ballot initiatives in recent decades aimed at protecting wild and domestic animals alike (Pacelle, 1998) suggests concern for the welfare of animals is on the rise generally. Coupling concern for animal welfare with the projected growth in the world's human population and increasing demand for animal protein reveals an uneasy conflict between these important societal goals. Increasing concern for the welfare of animals could intensify social conflicts concerning these goals, as well as political pressures to find policy solutions. In this way, rising concern for the

welfare of animals could serve as a catalyst for innovation both in the management of wildlife and domestic animals. The innovation may be crucial for developing policies and practices to negotiate trade-offs in the Anthropocene.

Chapter 4: What motivates concern about animal welfare?

4.1 Abstract

Human concern for non-human species has a long history; yet little research has focused on the underlying mechanism(s) that motivate this concern. To address this gap, an electronic survey was issued to a total student population of 1,381. The population was split between two animal-focused disciplines: Animal Sciences and Environment & Natural Resources. The survey measured empathy (both human and animal oriented), animal value orientation (AVO) (an extension of wildlife value orientation), attitudes toward the treatment of animals, and behavioral decisions based on concern for animals. Empathy was found to have no significant relationship with either attitude towards the treatment of animals ($r = 0.109$) or behavior based on concern ($r = -0.032$). Although the student populations were chosen for their seemingly diverse orientation, no significant difference ($p<0.05$) was measured in the mutualism AVO, which accounted for a large portion of both student populations. The mutualist orientation was found to have a moderately statistically significant positive relationship with attitude toward the treatment of animals ($r = 0.461$, $p<0.05$) and with behavior ($r = 0.296$, $p<0.05$). Domination AVO was moderately and negatively correlated with attitude toward the treatment of animals ($r = -0.175$, $p>0.05$), as well as with behavior based on concern ($r = -0.181$, $p<0.05$). Results of this study suggest that, at least for a highly motivated population, animal value orientation plays a significant role in generating concern about animal welfare.

4.2 Introduction

Human concern for the well-being of nonhuman animals is certainly not a new phenomenon. In fact, it has a very long history with its origins in western society dating back at least as far as 55 B.C. when Cicero described a Roman crowd as protesting the butchering of elephants in a staged hunt (Cartmill, 1995). Some eastern religions also incorporate elements of concern for non-human others. Jainism in particular, which dates back at least as far as the first century B.C., reveres all life and has been a forerunner in protecting the rights of animals, plants and even micro-organisms (Jain, 2015). In western cultures, concern for animals has arguably expanded through the ages. In the 1700's people in England protested blood-sports (e.g. bear baiting and dog fights), which led to the first Society for the Prevention of Cruelty to Animals (SPCA) established in London in 1824, gaining royal patronage in 1837, and becoming the RSPCA in 1840. Henry Bergh founded the first SPCA in the U.S. in New York in 1866. Today, according to World Animal Net, more than 17,000 animal protection societies exist in more than 130 countries.

Human concern for animals is also represented by animal welfare legislation. Prior to the establishment of the United States, the Massachusetts Body of Liberties, published in 1641 (https://history.hanover.edu/texts/masslib.html), established 100 liberties intended as guidance for the General Court. Two of these liberties were directed toward the protection of animals (#92 & #93), and mandated that "no man shall exercise Tirranny or Crueltie towards any bruite Creature" and that "Cattel moved from place to

place must be rested or refreshed for competent time with access to meadow or open place." Since then, various U.S. states have developed animal cruelty/protection legislation, culminating in the introduction of the 1966 federal U.S. Animal Welfare Act (7 U.S.C. § 2131, P.L. 89-544).

Additionally, the past 40 years witnessed an increase in scientific investigation of animal welfare (D. Mellor, personal communication, December 16, 2013). The initial objective of this work was to identify and improve the conditions affecting agricultural animal production efficiency; however, over time the objective has evolved into identifying and improving conditions that affect the quality of life for all animal species, including both their physical and psychological welfare. More recently, scholars have become increasingly interested in research incorporating social and bio-physical sciences to objectively measure both animal and human welfare (see Hemsworth et al., 2009 as an example). Recent evidence suggests that increased scientific inquiry paralleled an overall increase of human concern for animals over the past four decades. George and colleagues (2016) measured the change in American attitudes toward animals over the past thirty years by conducting a national survey comparing preference attitudes toward a list of varied species also used by Stephen Kellert in his 1978 study (Kellert & Berry, 1980). They found that, in general, attitudes have remained similar; however, their results did identify substantive increase in positive attitudes toward four species that have historically been stigmatized (i.e., bats, sharks, vultures, and rats) and two species often regarded as harmful or threatening to humans or their property (i.e., wolves and coyotes). George et al (2016) conclude that these shifts are indicative of an increase in human

concern for animals generally. As additional evidence, these researchers cite a rise in the use of citizen-driven ballot initiatives aimed at protecting wildlife from practices such as trapping, often associated with an animal welfare concern (Minnis, 1998; Pacelle, 1998).

Yet, even with the increased pursuit of scientific knowledge in the area of animal welfare, scholars have only begun to identify the underlying mechanism(s) driving concern for animals (Kendall et al., 2006; Manfredo, 2009). Understanding these mechanisms could offer new insights to effective communication and educational efforts on this topic. Thus, the question becomes, what factors motivate an individual's concern about animal welfare?

Psychological research indicates that individuals process information through two systems: the *experiential system*, in which information processing is rapid and intuitive and judgments driven by affect and emotion, and the *analytic system*, in which information processing is slow, and judgments governed by logic and normative rules (Chaiken et al., 1989; Epstein, 1994). These systems are not separate; rather, they are intertwined, meaning the experiential system can affect the analytical (and vice versa). Although many factors determine the dominance of one system over the other, Epstein (1994) claims that emotional arousal and relevant experience alter the balance toward the experiential system. The most common emotion associated with concern is *empathy*. Empathy is defined as not only acknowledging an emotion felt by others (e.g., joy, sadness, pain, etc.), but by an individual actually experiencing or *feeling* that emotion as a result of the acknowledgement (Coleman et al., 1998; Stotland, 1969). The question then becomes who are "others" who evoke empathetic responding, and importantly, are

"others" limited only to humans or can they include non-humans as well? Elizabeth Paul (2000) considered this question in her study examining the potential link between human-oriented and animal-oriented empathy. Paul (2000) determined that human-oriented empathy (measured by a "modified version" of the Mehrabian and Epstein (1972) Questionnaire for the Measurement of Emotional Empathy (QMEE)) and animal-oriented empathy (measured by the Animal Empathy Scale (AES), developed specifically for her study) scores were significantly and positively correlated—though not particularly strongly (Kendall's tau=0.26, $p<0.001$, n=497), indicating that although the two types of empathy are linked, it is unlikely they represent the same construct. Baron-Cohen and Wheelwright (2004) extended the research examining the measurement of human-oriented empathy. They developed and tested a new instrument, the Empathy Quotient (EQ), designed to purely focus on human-oriented empathy. They claimed that EQ specifically isolated empathy, unlike other psychological instruments, which, they argued, measured multiple factors. Lawrence and colleagues (2004) further evaluated the EQ test, determining that it was a valid and reliable measurement of empathy. However, while these studies have assisted researchers in better understanding empathy and how to measure it, still relatively little is known about how emotion generally may impact concern for the well-being of animals.

One avenue that could hold promise is researcher on human values. Schwartz (2010) describes values as "beliefs linked inextricably to affect." Since World War II, a shift has occurred in societal values due to social and economic development, moving from "materialistic" goals to attain basic needs toward "post-materialistic" (or "self-

expression") goals transcending from basic needs to greater concern for others, which Inglehart (1997) identifies as modernization theory (Inglehart & Welzel, 2005). Applying this theory, Manfredo and colleagues (2009) present evidence that suggests a shift in people's basic beliefs about wildlife is currently underway in the U.S. Specifically, these researchers suggest that "mutualism" orientations, which emphasize care and compassion for wild animals, are increasing in prevalence, while "domination" orientations, which emphasize mastery over wildlife and have long been prevalent among Americans, are decreasing. In the parlance of ethics, a mutualism orientation recognizes wild animals as "moral patients" – that is, as entities that deserve to be treated with some regard for their own welfare, not merely as instruments to human ends.

We reasoned that expanding concern and compassion for wildlife (as captured in the "mutualism" scales) might be part of a general increase in moral inclusivity among Americans that encompasses more than just wild animals, but also domestic animals and even ecological collectives, as well. Further, preliminary work indicated that measures of mutualism and domination were related (positively and negatively, respectively) with attitudes toward animals generally (Bruskotter, J.T., unpublished data). The connection between values, attitudes and behavior has been extensively tested in the body of wildlife literature (see Bruskotter & Fulton, 2008, Fulton et al., 1996, Manfredo et al., 1997, Whittaker et al., 2006 as examples). However, to date this research has largely ignored the role of emotions such as empathy (but see: Vaske et al., 2013). Conversely, the current body of literature pertaining to domesticated animals has focused on the emotional connection to animals, specifically targeting empathy while largely ignoring

the role of values as predictors of people's animal-related judgments, decisions and behaviors (see Coleman et al., 1998, Paul, 2000 and Taylor & Signal, 2005 as examples). Thus, a deeper understanding of empathy, value orientation and attitude toward the treatment of animals in general could lead to a better comprehension of what motivates concern about animal welfare.

Study Context

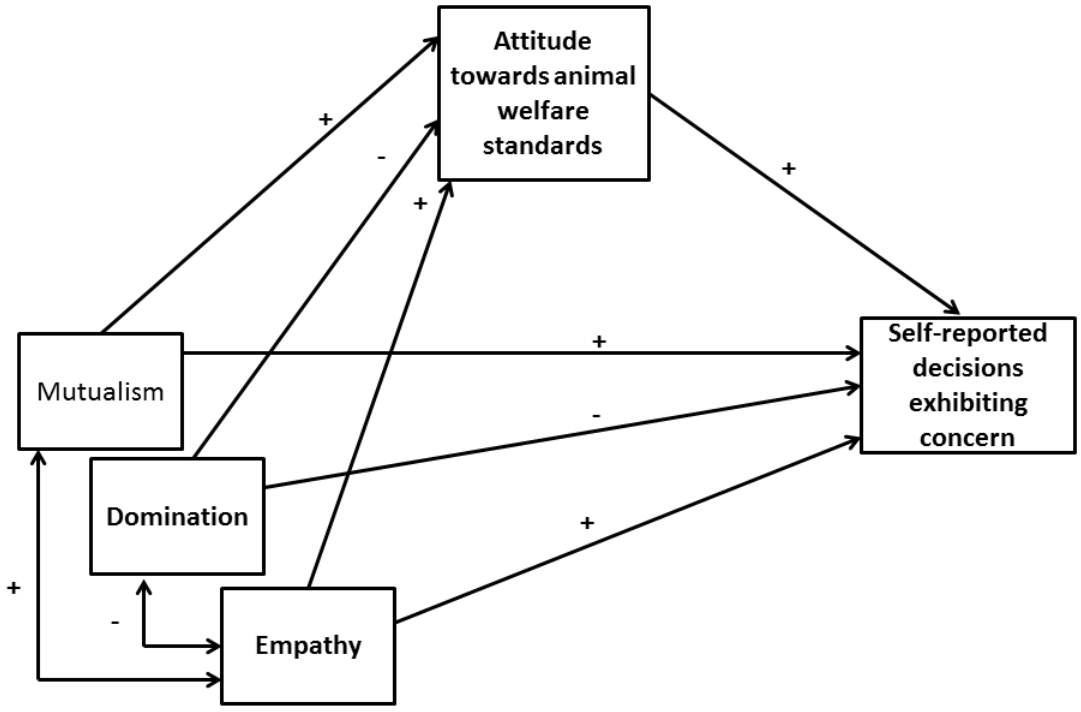
The objective of the current study was to better understand what motivates an individual's concern about animal welfare. Thus, the current study examined factors that might elicit concern for animals (i.e., empathy, value orientation, belief in animal sentience, attitude towards animal welfare standards, and belief in animal value) and their relationship with individuals' concern for animal well-being, measured by reported behavior related to concern. The population was students enrolled in the fields of Animal Sciences (AS) and Environment & Natural Resources (ENR) at The Ohio State University. The identified population offered the potential for a greater participation rate due to the representation of a motivated, yet potentially diverse, group of individuals concerned about animal welfare that also hold some level of objective knowledge regarding various animal species. We reasoned that these two student groups would differ in terms of their value orientations and species preference, as they often have competing interests and discourses regarding animals (i.e., AS = utilization of animals; ENR = preservation of animals). Species preference was measured in order to explore the possibility of differences in attitudes toward concern based on species category (e.g., animals on farm, perceived dangerous wildlife, etc.) as compared to animals in general.

The following hypotheses were tested:

1. Attitude towards species will vary based on academic discipline; that is AS majors will exhibit more positive attitudes toward animals on farm and ENR majors will exhibit more positive attitudes toward wildlife compared to other categories of species.
2. Animal value orientation will be positively correlated with academic discipline: AS with domination and ENR with mutualism.
3. Empathy will be positively correlated with concern for animal well-being.
4. Species preference will moderate the relationship between empathy and concern for animal well-being.
5. Mutualism animal value orientation will be positively correlated with concern for animal well-being.
6. Domination animal value orientation will be negatively correlated with concern for animal well-being.
7. Attitude towards animal welfare standards will be positively correlated with concern for animal well-being.

Figure 3 summarizes the study hypotheses. Arrows represent the proposed relationships between the study's variables.

Figure 3. Hypothetical model of concern for animal welfare behavioral intentions



4.3 Methods

An electronic survey was implemented using the Qualtrics platform over the course of two weeks in February, 2016 (see Appendix B for instrument). In total, 1,381 students received an invitation to participate in the study, approximately an equal number from each discipline, resulting in 325 completions (231 AS, 94 ENR), for an overall response rate of 24%. Other demographic information was collected such as student grade level (16% freshman, 21% sophomore, 24% junior, and 39% senior), gender (18%

male, 82% female), and if the student was currently or previously enrolled in the animal welfare course offered by the Department of Animal Sciences (11% enrolled, 89% not enrolled).

The survey instrument used a modified combination of the Empathy Quotient (EQ) developed by Baron-Cohen and Wheelwright (2004) and the Animal Empathy Scale (AES) developed by Paul (2000) to measure the personality characteristic empathy construct. Several questions on the combined empathy scale were reversed to help combat response bias. An adaptation of Manfredo et al.'s (2009) wildlife value orientations (i.e. *domination* and *mutualism*) was used to measure animal value orientations. The level of animal welfare concern was measured using a 7-points Likert-like scale (1=strongly disagree; 4=neither agree nor disagree; 7=strongly agree) of eight self-reported behavioral decisions (e.g., "I base my diet on my concern for animal welfare."). Lastly, the belief in (i.e. attitude towards) animal value and animal welfare standards was measured using an adapted version of the Paul and Serpell (1993) Scale of Attitudes Toward the Treatment of Animals (SATTA) and additional questions created by the research group.

In addition, respondents were presented 33 different species, one at a time, measuring attitudes toward specific animal species using a 7-points Likert-like scale (1=dislike extremely; 4=neither like nor dislike; 7= like extremely). Principle component analysis was conducted, resulting in six animal categories (Table 3). Preference mean scores were calculated using an independent samples T-test by academic discipline for each individual animal as well as each animal category (Table 4).

Table 3. Animal categories based on PCA of attitude means

Perceived as Pests	Perceived Non-dangerous Wildlife	Animals on Farm	Perceived Dangerous Invertebrates	Charismatic Animals	Non-descriptive
Cronbach's alpha **0.933**	**0.835**	**0.747**	**0.807**	**0.574**	**0.583**
bat	eagle	chicken	mosquito	dog	cat
coyote	butterfly	cow	cockroach	elephant	rabbit
crow	ladybug	pig	wasp	horse	squirrel
rattlesnake	robin	turkey		ape	
lizard	salmon				
skunk	swan				
raccoon	trout				
rat	turtle				
wolf					
shark					
vulture					

Table 4. Attitude mean scores calculated by academic discipline for animal categories and individual species

			AS			ENR	
Perceived as Pests	**t-test**	**Mean**	**Std Dev**	***n***	**Mean**	**Std Dev**	***n***
Pests	**-5.21***	**4.35**	**1.30**	**230**	**5.13**	**1.19**	**94**
bat	-4.23*	4.51	1.69	229	5.36	1.63	94
coyote	-4.41*	4.62	1.79	230	5.52	1.33	94
crow	-3.96*	4.21	1.51	230	4.96	1.60	94
lizard	-4.35*	4.70	1.59	229	5.50	1.28	94
raccoon	-3.90*	4.48	1.69	230	5.26	1.47	93
rat	-1.89	4.05	1.93	230	4.48	1.69	94
rattlesnake	-4.65*	6.46	1.92	230	4.52	1.84	94
shark	-4.45*	4.59	1.71	230	5.49	1.53	94
skunk	-3.94*	4.07	1.73	230	4.86	1.62	94
vulture	-4.24*	3.83	1.60	230	4.69	1.67	94
wolf	-2.85*	5.71	1.34	230	6.15	1.03	94
Perceived as Non-dangerous Wildlife							
			AS			**ENR**	
	t-test	**Mean**	**Std Dev**	***n***	**Mean**	**Std Dev**	***n***
Non-dangerous	**-4.82***	**5.09**	**0.78**	**230**	**5.60**	**0.87**	**94**
butterfly	-2.74*	5.45	1.19	230	5.86	1.25	94
eagle	-1.51	5.88	1.06	230	6.06	0.98	94
ladybug	-2.67*	4.39	1.51	230	4.90	1.60	94
robin	-4.32*	5.06	1.17	229	5.66	1.10	93
salmon	-6.72*	4.65	1.12	230	5.61	1.27	94
swan	-0.98	5.09	1.16	230	5.23	1.36	94
trout	-4.95*	4.49	1.06	230	5.18	1.31	94
turtle	-3.88*	5.72	1.07	230	6.21	0.97	94

Attitude means based upon scale ranging from 1 (dislike extremely) to 7 (like extremely) scale.

* designates statistically significant difference in means at $p<0.05$

Continued

Table 4 continued

			AS			ENR	
Perceived as Dangerous Invertebrates							
	t-test	**Mean**	**Std Dev**	***n***	**Mean**	**Std Dev**	***n***
Invertebrates	**-3.69***	**2.03**	**1.13**	**230**	**2.59**	**1.26**	**94**
cochroach	-3.76*	2.16	1.37	230	2.81	1.49	94
mosquito	-1.58	1.70	1.15	230	1.93	1.21	94
wasp	-4.16*	2.23	1.39	230	3.02	1.87	94
Animals on Farm							
			AS			**ENR**	
	t-test	**Mean**	**Std Dev**	***n***	**Mean**	**Std Dev**	***n***
Farm	**-0.26**	**5.53**	**0.84**	**230**	**5.55**	**0.93**	**94**
chicken	1.65	5.21	1.33	230	5.46	1.19	94
cow	3.42*	6.24	0.85	229	5.86	0.94	93
pig	-0.07	5.66	1.13	230	5.67	1.12	94
turkey	-1.53	4.99	1.24	229	5.22	1.30	94
Charismatic Animals							
			AS			**ENR**	
	t-test	**Mean**	**Std Dev**	***n***	**Mean**	**Std Dev**	***n***
Charismatic	**-1.57**	**6.11**	**0.71**	**230**	**6.25**	**0.70**	**94**
ape	-2.12*	5.34	1.43	230	5.70	1.36	94
dog	1.56	6.82	0.51	230	6.70	0.67	94
elephant	-2.53*	6.14	0.98	230	6.43	0.78	94
horse	-0.12	6.14	1.12	229	6.16	1.03	94

Attitude means based upon scale ranging from 1 (dislike extremely) to 7 (like extremely) scale.

* designates statistically significant difference in means at $p<0.05$

Continued

Table 4 continued

Non-descriptive							
			AS			ENR	
	t-test	**Mean**	**Std Dev**	***n***	**Mean**	**Std Dev**	***n***
Non-descriptive	**-0.94**	**5.76**	**0.88**	**230**	**5.86**	**0.92**	**94**
cat	1.27	6.1	1.31	230	5.89	1.47	94
rabbit	-2.01	5.73	1.01	230	5.97	0.94	94
squirrel	-1.94	5.44	1.27	230	5.72	1.14	94

Attitude means based upon scale ranging from 1 (dislike extremely) to 7 (like extremely) scale.
* designates statistically significant difference in means at $p<0.05$

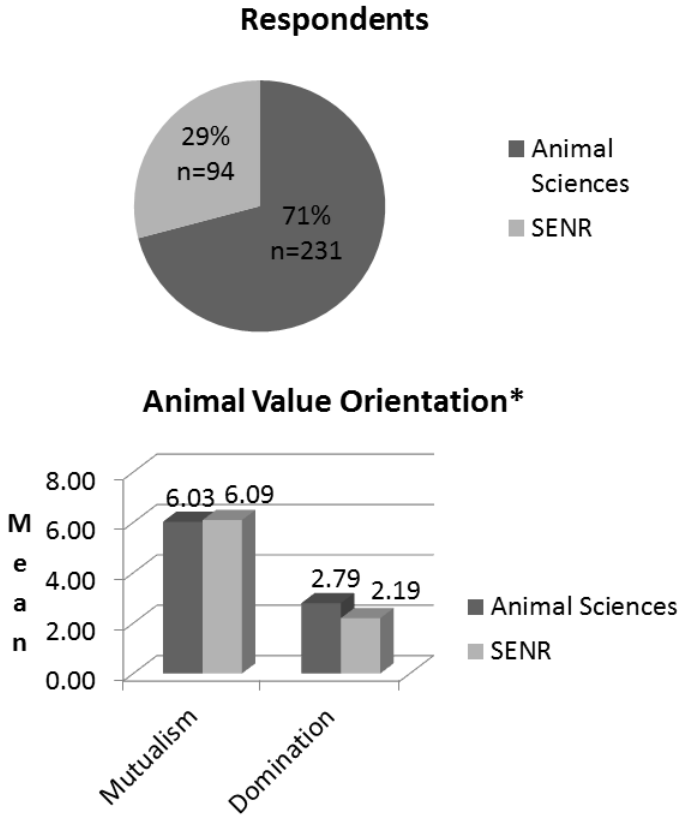
4.4 Results

Species attitudes differed significantly ($p<0.05$) by discipline in three of the six animal categories (i.e., perceived as pests, perceived non-dangerous wildlife, and perceived dangerous invertebrates) and for 21 of 33 individual species (Table 4). No significant difference between majors exists for attitudes toward animals on farm, charismatic animals, or non-descriptive animals. The student populations possess a significant difference ($p<0.05$) in the domination orientation but no significant difference between the two groups in the mutualism orientation (Fig 4). These results only partially support hypothesis 2. The student population did not differ in terms of empathy (Table 5). Interestingly, the original study design chose a student population assumed to be motivated in concern for animals, while diverse in other aspects, but results demonstrate that the populations are more similar than expected; therefore, the total student population was combined in subsequent analyses to test hypotheses 3-7.

The modified empathy scale (Table 5) was determined to represent a reliable measure ($\alpha = 0.778$). (George and Mallery (2003) provide the following scale for interpretation of Cronbach's alpha: >0.9=Excellent, >0.8=Good, >0.7=Acceptable, >0.6=Questionable, >0.5=Poor, and <0.5=Unacceptable.) Overall, both student populations scored high on the combined empathy scale (AS = 5.578; ENR = 5.512 on a 7-pt Likert-like scale with 7 being the highest score). However, empathy was found to have a weak, non-significant relationship ($r = 0.109$) with attitude towards animal welfare concern, resulting in no support for hypothesis 3. Empathy also showed a weak, non-significant relationship with self-reported behaviors based on concern for animals ($r = 0.090$). Species preference was tested as a moderator for the relationship between empathy and attitude towards animal welfare concern using regression modeling. No moderating relationship for any of the six species categories was found, resulting in no support for hypothesis 4.

An independent t-test comparing self-reported behaviors that exhibit concern for animals was conducted comparing student disciplines, resulting in significant differences on six of the eight behaviors measured (Table 6).

Figure 4. Population statistics and animal value orientation mean scores



* Means determined by a 1 (strongly disagree) to 4 (neutral or midpoint) to 7 (strongly agree) scale.

Mutualism AVO was found to have a moderate statistically significant positive relationship ($r = 0.461$, $p<0.05$) with attitude towards animal welfare concern, supporting hypothesis 5, and statistically significant with behaviors that exhibit concern for animals ($r = 0.540$, $p<0.05$). Domination AVO was found to have a moderate statistically significant negative relationship ($r = -0.175$, $p<0.05$) with attitude towards animal welfare concern, supporting hypothesis 6, as well as a statistically significant negative

relationship with self-reported behaviors that exhibit concern for animals ($r = -0.274$, $p<0.05$).

Principle component analysis of items assessing attitudes toward animal welfare standards resulted in a three-factor solution, which we generally labeled attitudes toward animal welfare standards, belief in animal value, and belief in animal sentience, resulting in Cronbach's $\alpha = 0.814$, $\alpha = 0.728$ and $\alpha = 0.624$ respectively. Bivariate correlations were performed to determine relationships between variables. A strong statistically significant positive relationship was found between attitude towards animal welfare standards and behavioral decisions based on concern for animal well-being ($r = 0.528$, $p<0.05$), supporting hypothesis 7. No significant relationship was found between belief in animal value or belief in animal sentience with behavioral decisions based on concern for animal well-being.

The hypothetical model was tested using the PROCESS macro in SPSS, developed by Hayes (2013). After finding no evidence of moderation, we used the PROCESS model 4 (i.e. mediation analysis) whereby empathy and AVOs (mutualism and domination) were independent variables (i.e. covariates), attitude towards animal welfare concern was a mediating variable, and self-reported behaviors that exhibit concern for animals as the dependent variable (Fig 5). The model explained 32% of the variance when attitudes toward welfare concern was not included and 45% of the variance when it was included; therefore, supporting the hypothesis that attitudes toward animal welfare standards mediates the relationship between AVOs and self-reported

behaviors exhibiting concern for animals. Additionally, all of the covariate relationships were determined to be statistically significant (Figure 5).

Table 5. Modified EQ and AES questions used to measure empathy

		N	Mean	Std. Deviation	Std. Error Mean
Combined Empathy Scale	AS	230	5.578	0.659	0.043
	ENR	94	5.512	0.763	0.079

Questions used for combined empathy scale		N	Mean	Std. Deviation	Std. Error Mean	Cronbach's alpha
It upsets me when I see helpless old animals.	AS	230	6.026	1.073	0.071	0.777
	ENR	94	5.947	1.379	0.142	
I get very angry when I see animals being ill treated.	AS	227	6.599	0.654	0.043	
	ENR	94	6.468	1.114	0.115	
Seeing animals in pain upsets me.	AS	230	6.470	0.763	0.050	
	ENR	94	6.479	1.024	0.106	
I am good at predicting how someone will feel.	AS	230	5.196	1.153	0.076	
	ENR	94	5.053	1.230	0.127	
I can sense if I am intruding, even if the other person doesn't tell me.	AS	230	5.674	0.931	0.061	
	ENR	94	5.713	1.103	0.114	
I can tune into how someone else feels rapidly and intuitively.	AS	230	5.348	1.182	0.078	
	ENR	94	5.138	1.449	0.149	
I can easily work out what another person might want to talk about.	AS	229	5.052	1.119	0.074	
	ENR	94	5.074	1.211	0.125	
I can tell if someone is masking their true emotion.	AS	230	5.270	1.026	0.068	
	ENR	94	5.255	1.261	0.130	
It is hard for me to see why some things upset people so much. *	AS	199	4.739	1.697	0.120	
	ENR	81	4.741	1.759	0.195	
Seeing people cry doesn't really upset me. *	AS	206	5.272	1.569	0.109	
	ENR	84	5.048	1.783	0.195	
Other people often say that I am insensitive, though I don't always see why. *	AS	207	5.667	1.561	0.109	
	ENR	82	5.585	1.571	0.173	

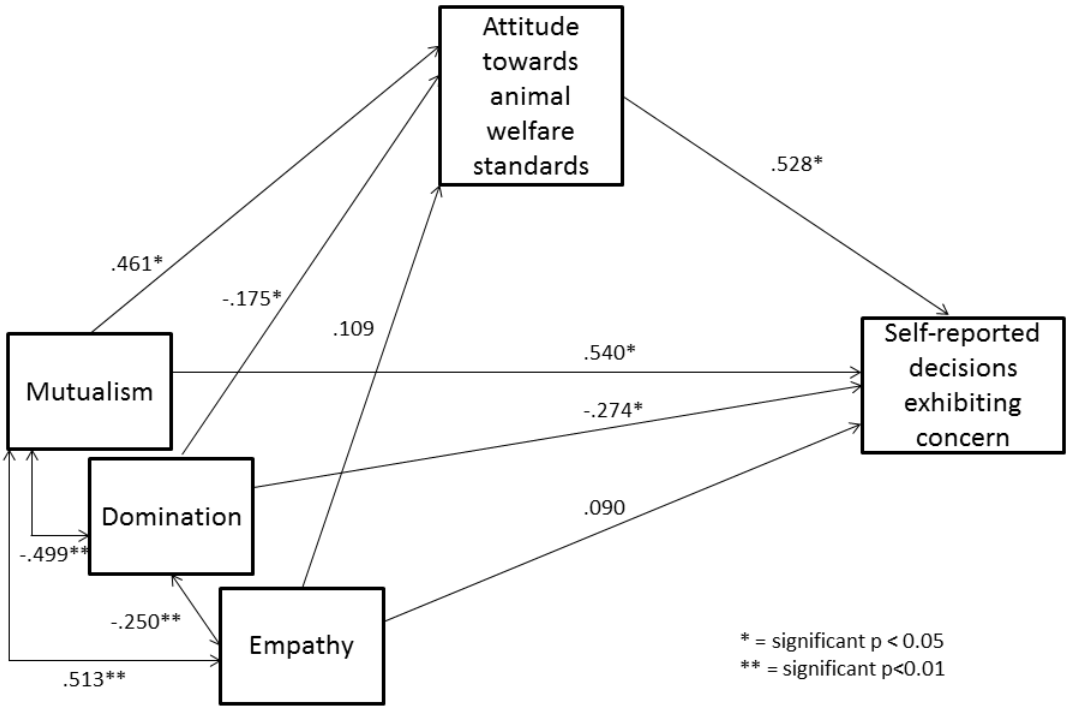
* Questions were reverse coded.

Table 6. Self-reported behaviors based on concern for animals

		N	Mean	Std. Deviation	t-test
I consider the welfare of an animal when I make decisions about how to interact with them.	AS	229	5.86	1.135	-2.15*
	ENR	94	6.16	1.139	
I financially support animal welfare organizations.	AS	230	3.55	1.784	-0.19
	ENR	93	3.97	1.844	
I make purchasing decisions based on animal welfare standards.	AS	230	3.80	1.770	-4.59*
	ENR	94	4.78	1.692	
I refuse to visit zoos based on my concern for animal welfare.	AS	230	2.24	1.302	-0.55
	ENR	93	2.33	1.378	
I would support governmental policies to enforce best animal welfare practices.	AS	229	5.77	1.257	-3.56*
	ENR	93	6.28	.864	
I base my diet on my concern for animal welfare.	AS	230	2.78	1.691	-6.30*
	ENR	94	4.17	2.041	
I refuse to purchase products developed through animal testing.	AS	229	3.20	1.773	-4.98*
	ENR	94	4.34	1.904	
I refuse to visit a circus based on my concern for animal welfare.	AS	230	3.59	1.989	-5.15*
	ENR	94	4.86	2.035	

Means based upon scale ranging from 1 (strongly disagree) to 7 (strongly agree).
* designates statistically significant difference in means at $p<0.05$

Figure 5. Statistical model of concern for animal welfare behavioral intentions



4.5 Discussion

The objective of the current study was to determine the underlying mechanism(s) that motivate individual concern about animal welfare. Results of this study demonstrate that with a highly motivated population (i.e., students in an animal-related field), animal value orientation plays a significant role (both mutualism and domination tested statistically significant $p<0.05$) in motivating concern about animal welfare. Conversely,

empathy was not significantly related to attitudes toward animal welfare standards, nor self-reported behaviors exhibiting concern for animals. Although not a primary objective in the study, data also supports Schwartz's recognition of the relationship between emotion and values; specifically, we found relatively strong relationships between empathy and both mutualism and domination. This finding suggests that empathy measured as a personality characteristic might be one of the drivers determining animal value orientation. This idea compliments Manfredo and colleagues use of Ingelhart's post-materialism theory as the potential mechanism for the seemingly shift in societal values. That is, as society becomes more affluent and less focused on basic needs, individuals have the freedom to consider others and other's needs – to become more empathetic, which may aid in value shift. Moreover, our total student population, which is predominately an urban/suburban demographic, scored high on the mutualism AVO scale, supporting Ingelhart's idea that as the general population shifts from a rural to a more urban society, their values will also shift toward post-materialism, which Manfredo and colleagues equate to a shift towards the mutualism orientation.

The current study's population scored high on the empathy scale (as indicated by mean). It is reasonable that the current student population was originally attracted to their respective academic disciplines due to their emotional attachment to animals, resulting in the increased motivation to seek and process information regarding animal well-being. Use of a motivated population is a limitation, as our results may not generalize to less motivated populations. Nevertheless, it is plausible that the general population may also be highly motivated regarding concern for animal well-being, albeit less informed.

Kellert and Westervelt (1983) examined how animals were depicted in U.S. news media from 1900-1976 and found a shift from "utilitarian" depictions (emphasizing material value of animals) to a more "humanistic" depiction (emphasizing affection for animals). Manfredo and colleagues (Manfredo et al., 2003; Manfredo et al., 2009; Teel & Manfredo, 2010) have also found evidence that a societal shift in American views regarding wildlife may be underway. Their research suggests that American wildlife value orientations are shifting away from the domination orientation toward a mutualistic orientation; although their data does not explicitly demonstrate a population majority holding mutualistic values.

Interestingly, the two populations of students (AS and ENR) varied substantially on species preference, differing statistically on three of the six species categories (i.e., perceived as pests, perceived non-dangerous wildlife, and perceived dangerous invertebrates). Overall, the ENR student population possesses more positive attitudes towards individual species than the AS student population (with the exception of domestic species—i.e., cow, dog, and cat). This could be explained by the foci of the academic discipline. The Animal Sciences program at The Ohio State University offers a pre-veterinarian curriculum, attracting students interested in companion animals. Additionally, the AS program includes an agricultural curriculum, which offers a focus in dairy and beef cattle management. Given the survey instrument generically used cow as a species, those students interested in either dairy or beef cattle may hold positive attitudes toward this species.

Past national surveys measuring attitudes toward species (George et al., 2016; Kellert & Berry, 1980) did not include animals on farm so there is no comparison available. However, Driscoll (1995) conducted a survey in Colorado using a convenience sampling technique, so in general, the population was the co-workers, family, and friends of the students enrolled in a research methods class at the University of Colorado at Denver. Driscoll's instrument included chicken, sheep, pig, and turkey, but the respondents were not asked to score attitude; rather the respondents were asked to rate the species on the following six dimensions: useful-useless; smart-stupid; responsive-unresponsive; lovable-unlovable; safe-dangerous; and important-unimportant. The chicken and turkey were reported as high in usefulness, importance, and safety, but were considered stupid and unlovable. The pig and sheep were reported to receive high ratings in usefulness, importance, smartness, lovableness, and responsiveness. Although the current study did not include sheep, the respondents (both academic disciplines) reported a high positive attitude towards animals on farm, conceivably demonstrating once again the societal value shift from a doministic orientation toward a more mutualistic orientation.

The combination of the EQ (developed to measure human-oriented empathy) and the AES (developed to measure animal-oriented empathy) was used in the current study as a general measure of empathy as a personality characteristic, resulting in no statistically significant relationship with behaviors associated with concern for animals. These results support the findings of Coleman and colleagues (1998), who determined that empathy does not directly predict behavior towards animals. (These researchers used

the QMEE to measure empathy, developed to measure human-oriented empathy, additionally used by Paul (2000) in her development of the AES.) It is plausible that people possessing a high empathetic score would avoid thinking about or engaging in activities that would arouse a negative emotion (or dissonance) such as empathy, resulting in no significant relationship between empathy, measured as a personality characteristic, and behavior towards animals. The current study's empathy results disagree with the claims by Taylor and Signal (2005), who concluded when considering empathy as a specific construct, there is a significant relationship between it and attitudes toward animals. However, it should be recognized that the current study correlated empathy with a different attitude object (attitude towards animal welfare standards), which could account for the difference in results.

Overall, results suggest that AVOs present a better explanation as to what motivates concern about animal welfare than the other factors (i.e. belief in animal sentience, belief in animal value, or empathy) examined in this study. Furthermore, the relationship between values and behavior, in this case, AVOs and self-reported behaviors exhibiting concern, are best explained when attitude serves as a mediating variable, in this case, attitude towards animal welfare standards, offering additional support to the value-attitude-behavior theory. In the case of domestic animals, the current study offers a new understanding of the underlying mechanism(s) that motivates concern – that is, values more than empathy. Although empathy did not serve as a good predictor in the current model, results do support the relationship between empathy and values.

Caution should be used when interpreting our results for empathy. That is, although empathy did not serve as a good predictor for behavior exhibiting concern, it should not be ignored. For example, if empathy were measured as a discrete response to a particular policy, animal handling practice, or event, as opposed to a personality characteristic (as it was assessed here), then we might expect empathy to be more strongly associated with behavioral responses. Affective responses to emotionally distressing information guide our abilities to make rational decisions (Damasio, 1994) and play an important role in controversial situations (Slagle et al., 2012).This affective response can present a cognitive challenge or tension if the individual behavior does not align with the response (Festinger, 1962). Often the solution to this tension is to negate the information that has caused this misalignment. As an example, if I eat meat but am given new information just prior to eating meat that questions the well-being of the animal used for my meal, I may either determine the information to be false so that I am comfortable with my decision to eat the meal, or I may chose not to eat that particular animal product, either way avoiding the potential for cognitive tension. Due to this possibility, as well as the relationship demonstrated between emotion and values, empathy should not be totally discounted.

4.6 Conclusion

The current study explored the underlying mechanism(s) that motivates individual concern about animal welfare. It was found that empathy, measured as a unitary construct and scoring high amongst the population, has no significant relationship with attitude

towards animal welfare standards or with behaviors associated with concern for animals. Conversely, animal value orientations (AVOs), measured here for the first time beyond wildlife species, have significant relationships with both attitude towards animal welfare standards and behaviors associated with concern for animals. Therefore, based on this highly motivated population, we conclude that animal value orientations are one such mechanism used when forming decisions regarding concern about animal well-being. Recognizing the significant relationships between AVOs, attitudes toward animal welfare, and behaviors based on concern may serve as a critical component for effective communication and educational efforts on the topic of concern for animal well-being. Hence, these efforts should not simply focus on an empathetic arousal; rather these efforts should also include scientific data and other information useful for analytical processing, capitalizing on the cognitive process. Moreover, this study supports the continuation to objectively measure animal welfare through scientific experiments in order to disseminate and teach findings, making these data available for cognitive processing, ultimately improving animal well-being by motivating human concern.

Chapter 5: Does experiential learning affect attitudes toward animal conditioning practices?

5.1 Abstract

Experiential learning serves as a valuable teaching tool to engage the participant in the learning process. The objective of this study was to establish if experience with an animal management practice affects attitudes toward that practice. University students enrolled in a course taught in the Department of Animal Sciences at The Ohio State University were the subjects for this study. The course offered students hands-on experience with animal management practices, some of which were potentially contentious in nature (i.e. piglet, chick, calf, and lamb conditioning). Researchers employed a pre-/posttest methodology to measure change in attitudes toward these practices as a result of the course. Potentially confounding mechanisms were assessed (e.g., empathy, animal value orientation, attitude toward animal treatment, student rank, student discipline, and gender). These predictor variables showed no significant effect; however substantial change in attitude was found in four of the five animal conditioning practices, suggesting that experiential learning affects change in attitude and potentially promotes critical thinking.

5.2 Introduction

The goal of any educational setting is to increase participants' understanding of prescribed concepts. Facts, figures, and theories can be explored and comprehended via multiple teaching methods. One valuable method is "hands-on" experience (Haury & Rillero, 1994). James Rutherford (1993), director of the science reform initiative, Project 2061, describes hands-on teaching as offering students the opportunity to learn by experience, which has been successfully demonstrated as a means to understanding scientific principles (Haury & Rillero, 1994). This method, known as Experiential Learning Theory (ELT), is the process by which knowledge is created through the transformation of experience (Kolb et al., 2001). The current study assesses the learning objective, 'to encourage critical thinking' in relation to standard animal conditioning practices currently used within the animal agricultural industries. In general, these practices include, but are not limited to: piglet conditioning (i.e., ear notching, teeth clipping and castration), chick conditioning (i.e., beak trimming), dairy calf conditioning (i.e., disbudding and castration), beef calf conditioning (i.e., dehorning and castration), and lamb conditioning (i.e., tail docking and castration). Critical thinking (CT) is described as the evaluation of arguments or propositions and making judgments that can guide the development of beliefs and taking action (Asleitner, 2013). Experiential learning may serve as a mechanism to promote CT by affording the learner an opportunity to understand and evaluate the situation systematically (i.e., beyond simple intuitive processing). In the current study, change in judgment towards how current animal conditioning practices are employed may be an indicator of CT. The question this

study sought to answer is: does experiential learning impact attitudinal change, and if so, what factors may affect this impact (e.g., empathy, animal value orientation (AVOs), attitude toward animal treatment (SATTA), student rank, student discipline, and gender), specifically in regard to judgments or attitudes toward animal conditioning practices, some of which were potentially contentious in nature. Contentious practices include those that include an ethical judgment. An example in animal agricultural industry is chick beak trimming, sometimes referred to as "debeaking." This practice is commonly used in the broiler industry due to the tendency for chickens to feather peck when in proximity to others, causing injury and sometimes death. By trimming the beak of the chick at a young age, industry believes this minimizes damage and improves conditions for chickens. It is also been suggested that by performing this procedure early in life, the pain of the procedure is reduced. Hence, a practice such as this provides an opportunity to determine if experiential learning affects attitudes toward the practice, given the judgment on the effect on animal well-being.

The term "animal welfare" is used to refer both to science aimed at understanding factors that impact animal well-being, and to policies and decisions aimed at the promotion of animal well-being. That is, it is commonly used to refer to questions of both a descriptive (i.e., what *is*) and prescriptive (i.e., what *should be*) nature (Fraser, 1999). Fraser (2008) notes, "Our understanding of animal welfare is both values-based and science-based…where the tools of science are used within a framework of values" (p. 1). Animal agriculture by its very nature employs management practices that impact animal well-being. Some of these practices are contentious given the personal ethical decision of

how an animal *should be* treated. In particular, early animal conditioning practices offer an opportunity to scientifically and objectively measure the effect on the animal's biological function, affective state, and natural living (recognized as the three basic areas of animal welfare) (Fraser, 2003) of the conditioned animal, meeting the descriptive component of animal welfare, as well as offering a need for an ethical decision as to whether the animal should be treated in this manner, satisfying the prescriptive component.

Following Fraser's definition, an element of animal welfare issues is value-based. Values are developed through socialization and are defined as few, slow changing, and enduring (Homer & Kahle, 1988; Rokeach, 1973). Schwartz (2010) describes values as "beliefs linked inextricably to affect". Values can be shared by individuals but how the individual orients their values may differ. Animal value orientations (AVOs) are an extension of the wildlife value orientations (WVOs) developed by Manfredo and colleagues (2009). These researchers characterize WVOs as *domination*, consumptive in orientation, and *mutualism,* appreciative in orientation, with life forms having rights like humans as part of an extended family, and deserving of care and compassion. Of note, WVOs have been tested beyond wildlife species and were found to hold consistent for agricultural animals, as well as companion animals (George et al., in review). Individual values and how one orients these values, lead to attitudes toward a target (Eagly & Chaiken, 1993). In the case of the current study the targets are the animal conditioning practices and the animal itself.

Study Context

The objective of the current study was to determine what factors influence the success of experiential learning measured through the change of attitude towards animal conditioning practices. The Department of Animal Sciences at The Ohio State University offers an *Animal Handling* course available to all university students. A course objective is to provide an understanding of animal caretaker skills and techniques, encompassing animal behavior and how animal behavior impacts handling and management, ultimately leading to more humane animal care. The learning objective is met through lecture exposure and laboratory (i.e., hands-on) experience, performing caretaker techniques, which include early animal conditioning practices. Using student responses generated within this course, the following hypothesis was tested: Gender, level of empathy, AVO, and SATTA will increase predictability of change in attitude towards animal conditioning practices.

5.3 Methods

A pre-/posttest methodology using an electronic survey distributed using the Qualtrics platform was employed to the student population enrolled in the Animal Sciences' *Animal Handling* course during the spring 2016 semester. The pre-test was distributed and data collected at the beginning of the 7-week course, before any lecture or hands-on experience initiated. The posttest was distributed and data collected at the end of the 7-week course, after the students had been exposed to the experiential learning involving animal conditioning practices and caretaker techniques, as well as lecture

materials describing the practices. In total, 58 students were enrolled in the course and received an invitation to participate. The course instructor offered bonus participation points (1% of final grade) to participate in the study. As a result, all 58 students completed the pre-test survey, resulting in 100% participation; compared to only 51 students completing the posttest survey, resulting in 88% participation. Other demographic information was collected including student grade level (22% freshman, 22% sophomore, 16% junior, and 41% senior) and gender (84% female and 16% male).

The survey instrument used a modified combination of the Empathy Quotient (EQ) human-oriented empathy scale developed by Baron-Cohen and Wheelwright (2004) and the Animal Empathy Scale (AES) developed by Paul (2000) to measure the unitary empathy construct. An adaptation of Manfredo et al.'s (2009) WVO scale was used to measure AVO. Attitude towards animal welfare standards was measured using an adapted version of the Paul and Serpell (1993) Scale of Attitudes Toward the Treatment of Animals (SATTA). Attitudes toward the specific species encountered were measured using a 7-point, bipolar response scale (1=dislike extremely to 7=like extremely). Lastly, attitudes toward specific animal conditioning practices were measured using the following response scale: 1) the current practice is acceptable with no changes necessary; 2) the current practice is acceptable if, and only if an anesthetic is used prior to the procedures; 3) the current practice is acceptable if, and only if an analgesic is administered after the procedures; 4) the current practice is acceptable if, and only if an anesthetic is used prior to and an analgesic is administered after the procedures; and 5) the current practice is unacceptable.

Supplemental data analyses included: (1) a principal component analysis on both pre- and posttest SATTA data, creating SATTA categories; (2) correlations between gender and empathy, empathy and AVOs, and AVOs and SATTA categories; and (3) a paired T-test comparing pre-test attitudes toward individual species to posttest attitudes toward the individual species after experiential intervention.

Logistical regression analysis was employed to calculate the probability that a participant would have a change in attitude towards the method of animal conditioning practices. The potential for change in attitude exists due to the fact that the student population is inexperienced with the animal conditioning practices, that is, the student population in the Department of Animal Sciences at The Ohio State University is predominately urban/suburban with little to no experience with agricultural animals or industry practices; therefore, their attitude stability is low. Gender, student rank (used in this study as previous experience due to other coursework), level of empathy (measured as a personality characteristic), AVO, and SATTA were used as predictor variables and change in attitude towards animal conditioning practices was measured as a dichotomous dependent variable (i.e., 0 = “no change” and 1= “change”) between the pre- and posttest data. Additionally, percentage of participant responses were calculated for each possible decision regarding acceptance of animal conditioning practices for each species examined (i.e., piglet, chick, dairy calf, beef calf, and lamb). Percentages were then compared across pre- and posttests and evaluated using z-scores.

Table 7. SATTA principal component analysis categories

Functionality	Empathetic
As long as adequate food, warmth, ventilation and light are provided, there is nothing cruel about battery hen farming.	Intensive battery egg production is cruel and unnatural.
Animals killed for food should be harvested humanely under strictly controlled conditions.	The export of live food animals such as sheep should be stopped because it causes considerable suffering.
Transport of food animals, such as sheep or cattle, by road and rail involves little or no discomfort or cruelty.	It is morally wrong for people to kill animals for food when alternative vegetarian diets are available.
In order to produce affordable meat, efficient production methods should be the first priority of farmers	Keeping farm animals such as pigs and veal calves in small crates where they cannot even turn around is utterly in humane.
The fact that intensively farmed pigs grow well and produce large litters of piglets shows that they are clearly not suffering	Analgesics should always be administered when performing a painful procedure on an animal.
Human beings are naturally meat-eaters, so we shouldn't feel guilty about killing animals for food.	Anesthetics should always be administered before performing a painful procedure on an animal.
Mammals deserve a higher level of treatment than other animals.	

5.4 Results

Principal component analysis on SATTA data revealed two categories (labeled by research team) – *functionality,* questions related to the humane treatment and use of animals (Cronbach's α=0.791) and *empathetic,* questions related to the humane treatment and non-use of animals (Cronbach's α=0.834) (Table 7).

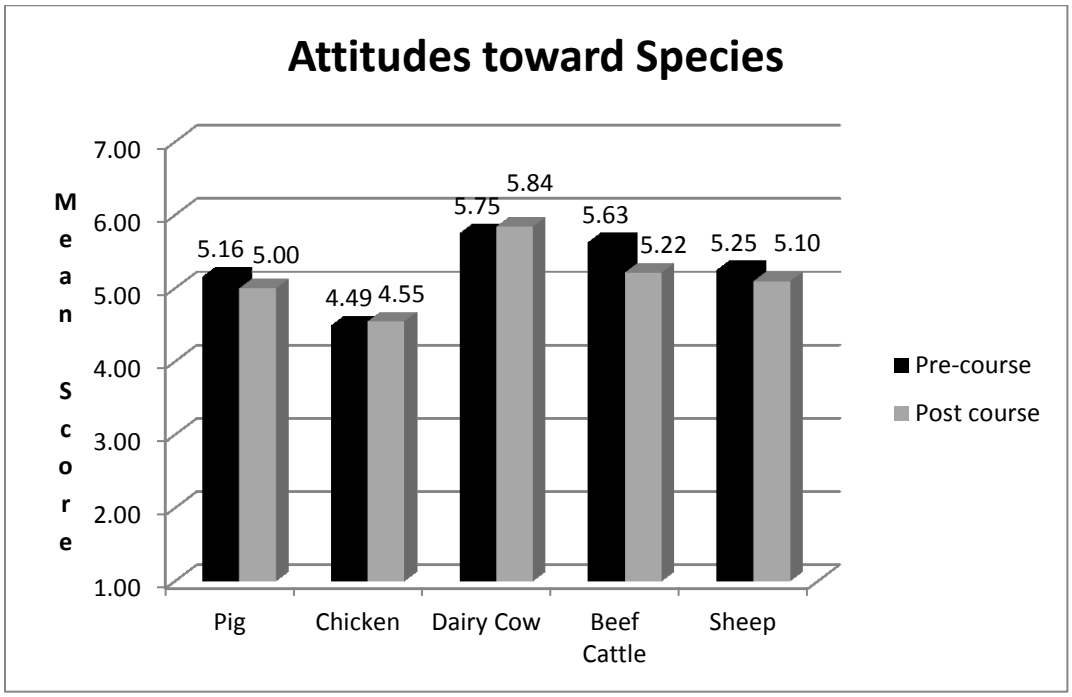
Mean scores for pre- and posttests AVOs were compared using a statistical assessment approach. On a 7-point scale (1 = strongly disagree; 4 = neither agree nor disagree; 7 = strongly agree), mutualism mean scores were 5.83/5.67 and domination mean scores were 3.19/3.31, resulting in no significant difference or change between pre-

and posttest outcomes. Given the consistency of SATTA categories and AVOs across the two tests, only the posttest data was used to measure relationship between the variables.

Correlation analysis of gender and empathy found a significant relationship ($r = 0.370$, $p<0.01$). Empathy and mutualism AVO also exhibited a significant correlation ($r = 0.822$, $p<0.01$) but empathy was not significantly correlated with domination AVO ($r = 0.197$, $p<0.01$). Mutualism AVO significantly correlated with both functionality and empathetic SATTA ($r = 0.359$, $p<0.01$ and $r = 0.520$, $p<0.01$, respectively). Domination AVO was significantly correlated with functionality SATTA ($r = 0.704$, $p<0.01$) but not with empathetic SATTA ($r = 0.009$).

Additional analysis compared the effect of experiential intervention on attitudes toward an individual species. No statistical significance was found between tests (Figure 6).

Figure 6. Summary of pre- and posttest student attitude towards livestock species in an animal handling course (n = 51 student respondents)



Responses rated using a 1 (dislike extremely) to 4 (neutral or midpoint) to 7 (like extremely) scale, with average values reported in tabular form. No statistical significance was found between tests.

Logistical regression analysis measuring the predictability that a participant would have a change in attitude towards animal conditioning practices after an experiential learning intervention using gender, student rank, level of empathy, AVOs, and SATTA as predictor variables resulted in an overall success rate of 80%. Table 8 shows the logistic regression coefficient and Wald test for each of the predictor variables. Employing a 0.05 criterion of statistical significance, no predictor variables had significant effect.

Table 8. Logistic regression predicting change in attitude towards animal conditioning practices from gender, student rank, level of empathy, AVOs, and SATTA (n = 51 student respondents)

Predictor	B	Wald X^2	p	Exp(B)
Gender	-0.420	0.090	0.764	0.657
Student Rank	0.398	1.011	0.315	1.488
Level of Empathy	-1.128	1.796	0.180	0.324
Mutualism AVO	0.966	1.980	0.159	2.628
Domination AVO	0.078	0.034	0.853	1.082
Functionality SATTA	-0.755	1.165	0.280	0.470
Empathetic SATTA	-0.062	0.025	0.875	0.940

Table 9. Change in pre- and posttest student assessment responses for the acceptance of animal conditioning practices in livestock species for students enrolled in an animal handling course (n = 51 student respondents)

	Pre-test	Posttest	Δ	z-score
Piglet conditioning (i.e., ear notching, teeth clipping and castration) is a typical management practice in conventional farming. Which of the following captures your sense of morally permissible actions regarding piglet conditioning?				
The current practice is acceptable with no changes necessary.	43	57	14	-1.229
The current practice is acceptable if, and only if an anesthetic is used prior to the procedures.	10	14	4	-0.543
The current practice is acceptable if, and only if an analgesic is administered after the procedures.	17	16	-1	0.218
The current practice is acceptable if, and only if an anesthetic is used prior to and an analgesic is administered after the procedure.	28	8	-20	2.657*
The current practice is unacceptable.	2	4	2	-0.700
Chick conditioning (i.e., beak trimming) is a typical management practice in conventional farming. Which of the following captures your sense of morally permissible actions regarding chick conditioning?				
The current practice is acceptable with no changes necessary.	53	63	10	-0.772
The current practice is acceptable if, and only if an anesthetic is used prior to the procedures.	9	6	-3	0.547
The current practice is acceptable if, and only if an analgesic is administered after the procedures.	16	16	0	-0.024
The current practice is acceptable if, and only if an anesthetic is used prior to and an analgesic is administered after the procedure.	19	8	-11	1.681
The current practice is unacceptable.	3	6	3	-0.606
Dairy calf conditioning (i.e., disbudding and castration) is a typical management practice in conventional farming. Which of the following captures your sense of morally permissible actions regarding dairy calf conditioning?				
The current practice is acceptable with no changes necessary.	34	37	3	-0.089
The current practice is acceptable if, and only if an anesthetic is used prior to the procedures.	17	18	1	-0.056
The current practice is acceptable if, and only if an analgesic is administered after the procedures.	19	29	10	-1.051
The current practice is acceptable if, and only if an anesthetic is used prior to and an analgesic is administered after the procedure.	29	12	-17	2.240*
The current practice is unacceptable.	0	4	4	-1.522

* significant at $p<0.05$

Continued

Table 9 continued

	Pre-test	Posttest	Δ	z-score
Beef calf conditioning (i.e., dishorning and castration) is a typical management practice in conventional farming. Which of the following captures your sense of morally permissible actions regarding beef calf conditioning?				
The current practice is acceptable with no changes necessary.	36	37	1	0.099
The current practice is acceptable if, and only if an anesthetic is used prior to the procedures.	14	20	6	-0.816
The current practice is acceptable if, and only if an analgesic is administered after the procedures.	19	31	12	-1.277
The current practice is acceptable if, and only if an anesthetic is used prior to and an analgesic is administered after the procedure.	29	8	-21	2.836*
The current practice is unacceptable.	2	4	2	-0.700
Lamb conditioning (i.e., tail docking and castration) is a typical management practice in conventional farming. Which of the following captures your sense of morally permissible actions regarding lamb conditioning?				
The current practice is acceptable with no changes necessary.	40	53	13	-1.186
The current practice is acceptable if, and only if an anesthetic is used prior to the procedures.	12	18	6	-0.821
The current practice is acceptable if, and only if an analgesic is administered after the procedures.	16	14	-2	0.264
The current practice is acceptable if, and only if an anesthetic is used prior to and an analgesic is administered after the procedure.	31	10	-21	2.711*
The current practice is unacceptable.	2	4	2	-0.700

* significant at $p<0.05$

Table 9 shows a substantive change in attitude towards animal conditioning practices between the pre-/posttest data, including four statistically significant changes ($p<0.05$). Attitudes toward piglet, chick and lamb conditioning practices primarily exhibited a change from the expectation toward the prescription of both an anesthetic prior and an analgesic after the procedure(s) to the acceptance of the practice with no change required. Attitudes toward dairy and beef calf conditioning practices exhibited a change from the expectation toward the prescription of both an anesthetic prior and an analgesic after the procedure(s) to the expectation of only providing an analgesic after the procedure to make it acceptable. Additionally, a small percentage of the population

changed their attitude towards all conditioning practices to now being completely unacceptable.

5.5 Discussion

Results of this study demonstrate a change in attitudes towards animal conditioning practices following the implementation of the experiential course. Although it is possible that other academic intervention may have simultaneously occurred, these results imply that experiential intervention helps to facilitate critical thinking, i.e., the evaluation of arguments or propositions and making judgments that can guide the development of beliefs and taking action (Asleitner, 2013). These results also offer support for Heberlein's (2012) belief that direct experience can change attitudes. However, one should be cautious when interpreting these results for two main reasons: dissonance and authority. First, given that all students participated in the animal conditioning practices as part of their class assignments, it is possible that the shift from the expectation to administer both an anesthetic and an analgesic to the acceptance of the practice with no changes could be the result of cognitive dissonance (Festinger, 1962). One way to reduce dissonance is to change your attitude towards the object that is causing the cognitive tension; hence, by participating in the practice, the student may need to change their attitude toward the practice in order to reduce their dissonance resulting from the participation. Second, the change in attitudes toward the animal conditioning practices may be a result of authority influence (Zimbardo, 1974). Given that an expert in the field of Animal Sciences is explaining the conditioning practices and

why/how the industry uses these practices, students may interpret this as the "correct" method, resulting in a change in attitude towards the practice.

An additional interesting finding is that none of the expected predictor variables were significant. The broader implications of these results imply that offering an experiential intervention opportunity to promote change in attitude, even when the attitude is toward an entity potentially contentious or value-based, such as a potential negative affect on an animal's well-being, may have an effect regardless of empathetic level, animal value orientation or attitude toward the treatment of animals. This suggests that outreach programs that involve an experiential element may be an effective tool in promoting change in attitude.

A significant relationship was found between gender and empathy, supporting the already well documented relationship between females and empathetic response (see Herzog et al., 1992, Herzog, 2007, and Kellert & Berry, 1987 as examples). Empathy and mutualism AVO were significantly and positively related, demonstrating support for Schwartz's (2010) claim that values are intertwined with emotions.

Mutualism AVO was significantly related with both functionality and empathetic SATTA, while domination AVO and functionality SATTA were also significantly related. These results are not unanticipated given these scales assess beliefs toward how humans should interact with animals (i.e., AVOs) and beliefs about how humans should interact with domestic animals (i.e. SATTA).

No support exists for an effect of experiential learning on attitudes towards species. This may be due to the already high positive attitudes toward the species

measured during the pre-test, plausibly due to population bias given the discipline of the students.

5.6 Conclusion

The current study assessed what factors impact the success of experiential learning (e.g., empathy, animal value orientation, attitude toward animal treatment, student rank, student discipline, and gender), specifically in regard to judgments or attitudes toward animal conditioning practices, which were potentially contentious in nature given the element of concern for animal well-being. Although none of the predictor variables resulted in significant effect, substantial change in attitude resulted from the experiential learning intervention, suggesting that experiential learning promotes change in attitude regardless of these presumed variables. Two limitations of this study should be acknowledged: 1) the study population was highly-motivated to learn about and experience the animal conditioning practices, potentially increasing the experiential effect; and 2) it is possible that the students' desire to agree with or appease the instructor may have caused a bias in the posttest data regarding acceptance of conditioning practice. These limitations should be further investigated in future research using a non-student population. Nonetheless, the broader inference from this study is that there is the potential to affect change in attitude through experiential learning, even when the attitude object is potentially contentious. Additionally, these results offer support for outreach opportunities to aid individuals in decisions regarding acceptability of animal

management practices, which often times are contentious due to the inherent impact on animal well-being.

Chapter 6: Conclusions, significance, and future research directions

The objective of this dissertation was to examine the human-animal relationship, in particular the growing concern for animal welfare. This examination encompassed three major components: 1) to establish if there has been an increase in societal concern for non-human animals; 2) to identify possible mechanism(s) that motivate concern; and 3) to establish a method to affect change in acceptability of current animal management practices, which inherently are ethical in nature due to the impact on animal well-being. These components were addressed respectively through three distinct research studies discussed in detail in Chapters 3, 4 and 5. A summary of these findings, their significance, and future research directions are offered in the next sections.

6.1 Conclusion summary

The first component of my research was to establish if there has been an increase in societal concern for non-human animals. One approach to this question is to determine if attitudes toward animals are becoming more positive in general. The reasoning for this is that we anticipate the more positive an attitude is toward specific species, the more likely you are to be concerned for that species (an affective response) and, in turn, respond with judgments, decisions and behavior that reflect this concern (Taylor & Signal, 2005). Results of our national survey conducted in 2014 compared to those of

Stephen Kellert's 1978 national survey show a steady preference or positive attitude towards most species (26 species duplicated in the survey). Additionally, a statistically significant increase in positive attitudes toward five species (i.e. bats, sharks, vultures, rats, wolves, and coyotes) either historically stigmatized or perceived as dangerous to humans, were found. The consistent and slight increase in positive attitudes toward species in general was determined to be an indicator of a general societal increase for the welfare of animals. One suggested mechanism for this increase in concern is the shift in societal values from a domination orientation toward a mutualistic orientation.

The second research component addressed was to identify potential mechanism(s) that motivate concern for animals. Results from the first project suggested that animal value orientation (AVO) may play a key role in the decision to be concerned or not; however another potential could simply be an emotional response. Hence, the second research project measured the influence of empathy and AVOs on attitude towards the treatment of animals, as well as on behaviors based on concern for animals. Results of this study showed empathy had no significant influence on either attitude or behavior, while AVOs had significant influence on both. This suggests that AVOs play a key role in motivating concern for animals. An additional interesting side note from this study is that the student populations chosen as participants were chosen based on the assumption that their value orientation would be quite diverse, given their chosen major. It was determined that the two cohorts were actually more similar than expected, with no significant difference in mutualistic orientation, suggesting support for the shift in societal values toward the mutualistic orientation.

The third and final component was to determine a potential method of affecting change in attitude toward current animal management practices. Building from the previous two studies, the choice was made to measure the effect of experiential learning. This choice was made based on the value-attitude-behavior theory and the idea that direct experience can change attitudes (Heberlein, 2012). Results from this study suggest that experiential learning can affect change in attitudes, possibly promoting more critical thinking when faced with decisions containing an ethical component, such as an impact on animal welfare.

6.2 Research significance

The research accomplished as part of my PhD program helps to fill several gaps in the current literature. First, the anecdotal notion that concern for animal welfare is on the rise has been confirmed through a quantitative examination of attitudes toward animals in the United States over the past three decades. This recognition could or maybe even should influence policy and animal management decisions in the future by requiring an animal welfare consideration and determination as part of the policy/management decision, making the policy/management practice more palatable to the general public. Second, the view that society simply emotionally responds to animal activists and animal advocacy propaganda may not be true. The shift in societal values from the domination toward the mutualism orientation pertaining to animals has shown to be a better motivator than empathy regarding attitudes toward and behavior decisions based on animal welfare. This implies that although values are "inextricably linked to affect"

(Schwartz, 2010), society will continue to make decisions concerning animals based on their values. Moreover, this study was the first attempt to measure value orientations beyond wildlife species, hence the change in name from wildlife value orientations to animal value orientations. Third, this research has demonstrated potential best practices to assist society in some of the difficult decisions that will certainly be addressed in the future – decisions such as acceptable animal management practices. Experiential learning has shown to be a potential teaching tool; however in the case of animal agriculture in particular, fewer members of society are involved, decreasing the potential for this type of experience. Hence, the current research has established the continued need for outreach programs to involve society in potential contentious practices, regardless of industry or species, to potentially help promote critical thinking in these areas.

6.3 Future research directions

Future research on the human-animal relationship seems endless. Our ethical obligations to "others" and how we determine who "others" are puts most of us in a moral gray area. Hal Herzog (2010) states this "troubled middle makes perfect sense because moral quagmires are inevitable in a species with a huge brain and a big heart" (p.12). The catch 22 that scientists have created, albeit unintentionally, by advancing knowledge regarding non-human animals has potentially put society further into this moral quagmire. Future research in this area will be both fascinating as well as necessary as society is faced with more decisions concerning the gamut of human-animal

relationships, everything from pet ownership, to medical research, to both human and animal health, to food and fiber production, to conservation.

Another research area I believe will be crucial for the future is to better understand animal value orientations across multiple cultures and geographic areas, given that my current research focused on populations in the U.S. AVOs stem from modernization theory (Inglehart, 1997; Inglehart & Welzel, 2005) which hypothesize that increasing levels of urbanization, income and education within societies change the way societies value and utilize animals. Teel and colleagues (2007) have already acknowledged the importance of this endeavor. Given this, measuring change in AVOs across time and place will strengthen the theory, as well as help predict the future concern for animals.

A final area of research I hope to pursue is the idea of interspecies cooperation. This cooperation takes many forms and has the potential for both risks and benefits for the participants. As our understanding of how and why humans make decisions about our relationships with animals expands, I think it would also be interesting to determine, if possible, how and why the animal makes the decision to participate in the relationship; that is, what level of emotions do they possess and what level of cognitive processing are they capable in achieving, which may result in the decision to participate in a human-animal relationship. Yes, it is true that some animals have no choice in participation; however more and more anecdotal evidence suggests that some animals seem to make the decision to participate in the human-animal relationship. The potential benefit from this

type of research is to better understand other species that we share this planet with, the potential risk is to drive us deeper into our moral quagmire.

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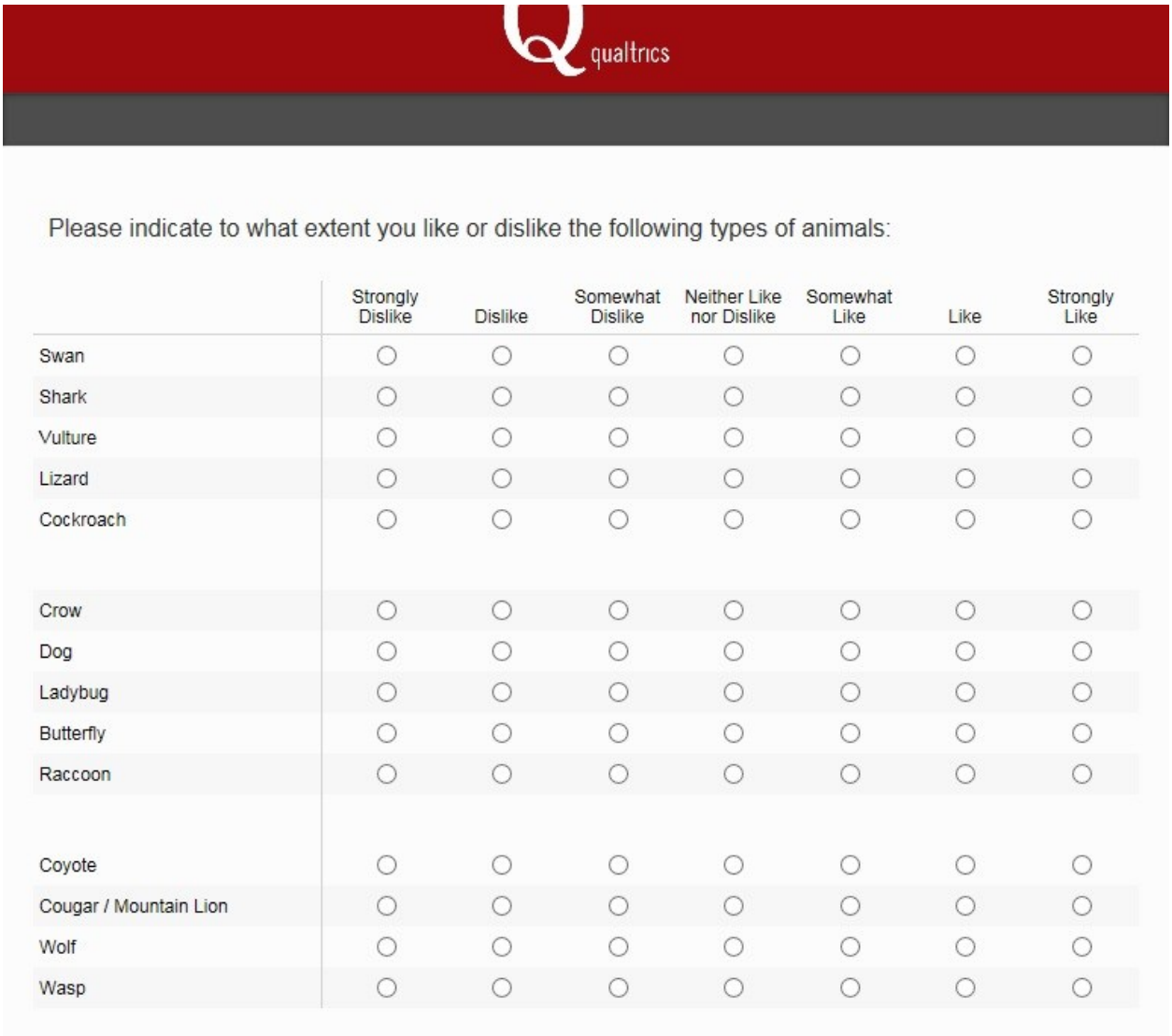
Appendix A: Illustration of instrument to measure Americans' attitudes toward 26 animals



Species include neutral or midpoint (4) on a 1 (strongly like) to 7 (strongly dislike) scale.

The above screenshot illustrates the survey question used to measure Americans' attitudes toward 26 animals. To maximize comparability to Kellert's 1978 study, while

reducing response burden and survey length, only the coyote, cougar/mountain lion, and wolf appeared to all respondents and eleven of the remaining 26 animals were randomized. The animals missing from the above illustration are the eagle, horse, robin, elephant, cat, turtle, salmon, trout, bat, skunk, rattlesnake, rat, and mosquito. Missing values were dropped from analyses.

Appendix B: Qualtrics online survey instrument – what motivates concern

Q2 Please indicate how strongly you disagree or agree with the following statements.

	Strongly Disagree (15)	Disagree (16)	Somewhat Disagree (17)	Neither Agree nor Disagree (18)	Somewhat Agree (19)	Agree (20)	Strongly Agree (21)
It upsets me when I see helpless old animals. (1)	❍	❍	❍	❍	❍	❍	❍
I get very angry when I see animals being ill-treated. (2)	❍	❍	❍	❍	❍	❍	❍
Pets have a great influence on my moods. (3)	❍	❍	❍	❍	❍	❍	❍
Seeing animals in pain upsets me. (4)	❍	❍	❍	❍	❍	❍	❍
People often make too much of the feeling and sensitivities of animals. (5)	❍	❍	❍	❍	❍	❍	❍
I am good at predicting how someone will feel. (6)	❍	❍	❍	❍	❍	❍	❍
I can sense	❍	❍	❍	❍	❍	❍	❍

if I am intruding, even if the other person doesn't tell me. (7)							
I can tune into how someone else feels rapidly and intuitively. (8)	❍	❍	❍	❍	❍	❍	❍
I can easily work out what another person might want to talk about. (9)	❍	❍	❍	❍	❍	❍	❍
I can tell if someone is masking their true emotion. (10)	❍	❍	❍	❍	❍	❍	❍
It is hard for me to see why some things upset people so much. (11)	❍	❍	❍	❍	❍	❍	❍
Seeing people cry doesn't really upset me. (12)	❍	❍	❍	❍	❍	❍	❍
I get upset	❍	❍	❍	❍	❍	❍	❍

if I see people suffering on news programs. (13)							
Other people often say that I am insensitive, though I don't always see why. (14)	❍	❍	❍	❍	❍	❍	❍
I tend to get emotionally involved with a friend's problems. (15)	❍	❍	❍	❍	❍	❍	❍

Q3 Please indicate how strongly you disagree or agree with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
Fish have the capacity to feel pain. (1)	❍	❍	❍	❍	❍	❍	❍
Invertebrates have the capacity to feel pain. (2)	❍	❍	❍	❍	❍	❍	❍
Mammals have the capacity to feel pain. (3)	❍	❍	❍	❍	❍	❍	❍
Young animals are more sensitive to pain. (4)	❍	❍	❍	❍	❍	❍	❍
Animals are sentient. (5)	❍	❍	❍	❍	❍	❍	❍
The more an animal's physiology is similar to a human's physiology, the more valuable the animal is. (6)	❍	❍	❍	❍	❍	❍	❍
Animals with eyes on the front of their head have a higher level of	❍	❍	❍	❍	❍	❍	❍

intelligence. (7)							
Apes should not be kept in captivity. (8)	❍	❍	❍	❍	❍	❍	❍
Mammals deserve a higher level of treatment than other animals. (9)	❍	❍	❍	❍	❍	❍	❍
Animals used in food production (e.g., sheep, cattle, pigs) are more valuable than other animals. (10)	❍	❍	❍	❍	❍	❍	❍
Companion animals (e.g., dogs, horses, parakeets) are more valuable than other animals. (11)	❍	❍	❍	❍	❍	❍	❍
Wildlife (e.g., wolves, robins, turtles) are more valuable than other animals. (12)	❍	❍	❍	❍	❍	❍	❍

Animals used in laboratory research (e.g., mice, rats, rabbits) are more valuable than other animals. (13)	❍	❍	❍	❍	❍	❍	❍
Scientists should use humane alternatives to painful animal experiments whenever possible. (14)	❍	❍	❍	❍	❍	❍	❍
Animals killed for food should be harvested humanely under strictly controlled conditions. (15)	❍	❍	❍	❍	❍	❍	❍
The fact that intensively farmed pigs grow well and produce large litters of piglets shows that they are clearly not suffering. (16)	❍	❍	❍	❍	❍	❍	❍

Many wild animals suffer considerably from stress and boredom as a result of being kept in zoos. (17)	❍	❍	❍	❍	❍	❍	❍
Transport of animals by road and rail involves little or no discomfort or cruelty. (18)	❍	❍	❍	❍	❍	❍	❍
Many wild animals suffer considerably from stress and boredom as a result of being kept in circuses. (19)	❍	❍	❍	❍	❍	❍	❍

Q4 Please indicate how strongly you disagree or agree with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
Animals have inherent value, above and beyond their utility to people. (1)	❍	❍	❍	❍	❍	❍	❍
I take great comfort in the relationships I have with animals. (2)	❍	❍	❍	❍	❍	❍	❍
I value the sense of companionship I receive from animals. (3)	❍	❍	❍	❍	❍	❍	❍
I feel a strong emotional bond with animals. (4)	❍	❍	❍	❍	❍	❍	❍
Animals should have rights similar to the rights of humans. (5)	❍	❍	❍	❍	❍	❍	❍
Animals have no value whatsoever. (6)	❍	❍	❍	❍	❍	❍	❍
Animals are only valuable if people get to use them in some way. (7)	❍	❍	❍	❍	❍	❍	❍
Animals are	❍	❍	❍	❍	❍	❍	❍

put on this earth primarily for people to use. (8)							
The needs of humans should take priority over animal protection. (9)	❍	❍	❍	❍	❍	❍	❍
Humans should manage animal populations so that humans benefit. (10)	❍	❍	❍	❍	❍	❍	❍

Q5 Please indicate how strongly you disagree or agree with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
I consider the welfare of an animal when I make decisions about how to interact with them. (1)	❍	❍	❍	❍	❍	❍	❍
I financially support animal welfare organizations. (2)	❍	❍	❍	❍	❍	❍	❍
I make purchasing decisions based on animal welfare standards. (3)	❍	❍	❍	❍	❍	❍	❍
I refuse to visit zoos based on my concern for animal welfare. (4)	❍	❍	❍	❍	❍	❍	❍
I would support governmental policies to enforce best animal welfare practices. (5)	❍	❍	❍	❍	❍	❍	❍
I base my diet	❍	❍	❍	❍	❍	❍	❍

on my concern for animal welfare. (6)							
I refuse to purchase products developed through animal testing. (7)	❍	❍	❍	❍	❍	❍	❍
I refuse to visit a circus based on my concern for animal welfare. (8)	❍	❍	❍	❍	❍	❍	❍

Q6 Please indicate to what extent you dislike or like the following animals.

	Dislike Extremely (1)	Dislike Very Much (2)	Dislike Slightly (3)	Neither Like nor Dislike (4)	Like Slightly (5)	Like Very Much (6)	Like Extremely (7)
Chicken (1)	❍	❍	❍	❍	❍	❍	❍
Eagle (2)	❍	❍	❍	❍	❍	❍	❍
Mosquito (3)	❍	❍	❍	❍	❍	❍	❍
Bat (4)	❍	❍	❍	❍	❍	❍	❍
Coyote (5)	❍	❍	❍	❍	❍	❍	❍
Butterfly (6)	❍	❍	❍	❍	❍	❍	❍
Cat (7)	❍	❍	❍	❍	❍	❍	❍
Rabbit (8)	❍	❍	❍	❍	❍	❍	❍
Cow (9)	❍	❍	❍	❍	❍	❍	❍
Crow (10)	❍	❍	❍	❍	❍	❍	❍
Dog (11)	❍	❍	❍	❍	❍	❍	❍
Ladybug (12)	❍	❍	❍	❍	❍	❍	❍
Elephant (13)	❍	❍	❍	❍	❍	❍	❍
Horse (14)	❍	❍	❍	❍	❍	❍	❍
Rattlesnake (15)	❍	❍	❍	❍	❍	❍	❍
Lizard (16)	❍	❍	❍	❍	❍	❍	❍
Cockroach (17)	❍	❍	❍	❍	❍	❍	❍
Pig (18)	❍	❍	❍	❍	❍	❍	❍
Skunk (19)	❍	❍	❍	❍	❍	❍	❍
Raccoon (20)	❍	❍	❍	❍	❍	❍	❍
Rat (21)	❍	❍	❍	❍	❍	❍	❍
Wolf (22)	❍	❍	❍	❍	❍	❍	❍
Robin (23)	❍	❍	❍	❍	❍	❍	❍

Salmon (24)	❍	❍	❍	❍	❍	❍	❍
Shark (25)	❍	❍	❍	❍	❍	❍	❍
Wasp (26)	❍	❍	❍	❍	❍	❍	❍
Squirrel (27)	❍	❍	❍	❍	❍	❍	❍
Swan (28)	❍	❍	❍	❍	❍	❍	❍
Trout (29)	❍	❍	❍	❍	❍	❍	❍
Turkey (30)	❍	❍	❍	❍	❍	❍	❍
Turtle (31)	❍	❍	❍	❍	❍	❍	❍
Vulture (32)	❍	❍	❍	❍	❍	❍	❍
Ape (33)	❍	❍	❍	❍	❍	❍	❍

Q7 Please identify your degree program.

- ❍ Animal Sciences (1)
- ❍ Environment & Natural Resources (2)

Answer If Please identify your degree program. Animal Sciences Is Selected

Q8 Please identify your degree specialization.

- ❍ Animal Biosciences (1)
- ❍ Animal Industries (2)
- ❍ Nutrition (3)
- ❍ Meat Science (4)
- ❍ Don't know (5)

Answer If Please identify your degree program. Environment & Natural Resources Is Selected

Q9 Please identify your degree specialization.

- EEDS Environment, Economy, Development, and Sustainability (1)
- EPDM Environmental Policy and Decision Making (2)
- ES Environmental Science (3)
- FFW Forestry, Fisheries, and Wildlife (4)
- NRM Natural Resource Management (5)
- Don't know (6)

Q10 Please identify your student rank.

- Rank 1 (freshman) (1)
- Rank 2 (sophomore) (2)
- Rank 3 (junior) (3)
- Rank 4 (senior) (4)

Q11 Are you currently enrolled or did you complete in autumn semester 2014, the

Animal Welfare course (Anim Sci 4400) offered in the Department of Animal Sciences?

- Yes (1)
- No (2)

Q12 Gender

- Male (1)
- Female (2)