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Attitudes in China, Japan, and the Netherlands toward the Use of Animals in Medical Research

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ABSTRACT

The use of animals in medical research raises ethical challenges. In light of this moral issue, this study sought to investigate and compare people's attitudes toward the use of ten animal species in medical research based on data collected from China ($n = 504$; men = 294, women = 210), Japan ($n = 900$; men = 446, women = 454), and the Netherlands ($n = 506$; men = 259, women = 247) using online questionnaires. We also aimed to explore the relationship between people's ethical ideology (idealism and relativism) and their attitudes toward animal use in medical research. Data were analyzed using both chi-square tests and binary logistic regression analysis. We found that the Chinese group showed a higher level of acceptability for using all ten animal species in medical research, as compared with the Dutch and Japanese respondents. Regarding people's attitudes toward animal-based medical research, ethical idealism was found to be a predictor for Dutch people, and ethical relativism for the Japanese group. Neither ethical idealism nor relativism showed predictive correlations with Chinese people's attitudes toward using any animal species in medical research. Significant negative correlations were found between people's acceptability for using animals in medical research and their attitudes toward animals in general, across the three countries. Our findings indicate that ethical ideologies behave differently in predicting people's attitudes toward animal-based medical research in China, Japan, and the Netherlands, which might be due to different levels of animal welfare and differing cultures between countries. In conclusion, the integration of ethical variables and social value preferences of a given society is of crucial importance in broadening people's understanding of balancing animal welfare concerns with the facilitation of scientific research.


KEYWORDS

Ethical idealism; ethical relativism; human–animal interaction; laboratory animals; medical research

Research involving animals has focused on scientific issues as its medical and social values are widely recognized (Franco et al., 2018; Pulcino & Henry, 2009). Many people regard

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animal-based medical research as justifiable because of medical and social benefits that come from it, yet little evidence is available to support this view (Pound et al., 2004). In recent decades, animal-based medical research has been increasingly challenged on ethical grounds (Izmirli et al., 2010; Kirk, 2018; Touitou et al., 2004). According to the 3Rs (replacement, refinement, and reduction) (Bayne et al., 2015; Sneddon et al., 2017), seeking alternatives that both minimize adverse effects on and improve the welfare of experimental animals needs more attention (Knight et al., 2010; Smith et al., 2018). Public attitudes toward animal-based medical research may be an important variable in directing the discussion of laboratory animal welfare. Therefore, this study investigated public attitudes toward animal use in medical research (PAAMR) from ethical and cross-cultural perspectives.

There is a cross-cultural consensus that people, although from different countries, suffer moral condemnation if they psychologically or physically harm innocent others. Yet, people may have different feelings regarding less clear-cut ethical issues (Forsyth et al., 2008): for example, medical research that promotes medical progress and simultaneously results in animal suffering. This is at least in part because ethical ideology is identified as the main factor in explaining individual differences in ethical judgments on moral issues, including animal use in laboratories (Zou & Chan, 2019). Forsyth's Ethics Position Questionnaire (EPQ) is designed to examine people's ethical ideology along two dimensions: idealism and relativism (Forsyth, 1980). Idealism relates more to "teleological" theories which focus on the consequences of the behaviors, in particular the avoidance of harming others, whereas relativism relates more to "deontological" theories, which focus on the specific behaviors of individuals and the extent to which they are impacted by a belief in universal rules (Redfern, 2004). Ethical idealism and relativism are classified according to their ethical values, which are at least partly a function of culture (Douglas & Wier, 2005). The dimensions of idealism and relativism provide a way of contrasting cultural consistencies on ethics, and their relationship to ethical activities varies across cultures. How ethical ideology is related to PAAMR might be more accurately reflected by introducing cultural consistencies and variations into analyses.

Moral and cultural studies suggest that some aspects of individual ethical ideology vary between countries and cultures (Hanitzsch et al., 2011; Jackson et al., 2000). Culture is highly related to societal or collectively held values (Douglas & Wier, 2005). As nations vary across cultural dimensions, individual values and people's reactions to animal-based research may also differ. The present study investigated individuals' acceptability of animal-based medical research and its relationship with ethical ideologies between Asian and European countries. China, Japan, and the Netherlands were chosen in this study as representative of Asian and Anglo-American cultural values. Compared with both Chinese and Japanese cultures, Dutch culture has a higher tolerance for uncertainty and ambiguity, prefers smaller hierarchical power distance (e.g., institutions), and has a higher preference for both individualism and feminism (Douglas & Wier, 2005). These cultural values describe different psycho-social constructs and are often discussed concerning ethical decision-making (e.g., animal-based medical research) (Arevalo et al., 2016). Given cultural differences and their integration with ethical ideologies, we predicted that groups of individuals from different societies would present different attitudes toward animal-based medical research and that relationships between ethical ideologies and attitudes may also differ between cultures.

Previous research has demonstrated that ethical ideologies and the ways that people interact with animals for their benefit are related to the acceptance of animal-based research in some nations (Galvin & Herzog, 1992; Ormandy & Schuppli, 2014; Rollin, 2017). However, these studies largely ignored the role of culture in shaping individual values regarding animal experimentation, especially in the field of medical research. Cross-cultural differences in reactions to societal and ethical variables provide a novel perspective for improving public understanding of animal-based medical research. The present study, therefore, investigated public attitudes toward laboratory animals in medical research, ranging from endangered wild animals (e.g., chimpanzees, dolphins), farm animals (e.g., cows, pigs), companion animals (e.g., dogs, cats) to some typical laboratory animals (e.g., rats, insects). These attitudes are then discussed from the perspective of East Asian and Anglo-American cultures. Moreover, we examined the relationship between ethical ideology and PAAMR and discuss possible influential factors, such as cultural background and social conditions. The study contributes to the knowledge of ethical and cultural variables that determine public attitudes toward experimental practices in medical research.

Methods

This study adhered to the ethical guidelines of Taylor & Francis and was conducted under protocols approved by Maastricht University's Ethical Review Committee Inner City faculties (ERCIC) and Shandong University. Research into the evaluation of Chinese, Japanese, and Dutch peoples' attitudes toward using laboratory animals in medical research and how ethical ideology determines these attitudes was conducted in November 2015 (Chinese and Dutch data) and May 2016 (Japanese data). During this period, an online survey was conducted via Flycatcher (Chinese and Dutch data) and Rakuten Research (Japanese data) by means of random sampling across these countries. Utilizing a standard translation/back-translation procedure, the English version of the questionnaire was translated into Chinese, Japanese, and Dutch. Two Chinese, two Japanese, and two Dutch-speaking researchers who had not seen the English version translated it back into English, independently. The original and re-translated versions of the questionnaire were compared and did not yield any significant differences in wording.

All respondents provided their e-mail address and received an invitation e-mail with a unique hyperlink to the questionnaire. We described the purpose of the study (to understand how people view animal use in medical research) in the questionnaire and stated that all information would be completely confidential. If they were interested in the research, respondents could then complete the questionnaire. Otherwise, they could reject or ignore the invitation.

Questionnaire

The questionnaire consisted of four sections (for full details of the questionnaire, see online supplemental file). In the first section, participants were asked to provide background information, including gender, age, the highest level of education attained, residence (urban, rural), the main source of religion (Buddhism, Judaism, Islam, Christianity, Taoism, and Others), pet ownership, and pet species (if relevant).

In the second section, the EPQ (Forsyth, 1980) was used to measure the ethical value orientations of respondents. The EPQ includes an ethical idealism subscale (the first 10 items) and an ethical relativism subscale (the last 10 items). Cronbach's alpha was 0.928 for the idealism subscale and 0.881 for the relativism subscale. The idealism subscale measures endorsement of idealistic moral positions concerning the legitimacy of causing harm to others (e.g., "People should make certain that their actions never intentionally harm others even to a small degree"), whereas the relativism subscale measures endorsement of relativistic moral positions (e.g., "Questions of what is ethical for everyone can never be resolved since what is moral or immoral is up to the individual"). Respondents were asked to indicate the extent of their agreement with each statement on a 9-point Likert scale, where 1 = completely disagree and 9 = completely agree.

In the third section, the Animal Attitude Scale (AAS) (Herzog et al., 1991) and Animal Issue Scale (AIS) (Meng, 2009) were introduced to measure attitudes toward animals in general. Cronbach's alphas for the AAS and AIS in the present study were 0.847 and 0.925, respectively. The AAS includes 20 items and the AIS includes 43 items (divided into eight parts: use of animals, animal integrity, killing animals, animal welfare, experimentation on animals, changes in animals' genotypes, animals and the environment, and societal attitudes toward animals). High scores on the AAS and the AIS indicate strong concern about animal welfare.

In the final section, ten laboratory animal species (chimpanzees/other apes, dolphins, horses, cows, pigs, dogs/cats, rats/mice/other rodents, chickens/other birds, fish, and insects) were presented. Respondents were asked whether they accepted the use of these animal species in medical research (options were "not acceptable = 1" and "acceptable = 2").

Statistical Analysis

The relationships between ethical ideologies and PAAMR in China, Japan, and the Netherlands were analyzed using the statistical software SPSS 24.0. A chi-square test was used to compare respondents' opinions about using ten laboratory animal species in medical research. The Fisher's LSD *post hoc* test was used for the three pairwise comparisons, and p -values < 0.0167 (corrected for multiple comparison) were considered significant. A binary logistic regression analysis, with a significance level of $p < 0.05$, was performed to assess the independent effects of ethical idealism and relativism on respondents' acceptability of using the ten species in medical research. Eta correlation analysis was conducted to investigate the correlation between attitudes toward animals in general and attitudes toward utilizing the ten species categories in medical research. A Cronbach's alpha internal consistency reliability coefficient was computed for each scale.

Results

Response Rates

A total of 504 responses were obtained from China, 900 responses from Japan, and 506 responses from the Netherlands. The response rates were 95.6%, 82.8%, and 87.1%, respectively. The background details of the respondents are given in Table 1.

The EPQ

Chinese and Dutch respondents showed higher scores for both idealism ($M_{\text{Chinese}} = 7.26$, $SD = 1.21$; $M_{\text{Dutch}} = 7.27$, $SD = 1.36$; $M_{\text{Japanese}} = 6.29$, $SD = 1.17$; $F = 148.74$, $p < 0.001$) and relativism ($M_{\text{Chinese}} = 6.07$, $SD = 1.33$; $M_{\text{Dutch}} = 6.07$, $SD = 1.35$; $M_{\text{Japanese}} = 5.56$, $SD = 1.02$; $F = 43.29$, $p < 0.001$) than Japanese respondents. Scores for idealism were significantly higher than those for relativism in all three countries (China: $t = 16.30$, $p < 0.001$; Japan: $t = 17.54$, $p < 0.001$; the Netherlands: $t = 16.46$, $p < 0.001$), based on the means and standard deviations of the two scales.

Which Animal Species Can Be Used in Medical Research?

Chinese respondents presented higher levels of acceptability for using the ten species in medical research than the Dutch and Japanese (all $p < 0.01$). Compared with Dutch respondents, the Japanese reported lower acceptability for using two out of the ten species (all $p < 0.01$). The dolphin was the most unacceptable species to respondents across all three countries, followed by horses in the Netherlands and Japan, and chimpanzees or other apes in China. Rodents and insects were the two most common animal species that were most acceptable for medical research in all three countries (Table 2). More than half of the Chinese respondents would accept using eight out of the ten species in medical research, more than half of the Dutch would only accept two, and more than half of the Japanese respondents would accept only one of the ten species for use in medical research (Table 2).

The Ethical Predictor of People’s Attitudes Toward Using Laboratory Animals in Medical Research

Binary logistic regression was used to predict the probability of accepting the use of the ten animal species in medical research, based on respondents’ ethical ideology scores across all three countries. As indicated in Table 3, neither Chinese respondents’ ethical

Table 1. Background details of the respondents.

	Chinese respondents	Japanese respondents	Dutch respondents
Gender			
Male	58.3%	49.6%	51.2%
Female	41.7%	50.4%	48.8%
Age	39.97 ± 13.31	44.81 ± 11.39	49.48 ± 16.78
Highest level of education			
High school and below	13.7%	28.8%	28.9%
Above high school	84.2%	71.2%	68.2%
Residence			
Urban	93.5%	81.8%	60.7%
Rural	6.5%	18.2%	39.3%
View religion as important in life	33.3%	12.7%	29.2%
Pet ownership	44.4%	27.6%	49.2%
Pet species			
Dogs	33.3%	15.0%	20.5%
Cats	17.1%	8.3%	27.8%
Others	28.3%	11.6%	25.7%

Table 2. The acceptance of using animals in medical research in China ($n = 504$), Japan ($n = 900$), and the Netherlands ($n = 506$).

The acceptance of using	China n (%)	Japan n (%)	Netherlands n (%)	χ^2	p
Chimpanzees or other apes	218 (43.3) ^a	319 (35.4) ^b	159 (31.4) ^{b,c}	15.99	< 0.001
Dolphins	165 (32.7) ^a	204 (22.7) ^b	117 (23.1) ^{b,c}	19.23	< 0.001
Horses	253 (50.2) ^a	218 (24.2) ^b	143 (28.3) ^{b,c}	104.71	< 0.001
Cows	272 (54.0) ^a	231 (25.7) ^b	157 (31.0) ^{b,c}	118.22	< 0.001
Pigs	336 (66.7) ^a	254 (28.2) ^b	172 (34.0) ^{b,c}	209.14	< 0.001
Dogs or cats	289 (57.3) ^a	233 (25.9) ^b	151 (29.8) ^{b,c}	148.83	< 0.001
Rats, mice, and other rodents	436 (86.5) ^a	512 (56.9) ^b	290 (57.3) ^{b,c}	141.29	< 0.001
Chickens or other birds	333 (66.1) ^a	278 (30.9) ^b	186 (36.8) ^{b,c}	171.45	< 0.001
Fish	346 (68.6) ^a	310 (34.4) ^b	210 (41.5) ^c	156.13	< 0.001
Insects	397 (78.8) ^a	340 (37.8) ^b	310 (61.3) ^c	230.74	< 0.001

Note: $df = 2$; a, b, and c indicate a significant difference among the three countries of people's acceptance of using animals in medical research; $p < 0.0167$ was considered statistically significant and given in bold.

idealism nor ethical relativism were predictive of their attitudes toward using any animal species. Japanese people's ethical relativism was found to significantly increase the probability of accepting eight out of ten animal species in medical research, although we did not find any relationship between Japanese people's ethical idealism and their attitudes toward using laboratory animals (Table 4). Dutch people's ethical idealism was found to be a significant predictor for accepting the use of all the ten animal species (all $p < 0.01$). Overall, the higher the idealism score, the lower the acceptability of using animals in medical research (Table 5).

The Correlation Between Attitudes Toward Animals in General and Attitudes Toward Animal-Based Research

Significant negative correlations were found between acceptability for using animal species in medical research and attitudes toward animals in general (according to the AAS and AIS scores) across the three countries (except for Chinese people's attitudes toward using insects and their AIS scores) (Table 6). Our results also include significant negative correlations between both male and female respondents' attitudes toward

Table 3. Logistic regression of ethical ideologies on Chinese people's acceptability of using animals in medical research.

Animal species	Idealism				Relativism			
	B	SE	Wald	p	B	SE	Wald	p
Chimpanzees or other apes	-0.124	0.076	2.691	0.101	-0.023	0.069	0.107	0.743
Dolphins	-0.023	0.079	0.085	0.771	-0.020	0.073	0.075	0.785
Horses	-0.064	0.075	0.783	0.390	0.086	0.069	1.551	0.213
Cows	-0.075	0.075	1.000	0.317	0.103	0.069	2.247	0.134
Pigs	-0.116	0.081	2.046	0.153	0.074	0.072	1.066	0.302
Dogs or cats	-0.134	0.077	2.981	0.084	0.023	0.069	0.107	0.744
Rats, mice or other rodents	0.006	0.107	0.003	0.958	0.063	0.062	1.020	0.312
Chickens or other birds	-0.063	0.080	0.618	0.432	0.002	0.072	0.092	0.761
Fish	-0.123	0.083	2.185	0.139	0.047	0.073	0.412	0.521
Insects	0.009	0.090	0.010	0.922	0.048	0.083	0.336	0.562

Note: $df = 1$.

Table 4. Logistic regression of ethical ideologies on Japanese people's acceptability of using animals in medical research.

Animal species	Idealism				Relativism			
	<i>B</i>	<i>SE</i>	Wald	<i>p</i>	<i>B</i>	<i>SE</i>	Wald	<i>p</i>
Chimpanzees or other apes	−0.063	0.065	0.949	0.330	0.190	0.074	6.588	0.010
Dolphins	−0.059	0.074	0.622	0.430	0.187	0.084	4.951	0.026
Horses	−0.055	0.072	0.584	0.445	0.163	0.082	3.943	0.047
Cows	−0.021	0.071	0.092	0.762	0.136	0.080	2.888	0.089
Pigs	−0.005	0.069	0.005	0.944	0.157	0.078	4.095	0.043
Dogs or cats	0.020	0.071	0.083	0.713	0.165	0.079	4.308	0.038
Rats, mice, or other rodents	0.063	0.062	1.020	0.312	0.193	0.073	7.073	0.008
Chickens or other birds	0.022	0.068	0.010	0.740	0.240	0.076	9.880	0.002
Fish	0.015	0.065	0.052	0.819	0.161	0.074	4.771	0.029
Insects	0.048	0.064	0.565	0.452	0.135	0.072	3.501	0.061

Note: *df* = 1. Significant *p*-values in bold.

animals in general and their attitudes toward using animal species in medical research across the three countries (except for Chinese male respondents' attitudes toward animals in general and their attitudes toward using fish and insects in medical research) (data not included).

Discussion

The use of animals in medical research is a controversial ethical issue. Animal use has accelerated medical progress, yet there is a concern about the well-being of laboratory animals (dos Santos, 2015; Sandgren et al., 2020). There is now a worldwide trend to re-evaluate the use of animals in medical research and to pay more attention to the ethics surrounding animal research (Carvalho et al., 2020; Herrmann, 2019; Rochelle et al., 2016; Smith et al., 2018). This study investigated the role of ethical and cultural values in predicting PAAMR in China, Japan, and the Netherlands. Our results showed a significant correlation between idealism and PAAMR in the Netherlands and between relativism and PAAMR in Japan, but neither ethical idealism nor ethical relativism showed predictive correlations with Chinese PAAMR. These findings demonstrate that the mechanisms underlying the effect of ethical ideology on PAAMR differ between cultures.

Table 5. Logistic regression of ethical ideologies on Dutch people's acceptability of using animals in medical research.

Animal species	Idealism				Relativism			
	<i>B</i>	<i>SE</i>	Wald	<i>p</i>	<i>B</i>	<i>SE</i>	Wald	<i>p</i>
Chimpanzees or other apes	−0.312	0.074	17.684	< 0.001	−0.099	0.077	1.655	0.198
Dolphins	−0.332	0.079	17.877	< 0.001	−0.127	0.086	2.201	0.138
Horses	−0.341	0.076	20.179	< 0.001	−0.134	0.080	2.780	0.095
Cows	−0.307	0.074	17.141	< 0.001	−0.092	0.077	1.425	0.233
Pigs	−0.299	0.073	16.676	< 0.001	−0.119	0.075	2.508	0.113
Dogs or cats	−0.303	0.074	16.524	< 0.001	−0.131	0.078	2.817	0.093
Rats, mice, or other rodents	−0.183	0.072	6.352	0.012	−0.044	0.070	0.400	0.527
Chickens or other birds	−0.312	0.073	18.274	< 0.001	−0.043	0.074	0.341	0.559
Fish	−0.291	0.072	16.157	< 0.001	−0.069	0.072	0.938	0.333
Insects	−0.204	0.075	7.423	0.006	−0.066	0.071	0.872	0.350

Note: *df* = 1. Significant *p*-values in bold.

Table 6. Eta coefficient of attitudes toward animals and attitudes toward animal-based medical research in the Netherlands, China, and Japan.

Animal species	China		Japan		Netherlands	
	AAS	AIS	AAS	AIS	AAS	AIS
Chimpanzees or other apes	-0.307*	-0.334**	-0.423**	-0.390**	-0.495**	-0.577**
Dolphins	-0.352**	-0.366**	-0.398**	-0.386**	-0.438**	-0.528**
Horses	-0.368**	-0.421**	-0.409**	-0.3866**	-0.484**	-0.567**
Cows	-0.335**	-0.373**	-0.416**	-0.407*	-0.486**	-0.558**
Pigs	-0.329**	-0.300**	-0.445**	-0.404**	-0.493**	-0.570**
Dogs or cats	-0.390**	-0.381**	-0.425**	-0.422**	-0.475**	-0.566**
Rats, mice, or other rodents	-0.246**	-0.226**	-0.397**	-0.340**	-0.488**	-0.545**
Chickens or other birds	-0.359**	-0.305**	-0.426**	-0.385**	-0.492**	-0.554**
Fish	-0.309**	-0.330**	-0.352**	-0.325**	-0.484**	-0.546**
Insects	-0.201*	-0.178	-0.302**	-0.287**	-0.384**	-0.449**

Note: ** $p < 0.01$, * $p < 0.05$. AAS = Animal Attitude Scale; AIS = Animal Issue Scale.

PAAMR in China, Japan, and the Netherlands

Chinese respondents were more accepting of animal-based medical research than Japanese and Dutch respondents, suggesting that the latter two had higher levels of awareness of laboratory animal welfare. Japan and the Netherlands are economically more developed countries and their animal-based scientific research has long been subject to public scrutiny (von Roten, 2013). Therefore, the negative attitudes toward animal-based medical research in these two countries may be related to public pressures. While for China, which is still considered a developing country, the lower levels of public awareness and oversight regarding animal use in medical research might explain why those respondents showed greater support for using animals (Bayne et al., 2015; Cao, 2015; Cyranoski, 2016). Our results reveal that economic and social differences may influence moral views on animal-based medical research between different cultures and countries.

The phylogenetic scale reflects people’s beliefs in animal mind, while beliefs in animal sentience may relate to people’s attitudes toward animal use (Bradley et al., 2020; Knight & Barnett, 2008; Knight et al., 2009). Previous research demonstrates that people prefer to rank different animal species on a continuum based on their perceived mental complexity, with larger-brained primates and mammals at the top of the scale and smaller-brained rodents, insects, and fish at the bottom (Knight & Barnett, 2008). This may explain why the use of dolphins, horses, and chimpanzees was strongly opposed, while the use of rodents and insects was perceived to be more acceptable. Additionally, the higher levels of support for research on rats and insects in all three countries indicates that nonmammals or rodents are more likely to be accepted for medical use than primates or companion animals (Hansen & Kosberg, 2019; Knight et al., 2009).

Relationship Between Idealism and PAAMR

The idealistic or teleological approach to research ethics advises that potential benefits should be weighed against potential costs (Ormandy et al., 2013). Findings from the Dutch respondents in this study confirm that ethical idealism is significantly related to PAAMR (Bègue & Laine, 2017), indicating that idealism pertains to Dutch people’s

concern for minimizing animal suffering and maximizing animal welfare. For people with a higher idealism score, the existence of any animal suffering renders the activities immoral (Su & Martens, 2017). As Dutch society has higher levels of awareness of animal welfare and ethical idealism, this may lead to increased attention paid to the suffering of animals in medical research, as indicated in the present study. This finding also suggests that Western people's high level of belief in animal minds is associated with their condemnatory attitudes toward animal use (Knight et al., 2004).

Chinese and Japanese people also believe that animals are capable of mental experience (Su & Martens, 2020). Yet, ethical idealism was not found to be related to Chinese or Japanese PAAMR. Chinese and Japanese societies are more accepting of the hierarchical ordering of humans and nonhuman animals (Kondo & Sato, 1999; Su & Martens, 2020). To some extent, this may explain why Chinese and Japanese people are more likely to accept pursuing social progress and scientific development by using laboratory animals. This suggests that social and cultural values, independent of idealistic values, can impact PAAMR. Also, an individual may find the general ideal of animal-based medical research worthy but may reach a different conclusion when faced with a detailed scenario (Knight et al., 2010). For instance, most Chinese and Japanese people prefer to avoid harming animals when specifically asked about the importance of animals (Davey & Wu, 2007; Su et al., 2018), yet they may support animal-based medical research because of the derived benefits (e.g., medical progress), owing to their collectivistic value orientation (Kobayashi et al., 2018; Kong & Qin, 2010; Ma et al., 2017).

Relationship Between Relativism and PAAMR

The relativist view acknowledges that there may not be universal ethical rules and that ethical standards may differ between groups within a single culture, between cultures, and over time (Lockhart & Franzwa, 2019; Redfern, 2004). We found that the relationship between relativism and PAAMR was only significant in Japan: the lower the level of Japanese respondents' relativism scores, the less they support animal-based medical research. From the perspective of relativism, the judgment of the ethical content of animal-based medical research is derived subjectively from individuals' experiences (Stedham et al., 2007). Japanese respondents' acceptance of the use of animals in medical research was low, which is in line with previous research showing that animal-based research is largely regarded as unacceptable in Japan (Ambros, 2012; Shoji, 2008). Also, as influenced by World War II and the Shinto religion, Japanese people are more submissive and less likely to show extreme opinions (Benedict, 2005), and this may have contributed to their lower relativism scores, as compared with the Dutch and Chinese respondents. The finding that Japanese people are less relativistic, meaning they are more likely to believe a universal ethical principle than the Chinese and Dutch respondents, may have directly contributed to their negative attitudes toward animal-based medical research.

Chinese people are major relativists in decision-making (Abdyrakhmanova & Kollár, 2020; Jackson et al., 2000). They attach greater importance to medical progress and are more likely to accept animal-based medical research owing to its contribution toward scientific progress. At extreme levels of pursuing social progress, individual sentiments

might be overridden by greater societal goals, thereby resulting in ethical relativism having a negligible impact on public attitudes toward animal use in medical research. Dutch respondents were more likely than Japanese respondents to believe that no moral absolutes exist and ethical behavior depends on the situation. Their low level of acceptability of using animals in medical research might be rooted in their unique cultural characteristics, rather than ethical relativism. For instance, Dutch people show a lower level of approval for animal research, a stronger public pressure on animal experiments, and a higher concern for the environment and animal welfare (Franzen & Meyer, 2010; von Roten, 2013). Also, the Dutch culture highlights power equalization and public involvement in the decision-making process, and Dutch people do not generally endorse power inequities such as animal experiments that sacrifice animals for human interests (Douglas & Wier, 2005). PAAMR in the Netherlands may be based more on these societal and cultural features than on relativism, which may have led to there being no statistically significant relationship between relativism and Dutch PAAMR.

Attitudes Toward Animals in General and PAAMR

Animal-based medical research has contributed significantly to medical science and social progress (Aske & Waugh, 2017), and it is largely regarded as acceptable when its benefits sufficiently outweigh animal suffering (Bradley et al., 2020). However, in recent decades, a growing number of people have challenged or refuted animal-based research, independent of their nationalities and cultures. Our results demonstrate that people with higher AAS/AIS scores have a more welfare-oriented attitude toward animal-based medical research. This indicates that people's concern for animal welfare is inherent to challenging animal-based medical research. However, using animals in medical research helps to save humans' lives, which can generate a moral conflict for individuals who disagree with animal use (Bradley et al., 2020; Garrett, 2012). More generally, the awareness of both animal welfare and the need for medical breakthroughs may promote efforts to seek alternatives (e.g., computer models, artificial animals) to replace animal usage, which, to some extent, could alleviate the conflict of values between medical progress and animal use.

As is common in cultural and ethical studies, there are limitations to this study. For instance, the relationship between ethical ideologies and PAAMR across the countries of China, Japan, and the Netherlands is complex, and it is, therefore, inherently difficult to explain it clearly from social and cultural perspectives. The study investigated people's attitudes toward just ten animal species used in medical research; it would be useful to include more (e.g., rabbit) in future studies to better reflect the full spectrum of animals used for testing in this industry. Variables or predictors such as types of medical research, alternative possibilities, animal suffering, and knowledge about animal experiments could all be considered to further enhance future related studies.

Conclusion

The present study reveals that ethical ideology behaves differently in predicting PAAMR among people in China, Japan, and the Netherlands. Specifically, significant correlations

were found between ethical ideology and Dutch and Japanese PAAMR, while we did not find significant correlations between ethical ideology and Chinese PAAMR. This study extends our understandings of PAAMR from ethical and cultural perspectives and represents a significant effort toward measuring and comparing the impacts of social values between countries when balancing the imperatives of animal welfare with those of medical progress. Owing to differences in ethical value orientations, one should not underestimate the importance of considering the appropriateness of assessing ethical value orientations from cultural, social, and ethical perspectives when seeking to explain different attitudes toward laboratory animals and predictor variables. According to the research ethics guiding the present study, inherent social and cultural differences must always be taken into account and respected when comparing groups and drawing conclusions.

This study captures some fundamental aspects of the evaluation of contemporary animal-based medical research from a cross-cultural perspective. The methodology presented here could also be applied to other countries to assess people's attitudes toward medical research and their philosophical values and cultures. Additionally, considering the dearth of previous research discussing animal-based research and laboratory animal welfare from ethical and cultural perspectives, the present study is exploratory and provides preliminary information that may serve to motivate future research in this area.

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