Public concern for animal welfare and its correlation with ethical ideologies after coronavirus disease (COVID-19) in China

B Su*† and P Martens‡

† School of Philosophy and Social Development, Shandong University, Jinan, People's Republic of China
‡ University College Venlo, Maastricht University, Venlo, The Netherlands
* Contact for correspondence: subingtao@sdu.edu.cn

Abstract

The outbreak of coronavirus disease (COVID-19) represents a major public health challenge and a serious threat to sustainable social development. A consideration of animal welfare is clearly justified, given the potential contribution of animals to the spread of the disease. The present study, therefore, sought to investigate the concern the Chinese people have for animal welfare (PCAW) and how their 'ethical ideology' (idealism and relativism) determines PCAW after COVID-19, through comparison with the same study, carried out in China in 2015. Our results demonstrated a significant improvement in Chinese PCAW after COVID-19. The adverse impact of COVID-19 may have resulted in a lowered idealism score and this decreased score served to neutralise significant correlations between idealism and PCAW, compared to the 2015 results. The global pandemic did not increase people's relativism score and a significant correlation was found between relativism and PCAW. Gender, age, educational level, public perception of animals after COVID-19, zoo and aquarium visiting were all shown to be predictor variables for PCAW. This study is one of the first to investigate Chinese PCAW after COVID-19 and can therefore provide knowledge that will potentially increase Chinese PCAW.

Keywords: animal welfare, China, COVID-19, culture, ethical idealism, ethical relativism

Introduction

The latest threat to global health is the quick spread of coronavirus disease 2019 (COVID-19) (Fauci *et al* 2020). The global COVID-19 pandemic has resulted in more than 106 million confirmed cases and in excess of two million deaths (Lau *et al* 2021). It is evidence of the potential for the animal-human interface to act as the primary source of emerging zoonotic diseases (Tiwari *et al* 2020) and this disease outbreak is a matter of human and animal health (Bonilla-Aldana *et al* 2020; Gortázar & de la Fuente 2020). However, it also sheds light upon illegal and unregulated activity pertaining to the trade and consumption of wild meat reflecting the negligent approach to animal welfare which is the subject of vigorous debate by various animal welfare organisations (Roe & Lee 2021). Since then, there has been growing interest in the relationship between disease severity and animal welfare (eg regulation of the trade in wildlife, the safety of animal products [in particular seafood], and veterinary care of companion animals) (Aitken 2020; Hashem *et al* 2020; Baptista *et al* 2021).

Animal welfare is a multidisciplinary concept and, according to OIE (the World Animal Health Organisation), at its core it is defined by how an animal copes within the conditions it finds itself. Here, the concept refers to the welfare of animals in general. An animal is in a good state of welfare if it is healthy, comfortable, well-nourished, safe, able to express innate behaviour, and not suffering from unpleasant states such as pain, fear and distress (Prescott & Lidster 2017). The COVID-19 pandemic has reinforced the significance of animal welfare since animals are linked inextricably to science and ethics, animal and human health and, ultimately, the benefit of society as a whole (De Paula Vieira & Anthony 2020). Identifying variables that impact animal welfare may, therefore, imbue the public with greater knowledge regarding how to promote animal welfare as well as protect social health and the environment against the negative effects of COVID-19.

Previous research has shown gender, age, education, pet ownership, culture, and ethical ideology to be highly correlated with people's concern for animal welfare (PCAW) (Herzog *et al* 2015; Bègue & Laine 2017; Su & Martens 2017; Su *et al* 2018a). Of these, ethical ideology has not been studied extensively due to the complicated cultural and philosophical nuances. Ethical ideology has the capability to explain differences in moral judgments. This set of attitudes, beliefs, and values may offer guidance to individuals to help judge and resolve ethically questionable behaviour (Forsyth & Nye 1990). According to Forsyth (1980), ethical ideology can be defined along two dimensions: idealism and relativism. Idealism describes people's

attitudes toward the consequences of an action, and how these consequences affect the welfare of others. Highly idealistic individuals believe that moral actions always have positive consequences and that it is unnecessary to pursue an action that harms others. Less idealistic people believe harmful consequences may sometimes be necessary in the pursuit of a greater good (Forsyth & Nye 1990; Forsyth 1992; Barnett *et al* 1994; Saha & Mathew 2019). Relativism describes the extent to which individuals reject universal moral principles and highly relativistic individuals believe that the morality of an action depends upon the specific circumstances involved, and do not believe in moral absolutes. Non-relativistic individuals rely upon universal moral principles when evaluating the ethics of an action (Forsyth 1980; Barnett *et al* 1994; Sunil & Verma 2018). A higher level of idealism and a lower level of relativism has been shown, prior to the COVID-19 pandemic, to correlate significantly with a greater concern for animal welfare (Su & Martens 2017). Although a promising area of study, in China, there have been no empirical studies examining PCAW and its relationship with ethical ideology since the COVID-19 pandemic.

The present study, therefore, investigated Chinese PCAW and how ethical ideology has determined PCAW post-COVID-19 according to data collected from Chinese citizens in May 2020. Specifically, we quantified Chinese PCAW, examined how ethical ideologies are related to PCAW and identified possible predictor variables of PCAW. Results were compared and contrasted with those of the same study the authors conducted in China in 2015 (Su & Martens 2017). Through this research, we aim to: (i) extend Chinese people's knowledge of and concern for animal welfare and the correlations between ethical ideologies and PCAW within the context of infectious disease pandemics such as COVID-19; and (ii) examine the possible determinant variables of PCAW.

Materials and methods

Recruitment of participants

In brief, two online surveys were conducted throughout China in November 2015 and May 2020 (after COVID-19 infections had peaked in China but while the virus was still spreading throughout Europe and the Americas) via Flycatcher and KuRunData, respectively, by means of simple random sampling (Kirk 2011). For the 2015 survey, a total of 504 responses were obtained from 527 people throughout China. For the 2020 survey, a total of 500 responses were obtained from 547 people. The response rates were 95.6 and 91.4%, respectively. Both surveys were conducted using protocols approved by Maastricht University's Ethical Review Committee Inner City faculties (ERCIC) and Shandong University and adhered to their ethical guidelines. Prospective participants were included in both surveys via completely independent methods, but both samples were representative of the Chinese population aged 18 years or older, in terms of age and gender.

Survey design

Implementing a standard translation/back-translation procedure, the English version of the questionnaire was translated into Chinese, and two Chinese-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. In the questionnaire, we explained the purpose of our study and stated that all information provided by participants would be kept completely confidential, and that personal information would not be released to or viewed by anyone other than the researchers directly involved in this project.

Survey development

Flycatcher and KuRunData are two research companies with a panel of 5,630 and 800,000 people, respectively, throughout China. All these people have been registered at the company and provided their email address. The companies randomly sent out invitation emails to potential participants, with a unique hyperlink to the questionnaire. Potential participants were free to begin completing the questionnaire if interested in our study, or simply ignore the request. Filling out the questionnaire entitled participants to a reward of coupons or money. To check the questionnaire and clarify our research questions, participants were required to complete an online pre-test.

Measurements

The Human-Animal Interactions questionnaire (S1 Questionnaire) consisted of four sections. The first included 14 items in the 2015 survey and 18 in the 2020 version. Respondents were asked to supply information regarding age, gender, educational level, animal protection/nature conservation/human health organisation participation, place of residence, household composition, pet ownership, the importance of religion, the frequency of meat-eating and zoo/aquarium visiting, and people's experience of and feelings for COVID-19, attitudes toward governmental response to COVID-19, and attitudes toward animals after COVID-19 (these last four items only appeared in the 2020 survey).

In the second section, the Ethics Position Questionnaire (EPQ, Cronbach's alpha = 0.879) was introduced to measure respondents' ethical ideology along two dimensions: idealism and relativism (Forsyth 1980). The EPQ includes 20 items, of which the first ten measured idealism and the last ten, relativism. Participants were required to indicate the extent of their agreement on a nine-point-Likert scale where 1 = completely disagree and 9 = completely agree. Examples of questions include: '1) People should make certain that their actions never intentionally harm another even to a small degree'; '11) There are no ethical principles that are so important that they should be a part of any code of ethics.'

In the third part, the Animal Attitudes Scale (AAS, Cronbach's alpha = 0.812) (Herzog Jr *et al* 1991), which includes 20 items, was provided to participants to measure their concern for animal welfare. The AAS is a five-point-Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree) for the

items of 2, 5, 6, 8, 9, 12, 13, 14, 15, 16 and 18, while the other nine items are reverse-scored from 1 (strongly disagree) to 5 (strongly agree). A high AAS score indicates a high awareness of animal welfare. Examples of questions include: '2) I do not think that there is anything wrong with using animals in medical research'; '11) I sometimes get upset when I see wild animals in cages at zoos.'

To get a clearer awareness of people's concern for animal welfare while simultaneously making our results more convincing, we also introduced the Animal Issue Scale (AIS, Cronbach's alpha = 0.945) (Meng 2009) in the final part of the questionnaire. The AIS is a complementary scale to the AAS and is more precisely structured and clustered. It includes eight animal issues (in total 43 items): use of animals (five items), animal integrity destruction (six items), killing animals (five items), deprive animal welfare (five items), experimentation on animals (five items), changes in animal genotypes (five items), harm animals for the environment (six items) and harm animals for social issues (six items). Participants were asked to respond to each description on a five-point-Likert scale, ranging from 1 (extremely acceptable) to 5 (extremely unacceptable). A higher score of the AIS means a greater awareness of animal welfare. Examples of items include: 'operations on animals to improve their health'; 'killing wild animals to stop the spread of diseases that could affect humans.'

Statistical analysis

Data were analysed by using IBM SPSS 24. The data in this study were either normally distributed or translated into a normal distribution, and the Levene test showed homogeneity of the variances. A t-test was carried out to investigate people's different concerns for animal welfare (ie, AAS, AIS, and the eight animal issues) between the 2015 and 2020 surveys. A multivariate analysis (MANOVA) was employed to elucidate the relationship between respondents' ethical ideologies (ie, idealism and relativism) and their concern for animal welfare (ie, AAS, AIS, and the eight animal issues). Fisher's procedure and REGWQ correction were performed in the analyses wherever Type-I errors needed to be reduced. Step-wise linear regression was used to relate respondents' concern for animal welfare (measured by the continuous variables of AAS and AIS) to 24 potential ordinal or categorical predictor variables, such as gender, age, educational level, pet ownership, meat-eating frequency, zoo/aquarium-visiting frequency, the main source of spiritual inspiration, natural environment organisation participation, attitudes toward animals after COVID-19 and attitudes toward governmental response to COVID-19. Step-wise regression may result in an inappropriate selection of predictors and the final model therefore can vary based on the selection procedure chosen (Derksen & Keselman 1992). To address these problems and simultaneously reduce Type-I errors, we only considered predictors appearing in the final model as influential variables (Petraitis *et al* 1996). An alpha value of 0.05 was used for variables to be entered into the models.

Results

Response rates

Respondents' basic information is presented in Table 1.

The AAS and AIS before and after COVID-19

Respondents showed a higher AAS score in 2020, after COVID-19, compared to 2015. The AIS score in the present study increased, but the difference was not significant compared to the results of the 2015 survey. However, our results showed that respondents' concern for the issues, 'use of animals' and 'harm animals for environment' increased significantly after COVID-19 (Table 2).

The EPQ before and after COVID-19

Respondents had lower mean (± SD) scores on the idealism scale after COVID-19 compared to 2015: 6.74 (± 1.12) as opposed to 7.26 (± 1.21), $t = 6.93$, df = 1,002; $P < 0.001$. Yet, we did not find any significant difference regarding their relativism scores between the 2015 and 2020 surveys: 6.07 (± 1.33) and 6.02 (± 1.14), (respectively); $t = 0.590$, df = 1,002; $P = 0.555$.

The correlation between ethical ideology and PCAW after COVID-19

The correlation between ethical ideology and PCAW before COVID-19 has been published in 2017, and the results showed that idealism was positively significantly correlated with PCAW and relativism was negatively significantly correlated with PCAW (according to their AAS and AIS scores) (Su & Martens 2017). However, the idealism showed predictive correlations with neither AAS nor AIS in this study, although respondents' ethical idealism was significantly positively correlated with their concern for issues of 'killing animals', 'deprive animal welfare' and 'harm animals for social issue', meaning that when having a higher idealism score, respondents expressed greater concern for the issues mentioned above. Significant correlations were found between relativism and PCAW (based on their AIS score). Specifically, when having a higher level of ethical relativism, respondents expressed less concern for animal welfare, resulting in higher acceptability of 'use of animals', 'killing animals', 'deprive animal welfare', 'experimentation on animals', 'changes in animal genotypes' and 'harm animals for social issue.' The interaction of idealism and relativism did not influence PCAW. However, the effect of ethical idealism on decreasing the acceptability of 'killing animals', 'deprive animal welfare' and 'harm animals for social issue' was stronger with a decreasing trend of ethical relativism (ethical idealism × ethical relativism) (Table 3).

The important determinants of the PCAW after COVID-19

Several possible variables were identified to relate to PCAW (according to their AAS and AIS scores). Results showed that the AAS scores of young respondents aged 19–44 years were, on average, 3.34 points higher than those of

Table 1   Basic information of respondents (n = 1,004).

Factor	2015		2020	
	n	%	n	%
Gender				
Male	294	58.3	248	49.6
Female	210	41.7	252	50.4
Age	38.97 (± 13.31)		40.81 (± 13.73)	
19–44 years	329	65.3	290	58.0
45–59 years	138	27.4	131	26.2
60+ years	37	7.3	79	15.8
Animal protection organisation participation	114	22.6	197	39.4
Nature conservation organisation participation	246	48.8	306	61.2
Human health organisation participation	166	32.9	204	40.8
Residence place				
Urban areas	471	93.5	331	66.2
Rural areas	33	6.5	169	33.8
Pet ownership	224	44.4	87	17.4
Meat eating: once a week or never	107	21.3	139	27.8
Zoo/aquarium visiting: once every year or less	309	61.3	355	71.0
Importance of religion	168	33.3	92	18.4

The seventh National Census (2020) showed China had 51.24% men to 48.76% women and that 63.35% of the population were aged 15–59 and 13.5% were 60 years and older.

Table 2   Mean (± SD) PCAW before and after COVID-19 (n = 1,004).

Factor	2015	2020	*t*	*P*-value
AAS	63.07 (± 7.83)	65.21 (± 8.77)	–4.087	**0.000**
AIS	138.21 (± 18.40)	139.54 (± 23.61)	–0.991	0.322
Use of animals	12.89 (± 2.81)	13.82 (± 3.55)	0.819	**0.000**
Animal integrity	17.71 (± 3.31)	17.53 (± 3.87)	0.115	0.413
Killing animals	17.08 (± 3.22)	17.06 (± 3.74)	0.181	0.908
Deprive animal welfare	20.38 (± 3.32)	20.33 (± 4.17)	1.158	0.856
Experimentation on animals	13.18 (± 3.04)	12.95 (± 3.32)	–0.044	0.247
Changes in animal genotypes	14.79 (± 3.63)	14.80 (± 3.80)	–2.429	0.965
Harm animals for environment	20.63 (± 3.69)	21.27 (± 4.12)	–0.983	**0.015**
Harm animals for social issue	21.54 (± 3.47)	21.77 (± 4.12)	–0.991	0.326

Values in bold show significance at *P* < 0.05.
df = 1,002

Table 3   The effects of idealism and relativism on PCAW after COVID-19 (n = 500).

Factor	Idealism (I)		Relativism (R)		I × R	
	F	*P*-value	*F*	*P*-value	*F*	*P*-value
AAS	1.42	0.08	1.16	0.27	1.17	0.19
AIS	1.09	0.36	2.00	**< 0.01**	1.22	0.14
Use of animals	1.09	0.36	1.94	**< 0.01**	1.02	0.48
Animal integrity	0.75	0.86	1.38	0.09	1.03	0.44
Killing animals	1.60	**0.03**	1.86	**< 0.01**	1.43	**0.02**
Deprive animal welfare	1.63	**0.02**	1.94	**< 0.01**	1.36	**0.04**
Experimentation on animals	0.87	0.70	1.56	**0.03**	0.87	0.81
Changes in animal genotypes	1.34	0.12	1.60	**0.03**	0.96	0.60
Harm animals for environment	1.25	0.18	1.41	0.08	1.34	0.06
Harm animals for social issue	1.61	**0.03**	2.77	**< 0.01**	1.46	**0.02**

Values in bold show significance at $P < 0.05$.

middle-aged (45–59 years) and old respondents (aged 60+), while female respondents were, on average, 1.85 points higher than their male equivalents. The AAS score of respondents with a higher level of education (college/technical school, university or above) was 1.77 points higher than respondents with a lower level of education (high school or lower). Respondents who think human beings should be more kind to animals after COVID-19 averaged 5.23 points above those who do not. Those reporting they owned a pet had an AAS score 2.78 points higher than those who did not. The AAS scores of respondents who eat less meat (once a week or never) were 2.13 points higher than those of respondents who eat more meat (2+ days a week). Those who visit zoos or aquaria once every year or less (including never) were 2.13 points higher than those who do so twice or more a week. Satisfaction with governmental response to COVID-19 was another factor that related to PCAW. Respondents who described themselves as satisfied scored 5.23 points higher than those who did not (Table 4).

According to the relationships between people's AIS scores and the possible determinant variables (see Table 5), we found that young respondents' mean AIS score was 7.09 points higher than that of middle-aged and old respondents, while female respondents' mean AIS score was 5.95 points higher than that of male respondents. Respondents with a higher educational level averaged 4.46 points above those with a lower level of education. The respondents belonging to or donating to an organisation involved in improving the natural environment had an average AIS score of 4.38 points greater than those who did not. Those reporting that human beings should be more kind to animals after COVID-19 averaged 12.59 points above those who did not.

Respondents who reported their main source of spiritual inspiration to be Islam had an AIS score 33.99 points lower than those who did not. Respondents who visit zoos or aquaria once every year or less (including never) were 8.30 points higher than those who visit zoos or aquaria two or more times a week.

Other correlated variables for PCAW after COVID-19 in China

During the COVID-19 pandemic in China, 63.8% of respondents described feeling panic, 92% of respondents felt satisfied or very satisfied regarding governmental action toward COVID-19 and 96.4% thought human beings should be more kind to animals after COVID-19. Additionally, our results showed this belief that humans should be more kind to animals after COVID-19 to be significantly correlated with their attitudes toward governmental action on COVID-19 ($\chi^2 = 33.46$; $P < 0.01$) and their feelings of panic during the worst moments of COVID-19 ($\chi^2 = 7.50$; $P < 0.01$).

Discussion

This study investigated Chinese PCAW and how individual ethical ideology relates to these attitudes after COVID-19. The results showed PCAW to have significantly increased. Ethical relativism was a predictor regarding PCAW, and this is in line with the same study conducted in 2015. However, we did not find any significant correlations between idealism and PCAW, and this finding differed from the 2015 survey which yielded a positive significant relationship. Our findings indicated that the COVID-19 pandemic might influence people's idealistic properties and the decreased idealistic position may further impact its relationship with PCAW.

Table 4   Multivariate regression analyses of predictor (socio-demographics and animal-related factors) of the Animal Attitudes Scale (AAS) after COVID-19 in China (n = 500).

	Unstandardised coefficients		Standardised coefficients	Zero-order coefficients	t	P-value
	B	Standard error	Beta			
Y) The attitudes towards animals						
Constant	77.04	3.74			20.61	0.000
X₁) What's your age? 18-44 years (1); 45 years and older (2)	–3.34	0.87	–0.19	–0.276**	–3.84	0.000
X₂) What's your sex? Male (1); female (2)	1.85	0.76	0.11	0.199**	2.43	0.016
X₃) What's your highest level of education? High school or lower (1); college/technical school, university or above (2)	1.77	0.64	0.12	0.195**	2.75	0.006
X₄) Do you think human beings should be more kind to animals after COVID-19? Yes (1); no (2)	–5.23	2.01	–0.11	–0.162**	–2.61	0.009
X₅) Do you have pet (s)? Yes (1); no (2)	–2.78	0.98	–0.12	–0.182**	–2.83	0.005
X₆) How often do you eat meat (including fish) every week? Once a week or never (1); 2 or more than 2 days a week (2)	–2.13	0.81	–0.11	–0.117**	–2.61	0.009
X₇) How often do you visit a zoo or aquarium? Once every six months or more (1); once every year or less (including never) (2)	1.82	0.85	0.09	–0.013	2.16	0.032
X₈) Are you satisfied with the government's response to COVID-19? Satisfied (1); dissatisfied (2)	–1.04	0.51	–0.09	–0.126**	–2.05	0.041

Standardised coefficients refer to the partial effect of one predictor after adjusting for the others;
$R^2 = 0.160$, Adj. $R^2 = 0.146$;
Durbin-Watson = 2.115;
Zero-order correlation test: ** $P < 0.01$; * $P < 0.05$.

PCAW

One common factor linking some of the first COVID-19 patients was the experience of visiting or working at a local seafood market (Parry 2020). Several other sporadic cases of COVID-19 in China were also found to have originated from cold-chain meat products or seafood, suggesting that in humans the disease can be traced back to an initial animal-to-human spread of the novel virus (Han *et al* 2020; Pang *et al* 2020). These phenomena reveal that animal welfare can be regarded as an indicator of food safety and human health. Our results indicate PCAW to be moderate in terms of respective scores of 65.21 (± 8.77) and 139.54 (± 23.61) for AAS and AIS in China, but still suggest that some respondents had a greater concern for animal welfare than others. The majority of respondents believe humans should be more kind to animals after COVID-19 and PCAW, in particular issues that are highly related to human health and sustainable development (eg use of animals, harm animals for environment), increased significantly after COVID-19, suggesting that the COVID-19 pandemic had a profound effect on people's desire for greater harmony in the relationship between humans, animals and the environment. The COVID-19 pandemic has highlighted the need for research to continue to improve PCAW, not only in China but also in other countries with lower levels of animal welfare.

Ethical ideologies and PCAW

In the 2015 survey, PCAW showed a positive correlation with idealism, and a negative correlation with relativism. The COVID-19 pandemic has had a serious effect on people's outlooks, both consciously and subconsciously (McKibbin & Fernando 2020). Not only was it a global health emergency impacting human health and resulting in social panic but it also lead to a major global economic downturn with the closure of companies, increased unemployment, etc (Alon *et al* 2020). These significant adverse impacts may have led to people displaying a more negative evaluation of prosocial choices when responding to moral dilemmas (eg not harming others as opposed to doing what

Table 5   Multivariate regression analyses of predictor (socio-demographics and animal-related factors) of the Animal Issue Scale (AIS) after COVID-19 in China (n = 500).

	Unstandardised coefficients		Standardised coefficients	Zero-order coefficients	t	P-value
	B	**Standard error**	**Beta**			
Y) The attitudes towards animals						
Constant	138.71	8.79			15.78	0.000
X_1) What's your age? 18-44 years (1); 45 years and older (2)	−7.09	2.43	−0.15	−0.211**	−2.91	0.004
X_2) What's your sex? Male (1); female (2)	5.95	2.07	0.13	0.178**	2.88	0.004
X_3) What's your highest level of education? High school or lower (1); college/technical school, university or above (2)	4.46	1.75	0.12	0.177**	2.54	0.011
X_4) Do you belong or donate to an organisation concerned with conservation of the natural environment? Yes (1); no (2)	−4.38	2.19	−0.09	−0.120**	−2.00	0.046
X_5) Do you think human beings should be more kind to animals after COVID-19? Yes (1); no (2)	−12.59	5.39	−0.10	−0.124**	−2.34	0.020
X_6) What is your main source of spiritual inspiration? Islam: no (0); yes (1)	−33.99	10.00	−0.14	−0.129**	−3.40	0.001
X_7) How often do you visit a zoo or aquarium? Once every six months or more (1); once every year or less (including never) (2)	8.30	2.34	0.16	0.067	3.55	0.000

Standardised coefficients refer to the partial effect of one predictor after adjusting for the others;
R^2 = 0.127, Adj. R^2 = 0.114;
Durbin-Watson = 1.968;
Zero-order correlation test: ** P < 0.01; * P < 0.05.

is best for the majority, killing wild animals to stop the spread of diseases that could affect humans) (McNair *et al* 2019; Forsyth 2021), and our findings of people's lower score of idealism after COVID-19 confirmed this hypothesis. The effect of idealism on PCAW was not strong, particularly when compared to the effect of idealism in the survey of 2015. We suppose this decreased idealistic position may serve to neutralise the significant correlations between ethical idealism and PCAW, compared to the results of the 2015 survey. Yet, it still had a statistical influence on individual opinions on issues, such as 'killing animals', 'deprive animal welfare' and 'harm animals for social issues' since these potentially illustrate the coherent relationships that exist between animal welfare, human health, and the natural environment.

The relativist view acknowledges that there may not be universal ethical rules (Lockhart & Franzwa 2019). Chinese people are highly relativistic and the COVID-19 pandemic did not increase this. Therefore, the present study confirmed previous findings showing a negatively significant correlation between ethical relativism and people's awareness of animal welfare (Su & Martens 2017). Relativism often manifests as non-compliance with standards that define the difference between right and wrong (Forsyth 2021). Although COVID-19 has improved PCAW, the nature of its infectiousness across humans and non-humans alike facilitates people's rational perception of certain phenomena, such as killing animals to stop the spread of diseases that could affect humans. Perhaps the destructive effects of COVID-19 set off the idealists' moral alarms and lead to their more moderate concern for animal welfare. Simultaneously, participants' less-idealistic characteristics may also contribute to its weaker effects on PCAW, compared to the effects of relativism in the present study.

Predictor variables for PCAW after COVID-19

A further aim of this study was to figure out the predictor variables that determine PCAW after COVID-19 in China. Female respondents showed a greater concern for animal

welfare than their male equivalents, while younger respondents held greater concern for animal welfare than the older population. These findings revealed females' perhaps more culturally constructed sympathetic reactions to an innocent other, including animals (Kammeyer 1966; Wuensch & Poteat 1998; Tingbani *et al* 2020) and young (19–44 years old in this study) people's greater knowledgeability of and positivity towards animal welfare (Davey 2006; Su & Martens 2017). Additionally, female respondents in this study were younger than their male counterparts, and this finding once again demonstrated the relationship between people's age and their concern for animal welfare. Besides gender and age, education is another important factor to predict PCAW. Given the increasing animal welfare research and teaching activities in universities, our findings confirmed that education can contribute to enhancing the welfare of individual animals (Mench 2008; Eadie 2011). People with a higher level of education, in particular those with university degrees or above, were more likely to convey intense emotions regarding animals. An alternate view may be that higher educated people have a greater likelihood of being aware of the more socially acceptable responses to such questions which would have a bearing on them describing greater concern for animals. However, as far as the present study is concerned, we have no evidence to support this possibility.

As regards the predictor variables of participants' subjective perception toward questions such as 'whether people should be more kind to animals after COVID-19' and 'Are you satisfied with the governmental response to COVID-19', our results verified the positive response without any doubt. Companion animal owners usually have more opportunities to interact with animals, their awareness of animal welfare therefore is higher than non-owners (Phillips 2008; Su & Martens 2017; Su *et al* 2018b). Our findings also reveal that the experience of environmental conservation participation could improve PCAW, which may be mainly due to the natural connection between the environment and animals (Macnaghten 2004). The welfare of zoo and aquarium animals is compromised to some extent by the varying perspectives of zoo administrators and visitor requirements (Fennell 2013). Hence, the experience of zoo and aquarium visits may distort people's cognition of animal welfare, resulting in lower concern for it. The practice of raising and killing animals for food is not in line with prevailing moral ideals regarding the treatment of animals (Loughnan *et al* 2010; Višak & Garner 2016). Vegetarians and people who rarely eat meat often show a higher AAS score, and we suppose their greater concern for the treatment of animals might explain why they ate less meat (Stockburger *et al* 2009; Su *et al* 2018a). The *Quran*, as the first primary source of jurisprudence accepted by all Muslims, states that all animals are part of human communities because they provide humans with food, emotions, entertainment, and companionship. Yet, it also highlights the greater cognitive understanding of humans compared to their animal counterparts which gives humans certain rights over animals (Farouk *et al* 2016). For instance, killing animals for some

rituals. This might be a reason to explain Muslims' lower concern for animal welfare presented in this study. However, given the relatively limited number of Muslims (1%) in this study, this finding needs to be viewed with caution.

Study limitations

As with any other comparative study, there are also limitations in this research. In the 2015 survey, more men (58.3%), young people aged 19–44 (65.3%) and urban residents (93.5%) were contacted and involved in the study. To make the results more representative and reduce any bias due to the sample in the 2020 survey, we limited the proportion of the respondents regarding their gender, age and living areas. For example, 58% respondents aged 19–44 years, 49.6% men and 66.2% urban residents. The structure of the respondents in the 2020 survey is more similar to the results of the 7th National Census (2020) (men: 51.24%, 15–59 years old: 63.35%, urban residents: 63.98%) than the 2015 survey. This improved the quality of the sample to some extent but may also have resulted in a bias conclusion between the two surveys. Therefore, future comparative studies should consider the distribution of participants. Additionally, due to the way in which data were collected, we cannot exclude the possibility of socially desirable answers in this study, and this signals a need for face-to-face interviews with familiarity between respondents and interviewers considered (Kühne 2018).

Conclusion

The COVID-19 pandemic has resulted in devastating consequences for human health and social stability throughout not merely China but the world as a whole and been the catalyst for a greater scrutiny of animal welfare standards (Parry 2020). The present study revealed that Chinese PCAW increased significantly after COVID-19. Ethical ideology behaves differently in predicting PCAW before and after COVID-19. Specifically, a significant correlation was found between idealism and PCAW prior to COVID-19, while this was not the case after it. The adverse impacts of COVID-19 may decrease people's idealistic attitudes toward animal welfare, and this could be the reason for the non-significant correlation.

The ethics of animal welfare is concerned with a careful examination of animal life and the harmonious relationship between humans and animals (Farouk *et al* 2016). Findings in this study extend our understanding of PCAW from an ethical perspective and raise a myriad of welfare concerns associated with humans, animals, and society. The unfolding of COVID-19 has highlighted the interrelationships of humans, animals and nature and the ensuing tragedy may finally create an opportunity to see Chinese PCAW improve (Roe *et al* 2020). Findings here and back in 2015 represent a significant effort toward measuring and comparing the impacts of COVID-19 on PCAW in China. They could also be a good indicator that the Chinese government will pay more attention to animal welfare due to its impacts on human health and social development.

Declaration of interest

Acknowledgements

References

Aitken MM 2020 Ensuring animal welfare during COVID-19 pandemic. *The Veterinary Record 186*: 389. https://doi.org/10.1136/vr.m1195

Alon TM, Doepke M, Olmstead-Rumsey J and Tertilt M 2020 *The impact of COVID-19 on gender equality*. National Bureau of Economic Research, Massachusetts, USA. https://doi.org/10.3386/w26947

Baptista J, Blache D, Cox-Witton K, Craddock N, Dalziel T, de Graaff N, Fernandes J, Green R, Jenkins H and Kahn S 2021 Impact of the COVID-19 pandemic on the welfare of animals in Australia. *Frontiers in Veterinary Science 7*: 1219. https://doi.org/10.3389/fvets.2020.621843

Barnett T, Bass K and Brown G 1994 Ethical ideology and ethical judgment regarding ethical issues in business. *Journal of Business Ethics 13(6)*: 469-480. https://doi.org/10.1007/BF00881456

Bègue L and Laine PJ 2017 Moral utilitarianism and attitudes toward animals. *Ethics & Behavior 27(3)*: 173-178. https://doi.org/10.1080/10508422.2016.1162720

Bonilla-Aldana DK, Dhama K and Rodriguez-Morales A 2020 Revisiting the one health approach in the context of COVID-19: a look into the ecology of this emerging disease. *Advances in Animal and Veterinary Sciences 8(3)*: 234-237. https://doi.org/10.17582/journal.aavs/2020/8.3.234.237

Davey G 2006 Chinese university students' attitudes toward the ethical treatment and welfare of animals. *Journal of Applied Animal Welfare Science 9(4)*: 289-297. https://doi.org/10.1207/s15327604jaws0904_4

De Paula Vieira A and Anthony R 2020 Recalibrating veterinary medicine through animal welfare science and ethics for the 2020s. *Animals 10(4)*: 654. https://doi.org/10.3390/ani10040654

Derksen S and Keselman H 1992 Backward, forward and stepwise automated subset selection algorithms: Frequency of obtaining authentic and noise variables. *British Journal of Mathematical Statistical Psychology 45(2)*: 265-282. https://doi.org/10.1111/j.2044-8317.1992.tb00992.x

Eadie EN 2011 *Education for Animal Welfare*. Springer Science and Business Media: Glenelg, Australia. https://doi.org/10.1007/978-3-642-16814-7

Farouk M, Pufpaff K and Amir M 2016 Industrial halal meat production and animal welfare: A review. *Meat Science 120*: 60-70. https://doi.org/10.1016/j.meatsci.2016.04.023

Fauci AS, Lane HC and Redfield RR 2020 COVID-19—navigating the uncharted. *New England Journal of Medicine 382*: 1268-1269. https://doi.org/10.1056/NEJMe2002387

Fennell DA 2013 Tourism and animal welfare. *Tourism Recreation Research 38(3)*: 325-340. https://doi.org/10.1080/02508281.2013.11081757

Forsyth DR 1980 A taxonomy of ethical ideologies. *Journal of Personality and Social Psychology 39(1)*: 175. https://doi.org/10.1037/0022-3514.39.1.175

Forsyth DR 1992 Judging the morality of business practices: The influence of personal moral philosophies. *Journal of Business Ethics 11(5-6)*: 461-470. https://doi.org/10.1007/BF00870557

Forsyth DR 2021 Moral relativists resist health mandates during the COVID-19 pandemic. *Personality and Individual Differences 175*: 110709. https://doi.org/10.1016/j.paid.2021.110709

Forsyth DR and Nye JL 1990 Personal moral philosophies and moral choice. *Journal of Research in Personality 24(4)*: 398-414. https://doi.org/10.1016/0092-6566(90)90030-A

Gortázar C and de la Fuente J 2020 COVID-19 is likely to impact animal health. *Preventive Veterinary Medicine 180*: 105030. https://doi.org/10.1016/j.prevetmed.2020.105030

Han J, Zhang X, He S and Jia P 2020 Can the coronavirus disease be transmitted from food? A review of evidence, risks, policies and knowledge gaps. *Environmental Chemistry Letters*: 1-12. https://doi.org/10.1007/s10311-020-01101-x

Hashem NM, González-Bulnes A and Rodriguez-Morales A 2020 Animal welfare and livestock supply chain sustainability under the COVID-19 outbreak: An overview. *Frontiers in Veterinary Science 7*: 679. https://doi.org/10.3389/fvets.2020.582528

Herzog H, Grayson S and McCord D 2015 Brief measures of the animal attitude scale. *Anthrozoös 28(1)*: 145-152. https://doi.org/10.2752/089279315X14129350721894

Herzog Jr HA, Betchart NS and Pittman RB 1991 Gender, sex role orientation, and attitudes toward animals. *Anthrozoös 4(3)*: 184-191. https://doi.org/10.2752/089279391787057170

Kammeyer K 1966 Birth order and the feminine sex role among college women. *American Sociological Review*: 508-515. https://doi.org/10.2307/2090774

Kirk RE 2011 *International Encyclopedia of Statistical Science* pp 1328-1330. Springer: CA, USA. https://doi.org/10.1007/978-3-642-04898-2_518

Kühne S 2018 From strangers to acquaintances? Interviewer continuity and socially desirable responses in panel surveys. *European Survey Research Association 12(2)*: 121-146

Lau H, Khosrawipour T, Kocbach P, Ichii H, Bania J and Khosrawipour V 2021 Evaluating the massive underreporting and undertesting of COVID-19 cases in multiple global epicenters. *Pulmonology 27(2)*: 110-115. https://doi.org/10.1016/j.pulmoe.2020.05.015

Lockhart C and Franzwa G 2019 *Politics, Policy, and Culture* pp 175-189. Routledge: Oxon, UK. https://doi.org/10.4324/9780429302503-10

Loughnan S, Haslam N and Bastian B 2010 The role of meat consumption in the denial of moral status and mind to meat animals. *Appetite 55(1)*: 156-159. https://doi.org/10.1016/j.appet.2010.05.043

Macnaghten P 2004 Animals in their nature: A case study on public attitudes to animals, genetic modification and 'nature.' *Sociology 38(3)*: 533-551. https://doi.org/10.1177/0038038504043217

McKibbin W and Fernando R 2020 *The Economic Impact of COVID-19*. CEPR Press: London, UK

McNair S, Okan Y, Hadjichristidis C and de Bruin WB 2019 Age differences in moral judgment: Older adults are more deontological than younger adults. *Journal of Behavioral Decision Making 32(1)*: 47-60. https://doi.org/10.1002/bdm.2086

Mench JA 2008 Farm animal welfare in the USA: Farming practices, research, education, regulation, and assurance programs. *Applied Animal Behaviour Science 113(4)*: 298-312. https://doi.org/10.1016/j.applanim.2008.01.009

Meng J 2009 *Origins of attitudes towards animals*. PhD Thesis, University of Queensland, QLD, Australia

National Census 2020 *Bulletin of the Seventh National Census*. National Bureau of Statistics: Beijing: China

Pang X, Ren L, Wu S, Ma W, Yang J, Di L, Li J, Xiao Y, Kang L and Du S 2020 Cold-chain food contamination as the possible origin of COVID-19 resurgence in Beijing. *National Science Review 7(12)*: 1861-1864. https://doi.org/10.1093/nsr/nwaa264

Parry NM 2020 COVID-19 and pets: When pandemic meets panic. *Forensic Science International: Reports 2*: 100090. https://doi.org/10.1016/j.fsir.2020.100090

Petraitis P, Dunham A and Niewiarowski P 1996 Inferring multiple causality: the limitations of path analysis. *Functional Ecology*: 421-431. https://doi.org/10.2307/2389934

Phillips C 2008 *The Welfare of Animals: The Silent Majority*. Springer Science & Business Media: Berlin, Germany

Prescott MJ and Lidster K 2017 Improving quality of science through better animal welfare: the NC3Rs strategy. *Lab Animal 46(4)*: 152. https://doi.org/10.1038/laban.1217

Roe D, Dickman A, Kock R, Milner-Gulland E and Rihoy E 2020 Beyond banning wildlife trade: COVID-19, conservation and development. *World Development 136*: 105121. https://doi.org/10.1016/j.worlddev.2020.105121

Roe D and Lee TM 2021 Possible negative consequences of a wildlife trade ban. *Nature Sustainability 4(1)*: 5-6. https://doi.org/10.1038/s41893-020-00676-1

Saha I and Mathew DJ 2019 *Research into Design for a Connected World* pp 211-222. Springer: Singapore. https://doi.org/10.1007/978-981-13-5977-4_18

Stockburger J, Renner B, Weike AI, Hamm AO and Schupp HT 2009 Vegetarianism and food perception. Selective visual attention to meat pictures. *Appetite 52(2)*: 513-516. https://doi.org/10.1016/j.appet.2008.10.001

Su B, Koda N and Martens P 2018a How ethical ideologies relate to public attitudes toward non-human animals: The Japanese case. *Society and Animals 7(26)*: 695-712. https://doi.org/10.1163/15685306-12341585

Su B, Koda N and Martens P 2018b How Japanese companion dog and cat owners' degree of attachment relates to the attribution of emotions to their animals. *PLoS ONE 13(1)*: e0190781. https://doi.org/10.1371/journal.pone.0190781

Su B and Martens P 2017 Public attitudes toward animals and the influential factors in contemporary China. *Animal Welfare 26(2)*: 239-247. https://doi.org/10.7120/09627286.26.2.239

Sunil S and Verma SK 2018 Moral identity and its links to ethical ideology and civic engagement. *Journal of Human Values 24(2)*: 73-82. https://doi.org/10.1177/0971685818754547

Tingbani I, Chithambo L, Tauringana V and Papanikolaou N 2020 Board gender diversity, environmental committee and greenhouse gas voluntary disclosures. *Business Strategy and the Environment 29(6)*: 2194-2210. https://doi.org/10.1002/bse.2495

Tiwari R, Dhama K, Sharun K, Iqbal Yatoo M, Malik YS, Singh R, Michalak I, Sah R, Bonilla-Aldana DK and Rodriguez-Morales A 2020 COVID-19: animals, veterinary and zoonotic links. *Veterinary Quarterly 40(1)*: 169-182. https://doi.org/10.1080/01652176.2020.1766725

Višak T and Garner R 2016 *The Ethics of Killing Animals*. Oxford University Press: USA

Wuensch KL and Poteat GM 1998 Evaluating the morality of animal research: Effects of ethical ideology, gender, and purpose. *Journal of Social Behavior and Personality 13(1)*: 139-150