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Individual Difference and Study-Specific Characteristics Influencing Attitudes about the Use of Animals in Medical Research

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Abstract
Research has shown that both individual difference characteristics (e.g., sex, attachment to pets) and study-specific characteristics (e.g., type of animal used) influence the extent to which people support or oppose the use of animals in research. The current study examined how three study-specific characteristics (type of animal used, level of harm to the animal, and severity of the disease being investigated) influenced attitudes toward the use of animals in biomedical research. Participants read one of 27 scenarios describing the use of an animal in research. Scenarios systematically varied each of the study-specific characteristics described above. Participants then completed a survey to assess their support for, or opposition to, the research described. Data on attachment to pets and attitudes toward the treatment of animals were also collected. Analysis of variance revealed significant main effects for each of the study-specific characteristics. Multiple regression analyses revealed that the individual difference and study-specific characteristics accounted for 49% of the variability in opposition to the use of animals in biomedical research among men, and 37% among women. Limitations and directions for future research are discussed.

Keywords
animals, attitudes, biomedical research, harm

Few issues within the animal welfare field elicit more emotion than the issue of how animals are used as subjects of research. Considerations of whether, when, and how animals are used as subjects of research are multifaceted. Since the publication of the Belmont Report in 1979 (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979), a fundamental tenet of modern research involving human subjects is informed consent: ethical principles prohibit a researcher from using humans as subjects without their agreement. No such consideration is offered to animal subjects.

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Further, animal subjects are potentially exposed to levels of harm and risk that would be considered unacceptable with human subjects. Nonetheless, research involving animals is often perceived as necessary, and fundamental to addressing problems that may be of concern to humans. The extent to which harming an animal is viewed as an acceptable means of solving human problems will be influenced by positions on broader issues of human-animal relations: Are animals resources to be used by humans, or are they beings with an inherent value comparable to that of humans? Under what circumstances is it acceptable to sacrifice an animal to benefit a human? Attitudes regarding the acceptability of the use of animals in research are diverse, and have been found to be influenced by a range of factors (see Hagelin, Carlsson, & Hau, 2003, for an overview of this research).

A variety of individual difference characteristics, such as idealism, political orientation, and history of interactions with pets, have been shown to be associated with support for, or opposition to, the use of animals in research. For example, Wuensch and Poteat (1998) found that, among a sample of college students, idealism (the belief that ethical behavior "will always lead only to good consequences," p. 140) was negatively correlated with support for the use of animals in research. Furnham and Pinder (1990) reported that participants holding a left-wing political orientation were less supportive of the use of animals in research than were those holding a right-wing orientation. Likewise, Furnham and Pinder (1990) also found that self-described "animal lovers" were more opposed to animal research than were non-animal lovers. Consistent with this finding, Hagelin, Johansson, Hau, and Carlsson (2002) found that 52% of non-pet guardians supported use of animals in medical research. The comparable rate among pet guardians was only 39%. Similar findings were reported by Wells and Hepper (1997) and Blackshaw and Blackshaw (1993).

Gender has been one of the most extensively researched corollaries of attitudes about the use of animals in research. The evidence has consistently indicated that women are less supportive of animal research than are men (see Broida, Tingley, Kimball, & Miele, 1993; Navarro, Maldonado, Pedraza, & Cavas, 2001; Swami, Furnham, & Christopher, 2008). For example, Furnham and Pinder (1990) found women to be less supportive of animal research than men, as did Wells and Hepper (1997). Pifer (1996) reported that, among a range of predictors, gender was the strongest correlate of opposition to animal research. Kellert (1980) reported that men exhibited more "dominionistic" attitudes toward the environment, while women exhibited more "moralistic" attitudes. In the Kellert study, "dominionistic" attitudes were defined as those in which "satisfactions [were] derived from mastery and con-

trol," while "moralistic" attitudes reflected "concern for the right and wrong treatment of animals" (1980, p. 89.) See Luke (2007) for an extensive discussion of the relation between gender and attitudes about the use of animals in research.

Taken together, the research reviewed above suggests that, to some degree, attitudes about the use of animals in research are independent of specific instances of the research, per se. Certain background factors appear to serve as a lens through which research is viewed; in some cases, the general perception will be relatively supportive, and in other cases, the general perception will be relatively nonsupportive. These judgments may be made regardless of the nature or purpose of the research being undertaken.

In contrast, previous research has also shown that there are a number of study-specific characteristics that influence the extent to which people support or oppose the use of animals in research. Generally, research has indicated that study-specific characteristics, such as the type of animal used, the type of research being conducted, and the level of harm to the animal, all influence the extent to which people support the use of animals in research.

With regard to the type of animal used, research suggests that people are more accepting of animal research that uses some types of animals, such as mice, rather than other types of animals, such as dogs. Blackshaw and Blackshaw (1993) found that use of dogs and cats as research subjects was particularly upsetting to pet guardians. Hagelin, Carlsson, and Hau (1997) asked participants if there was "any moral difference between using various categories of animals in research" (p. 160). Close to half of the respondents said that there is a moral difference between using different types of animals, implying that the use of some types of animals might be acceptable, while the use of other types of animals would be unacceptable. (Interestingly, an apparent gender difference emerged in response to this question, with 51% of women and just under 41% of men answering "yes.") Hagelin, Carlsson, Suleman, and Hau (2000) found that acceptance of the use of animals in research varied as a function of the "phylogenetic closeness" (p. 431) of the animal to humans. Generally, the use of nonhuman primates was judged least acceptable, while the use of invertebrates was judged most acceptable. Thus, it would appear that people do in fact differentiate between types of animals when judging the acceptability of animal research. Furthermore, this literature suggests that research involving primates or the most common pet species (dogs and cats) is viewed as being less acceptable than research involving other types of animals.

Similarly, the type of research being conducted has been shown to influence the extent to which animal research is viewed as acceptable (see Saucier &

Cain, 2006). For example, Stanistreet and Spofforth (1993) found that participants were less supportive of the use of animals in research that was viewed as "non-necessary" than research that was viewed as "necessary." Hagelin et al. (2002) found that participants were generally supportive of the use of animals in research if it resulted in cures for diseases affecting humans. Wuensch and Poteat (1998) found that participants expressed less support for cosmetic and agricultural research than for medical research. Driscoll (1992) found that the use of animals in product-testing research was considered less acceptable than the use of animals in medical research. Thus, the literature suggests that animal research that is viewed as providing tangible, meaningful benefits to humans is considered more acceptable than animal research that is viewed as less beneficial or necessary.

Finally, the literature on the use of animals in research also indicates that evaluations of the acceptability of animal research are influenced by the level of harm suffered by the animal. Wells and Hepper (1997) reported that, in general, participants were less supportive of the use of animals in research when the research resulted in the animal's suffering. Plous (1996) found more support for research involving confinement or observation of the animal than for research involving pain or suffering on the animal's part.

The purpose of the current study was to address two questions. First, how do study-specific characteristics influence judgments about the acceptability of the use of animals in research? Three study-specific characteristics were examined: the type of animal used in the research, the potential benefit to humans resulting from the research (represented by the severity of the human disease being examined), and the level of harm suffered by the animal. This study employed a full factorial design, which allowed for the examination of interactions between these factors. In other words, the design allowed for the exploration of questions such as, "Do people differ in their judgments about the use of different animals in research as a function of the level of harm experienced by the animals?" Second, the study explored how individual difference characteristics, such as sex, attachment to pets, and general attitudes about animals, combine with study-specific characteristics to determine attitudes about the use of animals in research. Specifically, the study examined how study-specific characteristics accounted for variability in opposition to the use of animals in research beyond variability accounted for by individual difference characteristics. Are judgments about the use of animals in research driven primarily by study-specific characteristics, individual difference characteristics, or both?

Methods

Participants. There were 577 participants in this study. All the participants were enrolled in an Introduction to Psychology class at the Metropolitan State College of Denver. Participants received class credit for participating in the research. Three hundred and ten (53.7%) of the participants were women and 266 (46.1%) were men.[1] The mean age of participants was 22.51 years (SD = 5.93). Four hundred and twenty-two (73.1%) participants identified themselves as white, 89 (15.4%) identified themselves as Hispanic, 48 (8.3%) participants identified themselves as black, 36 (6.2%) participants identified themselves as Asian, seven (1.2%) participants identified themselves as American Indian or Alaskan native, and 26 (4.5%) participants identified their ethnicity as "other." (These percentages sum to more than 100% because respondents could identify more than one race/ethnicity.)

Each data collection session consisted of groups of 15-30 participants. Each participant received a consent form and a packet containing the study surveys. The order of the surveys within the packets was counterbalanced to control sequence effects. The consent form described the type of questions the participant would be asked, informed the participants that they were able to refuse to participate without any negative repercussions, and requested a signature. All data collection materials and protocols were approved by the Metropolitan State College of Denver's Human Subjects Review Committee.

Materials. Attitudes toward the Treatment of Animals Scale (ATTAS). A 23-item attitude scale was used to assess sensitivity to the treatment of animals (Henry, 2004a, 2004b, 2006). Participants were asked to indicate the extent to which they would be bothered by thinking about a particular type of treatment of an animal. Each item was phrased, "How much would it bother you to think about…" Items assessed a variety of types of treatment of animals, such as failing to provide adequate food, shelter, or medical care; using animals in medical research; encouraging animals to fight; and killing or hurting an animal for no apparent reason. Participants responded to each item on a five-point scale ranging from 1 "Not at all" to 5 "A lot." Thus, higher scores reflected relatively more discomfort with the type of treatment specified.

On the basis of a previous factor analysis of the ATTAS (Henry, 2006), the items on the survey were divided into three subscales: Cruelty (8 items), Utilitarian (8 items), and Caregiving (7 items). The Cruelty subscale assessed individual differences in attitudes regarding the intentional harm of animals for no apparent reason. The Utilitarian subscale assessed individual differences in attitudes regarding the utilitarian use of animals as sources of food or as

subjects for research. The Caregiving subscale assessed individual differences in attitudes regarding a person's responsibilities for ensuring the safety and well-being of an animal (see Henry, 2006, for items comprising each subscale and evidence of the validity of the subscales).

Mean scores for the Cruelty subscale were 3.38 (SD = 0.74) for the men and 3.86 (SD = 0.66) for the women ($t(574) = -8.39$, $p < .001$). Scores for the Utilitarian subscale were 2.57 (SD = 0.76) for the men and 3.26 (SD = 0.75) for the women ($t(574) = -10.93$, $p < .001$). Scores for the Caregiving subscale were 3.76 (SD = 0.63) for the men and 4.26 (SD = 0.51) for the women ($t(574) = -10.36$, $p < .001$). Cronbach's alphas for the subscales ranged from 0.77 to 0.85.

Pet Guardianship and Attachment. Participants' experiences with pets were assessed using an eight-item questionnaire that asked participants whether they (or their family) had had pets when they were children (prior to the age of 18). If participants indicated that they had had pets in childhood, they were asked to indicate the types of pets, the greatest number of pets they had at one time, and their emotional attachment to those pets (rated on a scale from 1 = "very strong" to 5 = "none"). Participants were also asked to indicate if they currently had any pets. If they responded "yes," they were asked to indicate the types of pets and their emotional attachment to those pets (rated on a scale from 1 = "very strong" to 5 = "none").

Ninety-six percent of participants reported having had at least one pet prior to age 18. Women reported stronger emotional attachment to their childhood pets than did men. The mean emotional attachment to childhood pets was 1.62 (SD = 0.92) for women and 1.82 (SD = 0.86) for men, $t(562) = 2.72$, $p < .001$.

Seventy-one percent of participants reported currently having at least one pet.[2] Women again reported stronger emotional attachment to their pets than did men. The mean emotional attachment to pets was 1.31 (SD = 0.88) for women and 1.84 (SD = 1.19) for men, $t(445) = 5.37$, $p < .001$.

Attitudes about Biomedical Research (ABR). The dependent variable in this study was attitudes about the use of animals in biomedical research, assessed by an instrument developed specifically for this study. The instrument consisted of a one-paragraph scenario describing a specific instance of biomedical research utilizing animals, followed by four statements in which the participant would express his/her support for the research described in the scenario.

One purpose of this study was to examine the extent to which three factors (type of animal used in the research, level of harm experienced by the animal, and severity of the disease being addressed in the research) influenced opposi-

tion to, or support for, the research. Within the scenarios, each of these factors was systematically varied. Type of animal was varied by describing research using mice, dogs, or chimpanzees. Level of harm experienced by the animal was varied by indicating that the animal used in the research would suffer no harm, would suffer serious injury, or would suffer death as a result of the research. Severity of the disease being addressed was varied by indicating that the research was seeking a cure for eczema, rheumatoid arthritis, or Non-Hodgkin's lymphoma.[3]

The structure of the scenario was consistent across presentations. The scenario would begin with a description of "Dr. Smith's" research program, which was focused on finding a treatment for disease "X." This was followed by a brief description of the nature of the disease. Next, it was pointed out that in order to conduct his research, Dr. Smith would need to make use of a particular type of animal. Finally, the scenario would end with a description of the level of harm that would come to the animal.

The scenario for research on a treatment for eczema read as follows:

> Dr. Smith has compiled a body of research which reveals a possible treatment for Eczema. Eczema is a disease that causes itching and inflammation of the skin. Eczema is a chronic disease that can cause significant discomfort. In order to test his theory, Dr. Smith will administer his new treatment to a group of chimpanzees [or dogs or mice] in a laboratory setting. The nature of the research is such that the experiment will result in the death of [or no harm to or serious injury to] the chimpanzees.

The scenario for research on the treatment of rheumatoid arthritis read as follows:

> Dr. Smith has compiled a body of research which reveals a possible treatment for Rheumatoid Arthritis. Rheumatoid Arthritis is an autoimmune disease that causes chronic inflammation of the joints. Rheumatoid Arthritis is a chronic disease that can result in significant disability. In order to test his theory, Dr. Smith will administer his new treatment to a group of chimpanzees [or dogs or mice] in a laboratory setting. The nature of the research is such that the experiment will result in the death of [or no harm to or serious injury to] the chimpanzees.

The scenario for research on the treatment of Non-Hodgkin's lymphoma read as follows:

> Dr. Smith has compiled a body of research which reveals a possible treatment for Non-Hodgkin's Lymphoma. Non-Hodgkin's Lymphoma is a form of cancer that starts in the lymphoid tissue. Such tissue makes up the lymph nodes, spleen, and other organs of the immune system. Non-Hodgkin's Lymphoma is frequently fatal. In order to test his theory, Dr. Smith will administer his new treatment to a group of chimpanzees [or

dogs or mice] in a laboratory setting. The nature of the research is such that the experiment will result in the death of [or no harm to or serious injury to] the chimpanzees.

After reading the scenario, participants were asked to respond to four statements:

1. The idea of these animals being used for this research causes me discomfort.
2. I would support Dr. Smith's use of these animals for this research.
3. Dr. Smith should not be allowed to use these animals for this research.
4. In this situation, the use of these animals for research purposes is appropriate.

Responses to these statements were on a scale ranging from 1 = "strongly disagree" to 5 = "strongly agree." For scoring purposes, responses to Statements 2 and 4 were reversed, and responses across the four items were then averaged together. Thus, higher scores on this measure reflected greater opposition to the described use of animals. Cronbach's alpha for the four items was .80. The mean score on the ABR was 2.99 (SD = 1.04). Sex differences in the ABR are described in the Results section.

Procedure. Data were collected from groups of 2-30 participants at a time. The study utilized a 3 (level of harm) X 3 (type of animal) X 3 (severity of disease) between subjects factorial design. Thus, there were a total of 27 different scenarios. Each participant completed a packet of surveys containing a demographic questionnaire, the pet guardianship questionnaire, the ATTAS, and one ABR scenario. The sequence of surveys within the packets was completely counterbalanced to control order effects.

Results

Data analyses proceeded in three stages. First, the relations between opposition to the use of animals in biomedical research and sex, age, attachment to pets, and attitudes toward the treatment of animals were examined using bivariate correlations and t-tests. Second, a factorial analysis of variance (ANOVA) was used to examine the effects of the three manipulated factors (type of animal, level of harm, and severity of disease) on opposition to the use of animals in biomedical research. Finally, multiple regression models were constructed to examine whether the three manipulated factors could account for variability in opposition to the use of animals in biomedical research after controlling for background factors (e.g., age, general attitudes toward animals, etc.)

The relations between support for the use of animals in biomedical research and sex, age, attachment to pets, and attitudes toward the treatment of animals.

A t-test was used to examine sex differences in opposition to the use of animals in biomedical research. Results revealed that women were more opposed to the use of animals than were men. The mean ABR score for the women was 3.22 (SD = 1.03), while the mean for the men was 2.72 (SD = 1.00), t (569) = –5.84, p < .001. Because of this sex difference, bivariate correlational analyses were conducted separately for men and women.

Table 1. Bivariate correlations between age, attachment to pets, attitudes toward animals, and opposition to the use of animals in biomedical research

	Opposition to Use of Animals in Biomedical Research	
	Men	Women
Age	–0.03	–0.10
Childhood Attachment to Pets	–0.07	–0.10
Current Attachment to Pets	–0.05	–0.05
ATTAS Cruelty	0.32*	0.24*
ATTAS Utilitarian	0.50*	0.28*
ATTAS Caregiving	0.45*	0.29*

* p < .001

Pearson correlations were used to examine the relation between opposition to the use of animals in biomedical research and age, childhood attachment to pets, current attachment to pets, and attitudes toward the treatment of animals. Results are presented, separately for men and women, in Table 1. Among both men and women, opposition to the use of animals was significantly correlated with scores on the ATTAS Cruelty, Utilitarian, and Caregiving subscales. These results indicate that those who reported being more sensitive to the treatment of animals were also more opposed to the use of animals in biomedical research. The correlations between ATTAS Cruelty and ABR scores and ATTAS Caregiving and ABR scores were significantly greater among men than among women (z = 3.11, p < .01, and z = 2.21, p < .05, respectively).

Age, childhood attachment to pets, and current attachment to pets were not associated with scores on the ABR.

Effects of level of harm, type of animal, and severity of disease on opposition to the use of animals in biomedical research.

A 2 (sex) X 3 (level of harm) X 3 (type of animal) X 3 (severity of disease) ANOVA was conducted, with scores on the ABR as the dependent variable. In addition to a main effect for sex (with women scoring higher than men, $F(1, 517) = 40.24$, $p < .001$), main effects were found for each of the three manipulated factors. In addition, a significant sex X level of harm interaction emerged. No other two- or three-way interactions were observed. The means are depicted in Figures 1 and 2. The effects in relation to each factor will be discussed in order.

Level of Harm. Results indicated that participants were more opposed to biomedical research that resulted in harm to the animals. Scores in the "no harm" level had a mean of 2.57 ($SD = 0.89$); scores in the "serious injury" level had a mean of 3.17 ($SD = 1.08$); scores in the "death" level had a mean of 3.25 ($SD = 1.03$), $F(2, 517) = 32.16$, $p < .001$. Post hoc Scheffe tests revealed that both "death" and "serious injury" differed from "no harm" at the $p < .05$ level, but that "death" and "serious injury" did not differ from each other.

A sex X level of harm interaction was also found. This interaction is presented in Figure 3. Results indicated that, among women, a significant difference was found between the "serious injury" and "death" levels ($t(198) = 2.43$, $p < .05$); among men, however, the difference between "serious injury" and "death" was not significant ($t(171) = -1.29$, *ns*).

Type of Animal. Results indicated that participants were more opposed to biomedical research involving dogs and chimpanzees than research involving mice. Scores in the "mice" level had a mean of 2.51 ($SD = 0.95$); scores in the "dogs" level had a mean of 3.29 ($SD = 1.05$); scores in the "chimpanzees" level had a mean of 3.13 ($SD = 0.96$), $F(2, 517) = 33.76$, $p < .001$. Post hoc Scheffe tests revealed that both "chimpanzees" and "dogs" differed from "mice" at the $p < .05$ level, but that "chimpanzees" and "dogs" did not differ from each other.

Severity of Disease. Results indicated that participants were more supportive of biomedical research for more serious diseases. Scores in the "lymphoma" level had a mean of 2.80 ($SD = 0.99$); scores in the "arthritis" level had a mean of 3.01 ($SD = 1.10$); scores in the "eczema" level had a mean of 3.15 ($SD = 1.01$), $F(2, 517) = 4.86$, $p < .01$. Post hoc Scheffe tests revealed that "lymphoma" differed from "eczema" at the $p < .05$ level.

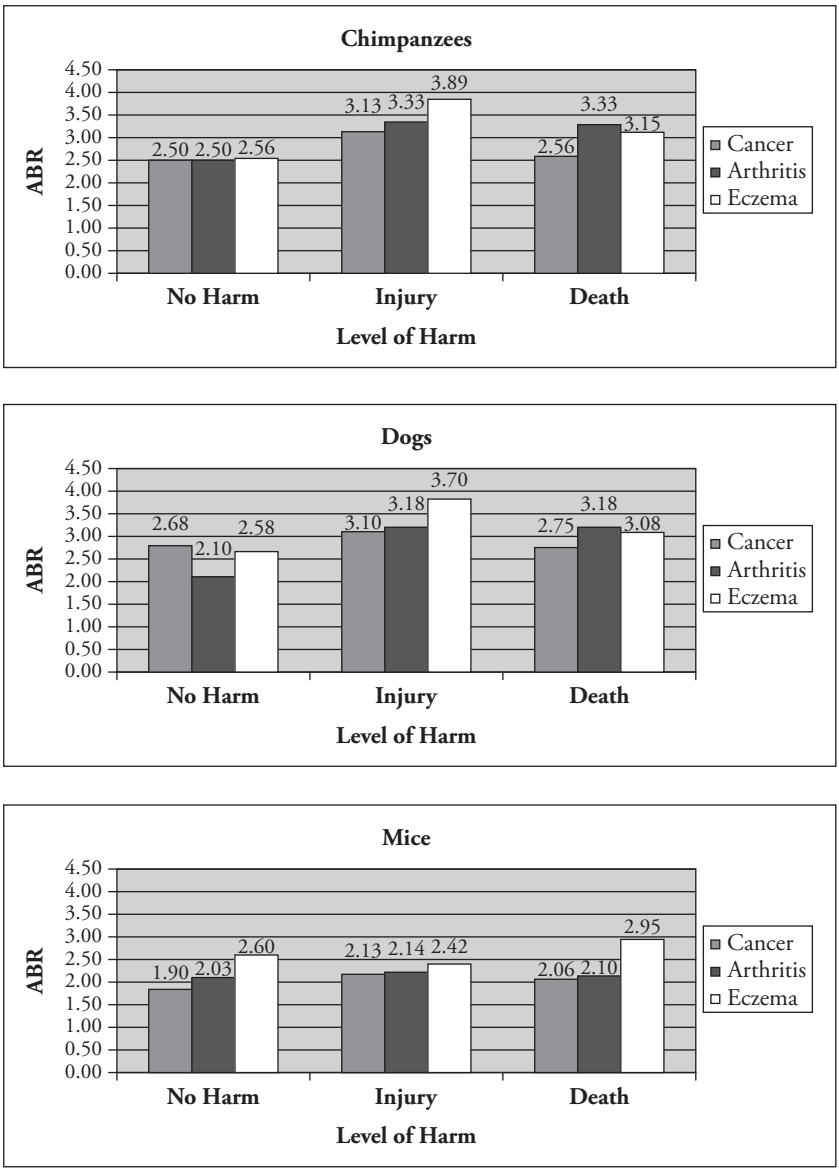
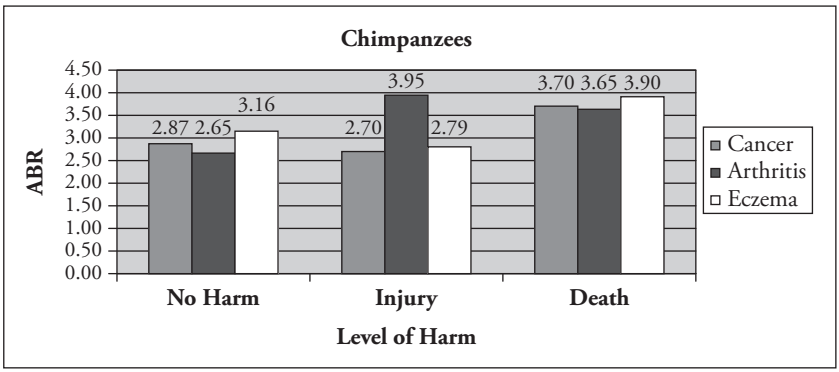
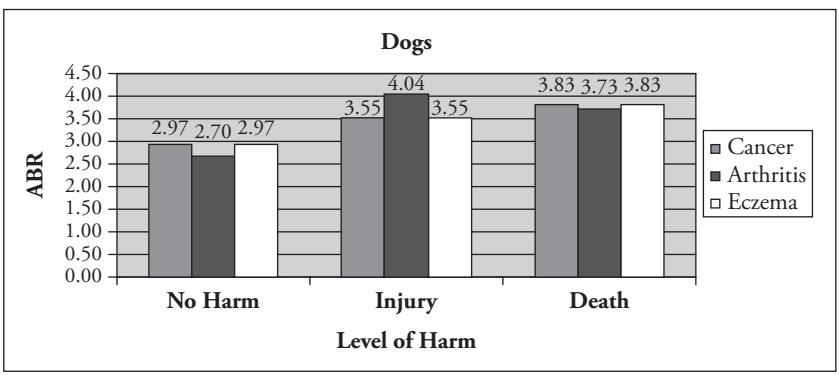


Figure 1. Mean ABR scores by type of animal, level of harm, and disease (men)





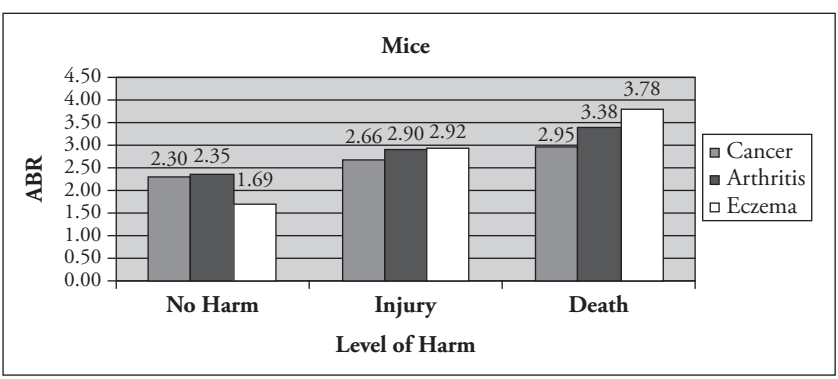


Figure 2. Mean ABR scores by type of animal, level of harm, and disease (women)

Figure 3. Interaction between sex and level of harm on opposition to the use of animals in biomedical research

Multiple Regression Models. In order to examine the extent to which level of harm, type of animal, and severity of disease influenced opposition to use of animals in biomedical research beyond the effects of general attitudes about animals, multiple regression models were constructed in which ATTAS subscale scores and the three manipulated factors (dummy coded) were used to predict ABR scores. Models were constructed separately for men and women. Results are presented in Tables 2 and 3.

As seen in Table 2, among men, the ATTAS Cruelty, Utilitarian, and Caregiving subscales, entered in Step 1, accounted for 27% of the variability in ABR scores. Scores on the ATTAS Utilitarian (beta = .38, p < .001) and Caregiving (beta = .22, $p < .01$) subscales both contributed significantly to variability in ABR scores.

In Step 2, level of harm, type of animal, and severity of disease accounted for an additional 22% of the variability in ABR scores. Consistent with the results of the ANOVA reported above, each of the three factors contributed uniquely to ABR scores. Overall, the regression model accounted for 49% of the variability in opposition to the use of animals in biomedical research.

As seen in Table 3, among women, the ATTAS Cruelty, Utilitarian, and Caregiving subscales, entered in Step 1, accounted for 10% of the variability in ABR scores. Only scores on the Caregiving (beta = .18, $p < .05$) subscale contributed significantly to variability in ABR scores.

Table 2. Multiple Regression Analysis: Predictors of opposition to the use of animals in biomedical research: Men

Variable	Beta	p-level	R^2
Step 1			
ATTAS Cruelty	–.07	ns	
ATTAS Utilitarian	.39	< .001	
ATTAS Caregiving	.22	< .01	.27
Step 2			
Type of Animal			
Chimpanzee vs. Mouse	.33	< .001	
Dog vs. Mouse	.33	< .001	
Level of Harm			
Death vs. No Harm	.26	< .001	
Serious Injury vs. No Harm	.27	< .001	
Severity of disease			
Lymphoma vs. Eczema	–.15	< .01	
Arthritis vs. Eczema	–.12	< .05	.49

Table 3. Multiple Regression Analysis: Predictors of opposition to the use of animals in biomedical research: Women

Variable	Beta	p-level	R^2
Step 1			
ATTAS Cruelty	.01	ns	
ATTAS Utilitarian	.15	ns	
ATTAS Caregiving	.18	< .05	.10
Step 2			
Type of Animal			
Chimpanzee vs. Mouse	.27	< .001	
Dog vs. Mouse	.21	< .001	
Level of Harm			
Death vs. No Harm	.41	< .001	
Serious Injury vs. No Harm	.35	< .001	
Severity of disease			
Lymphoma vs. Eczema	–.11	< .05	
Arthritis vs. Eczema	–.04	ns	.37

In Step 2, level of harm, type of animal, and severity of disease accounted for an additional 27% of the variability in ABR scores. Each of the three factors contributed uniquely to ABR scores, though on the "severity of disease" factor, only the comparison of cancer and eczema was significant. Overall, the regression model accounted for 37% of the variability in opposition to the use of animals in biomedical research.

Discussion

Results of the present study indicate that both individual difference and study-specific characteristics substantially influence opposition to the use of animals in medical research. Participant sex and general attitudes about the treatment of animals were both significant predictors of attitudes about animal research, regardless of the specific characteristics of the research under consideration. Women, and those who expressed more concern about the treatment of animals, were more opposed to the use of animals in medical research than were men and those who expressed less concern about the treatment of animals.

In addition to these individual difference characteristics, each of the study-specific characteristics examined was significantly related to opposition to the use of animals in medical research. Results indicated that, regardless of sex or general attitudes about animals, participants were: 1) more opposed to research using chimpanzees and dogs than research using mice; 2) more opposed to research resulting in death or injury for the animal than research resulting in no harm; and 3) more supportive of research seeking a cure for cancer than research seeking a cure for eczema. Each of these was a main effect; no interactions between these factors were observed. Together, the individual difference characteristics (attitudes about animals) accounted for 27% of the variability in opposition to animal research among men and 10% among women. The study-specific characteristics accounted for an additional 22% of the variability among men and 27% among women.

Results of this study were largely consistent with the existing body of research on attitudes about animal research. The observed differentiation between types of animals has been previously reported by Hagelin (2000), Hagelin et al. (1997), and Blackshaw and Blackshaw (1993), among others. Similarly, several researchers (Driscoll, 1992; Hagelin et al., 2002; Stanistreet & Spofforth, 1993; Wuensch & Poteat, 1998) have documented that participants are more supportive of animal research if it is viewed as being of significant benefit to humans. Finally, both Wells and Hepper (1997) and Plous (1996) found that level of harm to animal subjects significantly influences attitudes about animal research. However, the current study extended the findings of this previous research by examining the combined effects of

study-specific and individual difference characteristics. In addition, the factorial design utilized in this study allowed for a full analysis of potential interactions between these study-specific characteristics.

The fact that no interactions between the study-specific characteristics were observed indicates that participants were simultaneously evaluating each of these factors, but doing so independently of the other factors. These findings may shed light on the cognitive mechanisms people utilize when drawing judgments about the acceptability of the use of animals in research. There are various philosophical positions one might adopt when evaluating the appropriateness of the use of animals in medical research. For example, Regan (1983) argues that animals possess natural rights, and, as such, should never be reduced to being the subjects of research for the benefit of humans. Singer (1990) suggests that while some, very rare, instances of animal research may be acceptable, the interests of the animals being used in the research must be weighed against the interests of the humans who would benefit from the research. This "utilitarian" perspective becomes more complicated when considerations are given to how the interests of animals should be weighted in comparison to the interests of humans. Singer's "nonspeciesist" utilitarianism suggests that a human's interests are not inherently more important than an animal's interests. Garner (2005) argues that the "moral orthodoxy"—the most widely held position—is a view in which both the interests of animals and humans are considered, but that the interests of humans are regularly given greater weight than the interests of animals (a "speciesist" version of utilitarianism). This position suggests that judgments about the appropriateness of using animals in medical research require a cost-benefit analysis: medical research involving animals will be acceptable if the benefit to humans outweighs the cost to the animals.

Participants in this study clearly adopted a position more similar to that advanced by Garner than that advanced by Regan or Singer. The overall mean score on the ABR was 2.99, which was essentially the midpoint of the ABR scale. Participants were, across scenarios, not strongly opposed to the use of animals in research, though the level of support for (or opposition to) the research varied as a function of the specific characteristics of the scenario. The fact that participants were considering a variety of factors (animal, disease, harm) when making these judgments suggests that some type of cost-benefit analysis was occurring. A closer analysis of the pattern of results, however, raises questions as to whether or not participants were actually employing a cost-benefit approach when generating their judgments.

A cost-benefit analysis entails a direct comparison of the cost to the animals and the benefit to humans. For example, following Garner's "moral orthodoxy" view, one might consider research resulting in the death of an animal (a

high-cost situation) acceptable if the research is seeking a cure for a deadly disease such as cancer (a high-benefit outcome). Research resulting in the death of an animal might be considered unacceptable, however, if the research is seeking a cure for a less serious disease. In this case, the high costs might be judged as too great for the (relatively) low level of benefit. The acceptability of high-cost research should differ as a function of the level of expected benefits. Thus, if participants were simultaneously weighing both the costs and the benefits of the research, a level of harm X disease interaction should have been found.

As can be seen in Figures 1 and 2, for chimpanzees and dogs in particular, there was very little difference in opposition to research resulting in the death of the animal, regardless of the benefit to humans. Some evidence of a level of harm X disease interaction can be seen for mice. The general pattern of results suggests, however, that, rather than weighing two (or more) factors against each other, participants appeared to be evaluating the various factors independently of one another. This pattern is not consistent with a cost-benefit analysis. High-cost research was relatively strongly opposed regardless of benefit. Likewise, high-benefit research was relatively strongly supported regardless of cost.

Consistent with previous research (e.g., Furnham & Pinder, 1990), gender differences were observed in this study. In general, women were more opposed to the use of animals in research than were men. Two specific aspects of the observed gender differences warrant notice. First, the relation between general attitudes about animals and opposition to the use of animals in research was stronger among men than among women. The average correlation between the three ATTAS subscales and scores on the ABR for men was 0.42; for women, the average correlation was 0.27. The reasons for this difference are unclear. On the one hand, the relatively low correlation among women might be an artifact of the higher scores on both the ABR and ATTAS that women exhibited relative to men. Conversely, it is possible that women were more sensitive to variations in study-specific characteristics than were men. The ATTAS measures global attitudes toward the treatment of animals. If women were more likely than men to respond differentially to the specific animal research scenarios, this differentiation would introduce variability into the women's ABR scores that would not necessarily be related to global attitudes. This interpretation is supported by the results of the regression analyses, in which the study-specific characteristics accounted for a greater percentage of variability in ABR scores among women (27%) than among men (22%).

Second, women were more opposed to research resulting in death than they were to research resulting in injury; men did not differ in their views of these two levels of harm. In this study, women appeared to make more nuanced

judgments about their opposition to animal research than did men, essentially "matching" their level of opposition to animal research to the degree of harm suffered by the animal. Again, this may reflect greater sensitivity on the part of female participants to the specific characteristics of the scenario. It appeared that, with regard to level of harm, men had a particular threshold for their opposition to the research; once that threshold was exceeded, no further gradations in their opposition were observed. Sex differences in sensitivity to specific attributes of animal research are a topic that may require further exploration.

One area of inconsistency between the current results and previous research is in regard to the relation between attachment to pets and opposition to animal research. Previous research has indicated that participants who reported being more attached to their pets were more opposed to animal research (Furnham & Pinder, 1990; Hagelin et al., 2002; Wells & Hepper, 1997). In the present study, no such relationship was found. The failure to find this expected relationship may be a function of the way in which attachment to pets was measured in the present study. Participants were asked whether they had had pets in childhood, and if they currently had pets. If they responded "yes," they were asked to indicate, on a single item, the extent of their attachment to their pets. It is possible that use of a single item to assess attachment is simply not reliable enough to identify relations with attitudes about animal research. Further, it should be noted that scores on the pet attachment items were quite high. For both childhood attachment and current attachment, mean scores were in the 1-2 range, on a scale on which low scores represented greater attachment. This truncation of range may have obscured the true extent of the relationship between pet attachment and attitudes about animal research.

There are limitations to this study that should be recognized. For example, the design of the study necessitated the selection of a relatively limited range of animals and diseases to be included in the scenarios. Thus, results might have varied if different animals, or different diseases, were described. Future research may extend the current findings by utilizing other study-specific characteristics. Further, one individual difference characteristic that was not assessed in this study was experience with the diseases in question. It would be of interest to explore the extent to which experience with a particular disease (such as cancer) influences attitudes about the acceptability of animals in medical research. Additionally, the focus of this research was on the use of animals in medical research. It would be of interest to employ a similar methodology to explore other aspects of the animal-use issue. For example, a similar methodology might be used to explore attitudes about the use of animals

for entertainment purposes (e.g., in circuses, zoos, rodeos, etc.) Finally, as is often the case in social sciences research, the current study relied upon a sample of college students. It is possible (indeed, probable) that college students differ from the broader population on a host of social and political issues. Specifically, the role of animals in research may be viewed differently by college students than by nonstudents. A similar study employing a noncollege sample may find different patterns of results.

In summary, this study employed a factorial design to explore the degree to which the type of animal used, the disease addressed, and the extent of harm to the animal influenced attitudes about animal research. Consistent with previous research, a range of individual difference and study-specific characteristics combined to account for a substantial percentage of the variability in opposition to the use of animals in medical research. These results confirm and extend previous research, and suggest potentially fruitful avenues for future research.

Notes

1. One participant did not complete the demographic questionnaire. Descriptive statistics will be based on n = 576.

2. The large percentage of undergraduate students who had pets in this sample can be attributed in part to the fact that the Metropolitan State College of Denver is a commuter campus, with no on-campus dormitory accommodations.

3. It is important to note that these scenarios do not reflect the ways in which animals might be used in biomedical research. The purpose of the study was not to elicit responses to actual biomedical research. Rather, the purpose was to examine the characteristics of specific acts of animal research that people use when drawing conclusions about the acceptability of that research.

References

Blackshaw, J., & Blackshaw, A. W. (1993). Student perceptions of attitudes to the human-animal bond. *Anthrozoös, 6*, 190-198.

Broida, J., Tingley, L., Kimball, R., & Miele, J. (1993). Personality differences between pro- and anti-vivisectionists. *Society & Animals, 1*(2), 129-144.

Driscoll, J. (1992). Attitudes toward animal use. *Anthrozoös, 5*, 32-39.

Furnham, A., & Pinder, A. (1990). Young people's attitudes to experimentation on animals. *The Psychologist, 10,* 444-448.

Garner, R. (2005). *Animal Ethics.* Malden, MA: Polity Press.

Hagelin, J., Carlsson, H., & Hau, J. (1997). Medical students' views of the use of animals in biomedical research. *Scandinavian Journal of Laboratory Animal Science, 24*, 151-160.

—— (2003). An overview of surveys on how people view animal experimentation: Some factors that may influence outcome. *Public Understanding of Science, 12*, 67-81.

Hagelin, J., Carlsson, H., Suleman, M., & Hau, J. (2000). Swedish and Kenyan medical and veterinary students accept nonhuman primate use in medical research. *Journal of Medical Primatology, 29,* 431-432.

Hagelin, J., Johansson, B., Hau, J., & Carlsson, H. (2002). Influence of pet ownership on opinions toward the use of animals in biomedical research. *Anthrozoös, 15*, 251-257.

Henry, B. (2004a). The relation between animal cruelty, delinquency, and attitudes toward the treatment of animals. *Society and Animals, 12*(3), 185-207.

—— (2004b). Exposure to animal abuse and group context: Two factors affecting participation in animal abuse. *Anthrozoös, 17,* 290-305.

—— (2006). Empathy, home environment, and attitudes toward animals in relation to animal abuse. *Anthrozoös, 19*(1), 17-34.

Kellert, S. (1980). American attitudes toward and knowledge of animals: An update. *International Journal for the Study of Animal Problems, 1,* 87-119.

Luke, B. (2007). *Brutal: Manhood and the Exploitation of Animals.* Champagne: University of Illinois Press.

National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. (1979). *The Belmont Report: Ethical principles and guidelines for the protection of human subjects of research*. Retrieved March 20, 2009, from http://ohsr.od.nih.gov/guidelines.

Navarro, J., Maldonado, E., Pedraza, C., & Cavas, M. (2001). Attitudes among animal research among psychology students in Spain. *Psychological Reports, 89,* 227-236.

Pifer, L. (1996). Exploring the gender gap in young adults' attitudes about animal research. *Society & Animals, 4*(1), 37-52.

Plous, S. (1996). Attitudes toward the use of animals in psychological research and education. *American Psychologist, 51,* 1167-1180.

Regan, T. (1983). *The case for animal rights.* Berkeley: University of California Press.

Saucier, D., & Cain, M. (2006). The foundations of attitudes about animal research. *Ethics & Behavior, 16,* 117-133.

Singer, P. (1990). *Animal liberation.* London: Cape.

Stanistreet, M., & Spofforth, N. (1993). Attitudes of undergraduate students to the uses of animals. *Studies in Higher Education, 18,* 177-196.

Swami, V., Furnham, A., & Christopher, A. (2008). Free the animals? Investigating attitudes toward animal testing in Britain and the United States. *Scandinavian Journal of Psychology, 49,* 269-276.

Wells, D., & Hepper, P. (1997). Pet ownership and adults' views on the use of animals. *Society & Animals, 5*(1), 45-63.

Wuensch, K., & Poteat, G. M. (1998). Evaluating the morality of animal research: Effects of ethical ideology, gender, and purpose. *Journal of Social Behavior and Personality, 13,* 139-150.