Extending Perspective Taking to Non-Human Animals and Artificial Intelligence

Ali Ladak[1], Matti Wilks[2], Jacy Reese Anthis[3, 1]

[1]Sentience Institute

[2]Department of Psychology, Yale University

[3]Department of Sociology, University of Chicago

Author Note: Correspondence concerning this article should be addressed to Ali Ladak at ali@sentienceinstitute.org. All data, code, and experimental materials are available for download at: https://osf.io/srxgm. Supplemental Materials can be found here.

Abstract

Perspective taking can have positive effects in a range of human intergroup contexts. In two experiments, we tested whether these effects generalize to two yet-to-be-studied nonhuman groups: animals and intelligent artificial entities. Estimation of mediation models revealed no evidence of total effects of either taking the perspective of a farmed pig or an artificial entity on moral attitudes, compared to instructions to stay objective and a neutral condition. However, in both studies, we found evidence of indirect effects of perspective taking on attitudes via empathic concern and self-other overlap, supporting two mechanisms well-established in the literature. The lack of total effects can be partly explained by competitive mediation: in both studies, after accounting for the mediators, we found positive effects of staying objective on moral attitudes. Overall, the study suggests there are paths through which both perspective taking and staying objective can positively affect attitudes towards animals and artificial entities.

Keywords: Perspective taking; morality; attitudes; human-animal relations; artificial intelligence

Extending Perspective Taking to Non-Human Animals and Artificial Intelligence

The moral circle, that is, the boundary around the entities that are granted moral consideration, has arguably expanded over time (Singer, 1981). Pinker (2011) argued that one factor explaining this expansion is perspective taking, the active consideration of another individual's mental states, such as their thoughts and feelings (Todd & Galinsky, 2014). There is evidence to support this theory: experimental studies have found positive effects of encouraging perspective taking in a range of intergroup contexts, including race (Dovidio et al., 2004; Finlay & Stephan, 2000; Shih et al., 2009; Todd et al., 2011; Vescio et al., 2003), gender (Simon et al., 2019), the elderly (Galinsky & Moskowitz, 2000), disability (Clore & Jeffery, 1972), people with AIDS, homeless people, and convicted murderers (Batson, Polycarpou, et al., 1997), and the environment as a whole (Berenguer, 2007, 2010; Schultz, 2000; Sevillano et al., 2007; Swim & Bloodhart, 2015).

Two non-human groups that currently lie on the frontiers of society's moral circle (Anthis & Paez, 2021) are excluded from this list: nonhuman animals and intelligent artificial entities. There is increasing interest in understanding human moral relations with both of these groups (e.g., Gunkel, 2018; Sunstein & Nussbaum, 2004). Moreover, there is now a well-established literature on the psychology of human-animal relations (e.g., Amiot & Bastian, 2015; Dhont et al., 2019), and a growing literature studying human-AI interaction from an intergroup relations perspective (Vanman & Kappas, 2019). In both cases, researchers have found evidence of many of the same psychological mechanisms that operate in human intergroup interactions. For example, common psychological factors underlie speciesism and forms of prejudice towards human outgroups (Dhont et al., 2016), and attitudes towards animals can be improved in some contexts through interventions such as imagined intergroup contact (Auger & Amiot, 2019). In the case of artificial entities, studies have found, for example, that the extent to which people discriminate against robots depends on whether they are framed as ingroup versus outgroup members (Eyssel & Kuchenbrandt, 2012; Fraune, 2020), that positive and negative emotions predict people's willingness to interact with

robots (Smith et al., 2020), and, consistent with the literature on non-human animals, negative attitudes towards artificial intelligence can generalize to perceived human outgroups (Gamez-Djokic & Waytz, 2020). As with nonhuman animals, willingness to interact with robots can be increased by intergroup contact (Wullenkord et al., 2016).

These studies showing similar psychological mechanisms in the contexts of nonhuman animals and artificial entities as in human intergroup relations, as well as the broad range of intergroup contexts that perspective taking encouragement has been found to have positive effects in, provide reasons to think that the benefits of perspective taking will extend to these groups. In the present paper we explore three overarching questions: (1) whether perspective taking affects moral attitudes towards these two groups overall, including the extent to which the effects can be attributed to its encouragement (rather than its suppression; see next section); (2) the mechanisms through which perspective taking affects attitudes; and (3), how broadly or narrowly the effects generalize to groups that include the perspective taking targets. We discuss each of these goals in more detail below.

The Effectiveness of Encouraging Perspective Taking

Perspective taking is typically manipulated in experimental studies by encouraging a treatment group to take the perspective of another individual and a control group to stay objective (Todd & Galinsky, 2014). Researchers then compare the two groups on outcomes such as attitudes and helping behavior, attributing the differences to the effects of perspective taking. However, this experimental design means that differences in outcomes between the two conditions could be driven by the negative effects of the instructions to stay objective, rather than the positive effects of the perspective taking instructions. A meta-analysis by McAuliffe et al. (2020) found that the effect of perspective taking on empathic concern is largely driven by instructions to stay objective, indicating that people empathize less in the condition encouraging objectivity, rather than more in the perspective taking condition. This suggests that encouraging perspective taking may be less effective at improving intergroup relations than is currently believed.

Importantly, in the context of the present study, McAuliffe et al. (2020) only included studies that used human perspective taking targets. They suggested that encouraging perspective taking may be more effective when directed at targets who do not usually elicit empathy because baseline levels of empathy are lower. Given that the perspective taking targets in the present study, non-human animals and artificial entities, are more distant than those considered in McAuliffe et al. (2020), humans likely have a weaker natural empathic response to them (Krebs, 1975; Miralles et al., 2019). We may, therefore, be more likely to find a positive effect of encouraging perspective taking in the current contexts. To test this hypothesis, we compared perspective taking to a neutral condition that encouraged neither objectivity or perspective taking. In addition to this, we compared perspective taking to a condition that encouraged objectivity. This latter comparison is consistent with the existing literature, and gives us an understanding of the overall effect of perspective taking, whether induced by the instructions encouraging perspective taking or suppressed by the instructions encouraging objectivity. Given the research outlined in the previous section, as well as the possibility of greater effectiveness in more distant contexts, we predicted that people encouraged to perspective-take will show more positive attitudes towards animals and artificial entities than those who are encouraged to stay objective or given neutral instructions.

Perspective Taking Mechanisms

What are the mechanisms through which perspective taking positively affects intergroup attitudes? Several accounts have been proposed in the literature. Batson and colleagues (1997) proposed a model whereby taking the perspective of an individual generates empathic concern, a form of other-focused empathy characterized by emotions such as compassion, warmth and tenderness, which, in turn, increases the value the perspective taker places on that person's welfare. If the individual's group membership is salient, the positive effect generalizes to their whole group. A competing account is that perspective taking increases self-other overlap, a measure of psychological closeness that reflects how much another entity is mentally represented as part of oneself, by increasing the extent to which the other person is considered "self-like," (Davis et al.,

1996; Cialdini et al., 1997, Galinsky and Moskowitz, 2000). Other accounts emphasize mediating roles for anger and indignation (Finlay and Stephen, 2000; Dovidio et al., 2004), personal distress (Batson, Early, et al., 1997), and situational attributions (Vescio et al., 2003).

Some studies have attempted to adjudicate between the different mediators (Batson, Sager, et al., 1997; Cialdini et al., 1997; Maner et al., 2002), while others have evaluated the circumstances under which different mediators play a role. Batson, Early, et al. (1997) found that "imagine-other" perspective taking, that is, imagining the experience of another person, results in other-focused emotions such as empathic concern, whereas "imagine-self" perspective taking, such as imagining oneself in the situation of another person, results in both empathic concern and self-focused emotions such as personal distress. Consistent with this, Myers et al. (2014) found that imagine-self perspective taking resulted in both self-other overlap and empathic concern, whereas imagine-other perspective taking triggered only empathic concern. In the present study, we limited our attention to imagine-other perspective taking and therefore expected to find a key effect via empathic concern. Given its prominence in the literature even in the context of imagine-other instructions (e.g., Maner et al., 2002), we also hypothesized an effect through self-other overlap. We did not expect to find an effect via personal distress because we did not test imagine-self perspective taking and there is weaker evidence of a role for it in the literature; however, we collected data on it and included it as part of sensitivity analyses testing alternative models.

Scope of Generalization

The present study also considered the scope of the generalization effects—how broadly or narrowly do attitudes generalize when taking the perspective of an individual non-human entity? Several studies have tested whether the benefits of perspective taking spill over to adjacent outgroups (e.g., Todd et al., 2011; Vescio et al., 2003). In the present study we addressed a related, less studied question, termed "superordinate generalization" by Auger and Amiot (2019). This asks whether the effects generalize to the broader categories that include the perspective taking target. For example, if asked to take the perspective of a farmed pig, the anticipated positive effects may

generalize to all farmed pigs, but could also generalize to broader categories, such as all farmed animals, all mammals, and so on. This effect likely depends on the extent to which the perspective taking target is representative of the broader group (Brown & Hewstone, 2005). To test this, in the present study we included multiple dependent variables capturing moral attitudes towards increasingly broad groups. These dependent variables included a Substratism Scale measuring attitudes towards artificial entities, which we adapted from the Speciesism Scale (Caviola et al., 2019) in an effort to connect our understanding of perspective taking in the contexts of artificial entities and non-human animals.

Overview of Present Research

In two experiments we tested the effects of perspective taking on moral attitudes towards two non-human groups: animals and artificial entities. Each study included three conditions: one that encouraged perspective taking, one that encouraged objectivity, and a neutral condition. In summary, we hypothesized that perspective taking would be associated with more positive moral attitudes towards animals and artificial entities compared to (H1) staying objective and (H2) a neutral condition, and that the positive effects would be mediated by (H3) empathic concern and (H4) self-other overlap. To understand the scope of the effects, we measured moral attitudes towards multiple, increasingly broad, groups. The specific dependent measures we tested are reported in the relevant sections for each study.

Open Science. The hypotheses listed above are summarized versions of the full hypotheses. The preregistered hypotheses, study design, planned sample size, inclusion/exclusion criteria, and analysis plan can be found for Study 1 here: https://osf.io/mhgba and for Study 2 here: https://osf.io/d6fgb. The datasets, codebooks, experimental materials, and code to run the analyses, can be found here: https://osf.io/srxgm. We report all manipulations, measures, and exclusions for both studies in the next sections.

Study 1

Study 1 looked at the effect of taking the perspective of a farmed pig on moral attitudes towards animals. We chose a pig as the target because their perceived status as food animals means they are typically granted lower moral concern than other animals (Bratanova et al., 2011), making them an interesting and important group in the context of the present study which seeks to understand effects on moral attitudes. Pigs have also been considered in psychological studies on human-animal relations in previous studies (e.g., Caviola & Capraro, 2020; Wilks et al., 2021).

Study 1 tested H1–H4. We tested the impact on moral attitudes towards three groups: all farmed pigs, all farmed animals, and all animals.

Method

Participants

We recruited participants from the United States from Prolific. *A priori* power analysis in G*Power ($\alpha = 0.05$, $\beta = 0.80$) indicated that a sample size of 250 would enable us to detect small to medium effects ($f^2 = 0.05$) in a linear regression model with four predictors, which was the largest number of predictors in all the models we ran. To account for data exclusions, we recruited 276 participants. Five participants, three in the perspective taking condition, one in the objective condition, and one in the neutral condition, were excluded because they failed at least one of two attention checks. This left a final sample of 271 participants (50.7% female, 48.5% male, 0.7% other; $M_{age} = 35.2$, $SD_{age} = 12.3$; 5.2% Asian, 6.6% Black or African American, 4.1% Hispanic, Latino or Spanish, 76.4% White, 7% other, 0.7% prefer not to say).

Procedure

After giving their consent to take part in the study, participants were randomly assigned into one of three conditions: “perspective taking,” “stay-objective,” and “no-instructions.” All participants were told that they would read an article about a farmed pig and were encouraged to take their time and read the article carefully. They were given additional instructions to manipulate perspective taking based on the condition they were in, following the standard approach in the

literature (Todd & Galinsky, 2014). Participants in the perspective taking condition were given the following additional instructions: “While reading the article, please try and take the perspective of the pig, imagining how it feels about its situation and how its experiences have affected its life. Try to feel the full impact of what the pig has been through and how it feels as a result.” Participants in the stay-objective condition were told: “While reading the article, please try and be as objective as possible about the situation of the pig and how its experiences have affected its life. Try not to get caught up in how the pig feels; instead try and remain objective and detached.” Participants in the no-instructions condition were not given any additional instructions.

Participants in all conditions then read an article that described the life of a farmed pig. The article described the pig’s confinement in a crowded indoor space, the negative physical and psychological impacts of this confinement, and the pig’s eventual slaughter.

Measures

Manipulation checks. In line with the standard approach in the literature (e.g., Batson, Polycarpou, et al., 1997; Todd et al., 2011), participants were asked to report the extent to which they focused on the feelings of the farmed pig while reading the article, and the extent to which they stayed objective about the pig’s situation. These were measured on five-point scales (1 = *not at all*, 5 = *extremely*). Participants were also asked how believable they found the article (1 = *not at all*, 5 = *extremely*), and, depending on the condition they were in, how easy or difficult they found taking the perspective of the pig or staying objective while reading the article (1 = *very easy*, 5 = *very difficult*).

Empathic concern. Participants were asked to respond, on a seven-point scale (1 = *not at all*, 7 = *extremely*), the extent to which they felt 14 emotions while reading the article. The list of emotions included six items which, following the standard approach in the literature (e.g., Batson, Polycarpou, et al., 1997), were averaged to create a measure of empathic concern: compassionate, sympathetic, tender, warm, moved, and soft-hearted ($\alpha = .88$).

Personal distress. Following Dovidio et al. (2004), the list of 14 emotions also included four items that were averaged to create a measure of personal distress: distressed, disturbed, upset, grieved (α = .91). This measure was not included in the main models; it was tested as part of sensitivity analysis.

Self-other overlap. This was measured using the Inclusion of Other in the Self Scale (Aron et al., 1991), a one-item scale that involves asking participants to choose one of seven increasingly overlapping circles that best represents their relationship with another entity. In this case, participants were asked to indicate the pair of circles that best reflected the extent to which they felt connected to the pig after reading the article.

Moral concern. Following a brief introduction to the concept of "moral concern," participants were asked to report their degree of moral concern, on a seven-point scale (1 = *none at all*, 7 = *a great deal*), for seven groups. Embedded in the list of seven groups were two groups used as dependent measures in the study: farmed pigs and farmed animals in general. The responses for the other five groups (dogs, other people, rocks, trees, and family) were averaged to create a measure of general moral concern that was used in the sensitivity analysis in this study.

Speciesism. Moral attitudes towards all animals was measuring using the Speciesism Scale (Caviola et al., 2019). The scale asks participants to report the extent to which they agree, on a seven-point scale (1 = *strongly disagree*, 7 = *strongly agree*), with six statements relating to animals, such as "Morally, animals always count for less than humans," and "Humans have the right to use animals however they want to." The mean score of the six items (with one item reverse scored) was calculated to give an overall score with higher scores reflecting greater speciesism (α = .86).

Analysis Plan

To test our hypotheses, we estimated three separate mediation models for each of the dependent variables using the "mediate" function in the R "Psych" package (Version 2.0.9; Revelle, 2020). We built our models following the methods set out in Hayes and Preacher (2014) for models

with multicategorical independent variables and Preacher and Hayes (2008) for models with multiple mediators. Each model included two dummy-coded independent variables: one for the stay-objective condition (1 = stay-objective, 0 = otherwise) and one for the no-instructions condition (1 = no-instructions, 0 = otherwise), allowing us to interpret their effects relative to the perspective taking condition. The two mediators, empathic concern and self-other overlap, were included simultaneously in all the models. The "indirect effects"—the effects of the independent variables on the dependent variables via the mediators (H3 and H4)—are calculated as the product of two effects: the effect of the independent variables on the mediators, and the effect of the mediators on the dependent variables controlling for the independent variables. Given that our models included two independent variable and two mediators, we estimated four indirect effects. Statistical significance of the indirect effects was inferred based on 95% confidence intervals constructed from 10,000 bootstrap samples. We also estimated the effects of the independent variables on the outcome variables without controlling for the mediators (the "total effects", H1 and H2, which we also estimated with one-way ANOVAs), and the effects of the independent variables on the outcome variables controlling for the mediators (the "direct effects"). All reported effects of the mediation models are standardized.

Results

Descriptive statistics

Means, standard deviations, and bivariate Pearson correlations for the dependent variables and mediators used in the main analysis are presented in Table 1. The pattern of results shows that moral concern for pigs and for all farmed animals was highest in the perspective taking condition, followed by the stay-objective condition and then the no-instructions condition. Speciesism was lowest in the stay-objective condition, followed by the perspective taking condition and then the no-instructions condition. We statistically test for group differences with reference to our hypotheses in the sub-sections below. The correlations between the mediators and the dependent variables were in

the expected directions: both self-other overlap and empathic concern and positively correlated with moral concern for farmed pigs and for farmed animals, and negatively correlated with speciesism.

Table 1

Study 1 Means, Standard Deviations, and Pearson Correlations

	Perspective taking (N = 90)		No-instructions (N = 89)		Stay-objective (N = 92)		1	2	3	4
	Mean	*SD*	Mean	*SD*	Mean	*SD*	–	–	–	–
1. Pigs moral concern	5.12	1.39	4.72	1.68	4.93	1.55				
2. Animals moral concern	5.13	1.42	4.89	1.56	5.00	1.47	.91**			
3. Speciesism	2.98	1.33	3.27	1.42	2.86	1.12	-.62**	-.62**		
4. Empathic concern	4.71	1.20	4.35	1.39	4.03	1.43	.54**	.54**	-.31**	
5. Self-other overlap	3.86	1.63	3.35	1.79	2.93	1.55	.49**	.54**	-.35**	.60**

*Note: * $p < .05$, ** $p < .01$.*

Manipulation checks

In line with our expectations, we found that participants in the perspective taking condition reported greater focus on the pig's feelings ($M = 4.17$, $SD = 0.85$) than participants in the stay-objective condition ($M = 2.73$, $SD = 1.17$) and participants in the no-instructions condition ($M = 3.44$, $SD = 1.09$), both $p < .001$. The difference between the no-instructions and the stay-objective condition was also significant and in the expected direction, $p < .001$. We also found that participants in the perspective taking condition reported less focus on staying objective ($M = 3.02$, $SD = 1.32$) than participants in the stay-objective condition ($M = 3.64$, $SD = 0.91$), $p = .001$. However, we did not find significant differences in focus on staying objective between participants in the stay-objective condition and participants in the no-instructions condition ($M = 3.23$, $SD = 1.15$), $p = .098$, or between participants in the perspective taking condition and participants in the no-instructions condition, $p = .252$.

Overall, these results suggest that the manipulation had the intended effects, though the perspective taking instructions were more effective than the stay-objective instructions. This may be explained by the greater reported difficulty of staying objective while reading the article ($M = 3.45$, $SD = 1.10$) than taking the perspective of the pig ($M = 2.06$, $SD = 0.95$).

Finally, participants found the vignette believable; the mean across the whole sample was 4.32 (SD = 0.80) on a five-point scale.

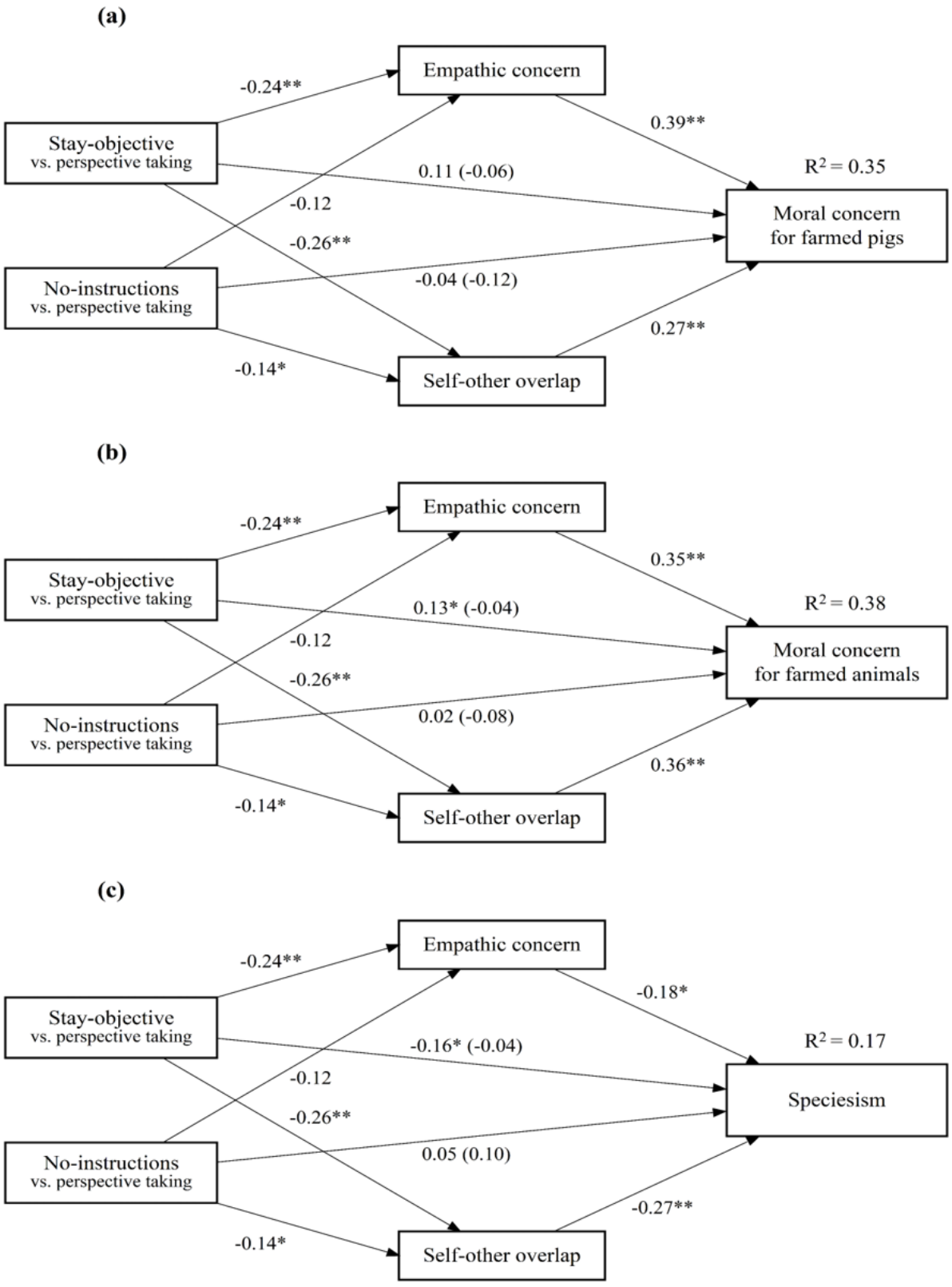

Figure 1. Study 1 mediation models of perspective taking via empathic concern and self-other overlap on (a) moral concern for farmed pigs, (b) moral concern for all farmed animals, and (c) speciesism. All reported effects are standardized. Total effects are reported in parentheses. R^2 values refer to regressions estimating direct effects. * $p < .05$, ** $p < .01$. Plots created using the R package "DiagrammeR" (Version 1.0.6.1; Iannone, 2020).

Table 2

Study 1 Indirect Effects of Independent Variables via Mediators

	Moral concern for farmed pigs				Moral concern for farmed animals				Speciesism			
			95% CI				95% CI				95% CI	
	β	*SE*	LL	UL	*β*	*SE*	LL	UL	*β*	*SE*	LL	UL
Empathic concern												
Stay-objective	-0.09	0.03	-0.15	-0.04	-0.08	0.03	-0.14	-0.03	0.04	0.02	0.01	0.09
No-instructions	-0.05	0.03	-0.11	0.003	-0.04	0.03	-0.10	0.002	0.02	0.02	-0.001	0.06
Self-other overlap												
Stay-objective	-0.07	0.03	-0.13	-0.03	-0.09	0.03	-0.15	-0.04	0.07	0.03	0.02	0.13
No-instructions	-0.04	0.02	-0.09	0.0003	-0.05	0.03	-0.11	-0.001	0.04	0.02	0.001	0.09

Note: Reference group in each case is perspective taking condition. Standardized effects reported. LL = confidence interval lower limit; UL = confidence interval upper limit. Statistical significance inferred from 95% CI not containing zero.

Moral concern for farmed pigs

A one-way ANOVA indicated that there were no differences in moral concern for farmed pigs between the three conditions, $F(2, 268) = 1.53$, $p = .219$, $\eta^2 = .01$. This was also supported by the mediation models: we did not find evidence of a total effect of either the stay-objective condition ($\beta = -0.06$, $SE = 0.07$, $p = .414$) or the no-instructions condition ($\beta = -0.12$, $SE = 0.07$, $p = .082$) relative to the perspective taking condition on moral concern for farmed pigs. However, significant total effects are not necessary for mediation (see Hayes, 2009). Therefore, we estimated the indirect effects.

The indirect effects are made up of two components: the effect of the independent variables on the mediators, and the effect of the mediators on the dependent variable. We found that participants in the stay objective condition reported lower empathic concern ($\beta = -0.24$, $SE = 0.07$, $p = .001$) and self-other overlap ($\beta = -0.26$, $SE = 0.07$, $p < .001$) than participants in the perspective taking condition. Participants in the no instructions condition reported lower self-other overlap ($\beta = -0.14$, $SE = 0.07$, $p = .042$) than participants in the perspective taking condition but the difference in empathic concern was nonsignificant ($\beta = -0.12$, $SE = 0.07$, $p = .077$). In the models with moral concern for pigs as the dependent variable and condition and both mediators as independent

variables, we found that empathic concern was positively associated with moral concern (β = 0.39, SE = 0.06, p < .001), as was self-other overlap (β = 0.27, SE = 0.06, p < .001). For the stay-objective versus perspective taking comparison, we found that there were indirect effects via both empathic concern (β = -0.09, SE = 0.03, 95% CI [-0.15; -0.04]) and self-other overlap (β = -0.07, SE = 0.03, 95% CI [-0.13; -0.03]). However, we did not find indirect effects for the no-instructions versus perspective taking comparison via either empathic concern (β = -0.05, SE = 0.03, 95% CI [-0.11; 0.003]) or self-other overlap (β = -0.04, SE = 0.02, 95% CI [-0.09; 0.0003]).

After accounting for the effects of the mediators, the direct effects were nonsignificant for both the stay-objective condition (β = 0.11, SE = 0.06, p = .075) and the no-instructions condition (β = -0.04, SE = 0.06, p = .532).

Moral concern for all farmed animals

A one-way ANOVA indicated that there were no differences in the group means for this dependent variable, $F(2, 268) = 0.61$, p = .542, η^2 = .01. Estimates of the total effects supported this: there were no significant differences in moral concern for farmed animals between either the stay-objective condition (β = -0.04, SE = 0.07, p = .545) or the no-instructions condition (β = -0.08, SE = 0.07, p = .269) and the perspective taking condition.

However, we did find evidence of indirect effects through our hypothesized mediators. The differences between the conditions on the mediators are the same as in the previous model. There was a positive association between moral concern for all farmed animals and both empathic concern (β = 0.35, SE = 0.06, p < .001) and self-other overlap (β = 0.36, SE = 0.06, p < .001). The indirect effects of being in the stay-objective condition via empathic concern was statistically significant (β = -0.08, SE = 0.03, 95% CI [-0.14; -0.03]), as was the indirect effect via self-other overlap (β = -0.09, SE = 0.03, 95% CI [-0.15; -0.04]). For the no-instructions condition, we did not find an indirect effect via empathic concern (β = -0.04, SE = 0.03, 95% CI [-0.10; 0.002]), though we did find an effect via self-other overlap (β = -0.05, SE = 0.03, 95% CI [-0.11; -0.001]).

In this model, after accounting for the effect of the mediators, there was a significant positive effect of the stay-objective instructions on moral concern for farmed animals (β = 0.13, *SE* = 0.06, p = .022). We did not find this effect in the case of the no-instructions condition (β = 0.02, *SE* = 0.06, p = .784). The significant direct effect for the stay-objective condition suggests there may be positive effects of staying objective on moral concern for farmed animals that the model does not capture (Zhao et al., 2010).

Speciesism

A one-way ANOVA indicated that there were no differences between the three groups on speciesism, $F(2, 268) = 2.35$, p = .097, η^2 = .02. This was supported by the mediation model: we did not find total effects for either the stay-objective condition (β = -0.04, *SE* = 0.07, p = .541) or the no-instructions condition (β = 0.10, *SE* = 0.07, p = .137) on speciesism.

As with the previous models, however, we did find evidence of indirect effects through our hypothesized mediators. The differences between the conditions on the mediators are the same as in the previous models. There was a positive association between speciesism and both empathic concern (β = -0.18, *SE* = 0.07, p = .011) and self-other overlap (β = -0.27, *SE* = 0.07, $p < .001$). The indirect effects of the stay-objective condition via both empathic concern (β = 0.04, *SE* = 0.02, 95% CI [0.01; 0.09]) and self-other overlap (β = 0.07, *SE* = 0.03, 95% CI [0.02; 0.13]) were also significant. For the no-instructions condition, we did not find evidence of an indirect effect via empathic concern (β = 0.02, *SE* = 0.02, 95% CI [-0.001; 0.06]), though the indirect effect via self-other overlap was significant (β = 0.04, *SE* = 0.02, 95% CI [0.001; 0.09]).

As with the case for all farmed animals, after accounting for the effect of the mediators included in the model, we found a significant direct effect of the stay-objective condition on speciesism (β = -0.16, *SE* = 0.07, p = .021), but not for the no-instructions condition (β = 0.05, *SE* = 0.07, p = .494), suggesting that there may be positive effects of staying objective that are not captured by the model.

Sensitivity Analysis

We ran three sets of sensitivity analyses; the key findings are reported here with full results in the Supplemental Materials. First, we ran each of the main models with a control variable for general moral concern. This shed light on whether the effects we found on attitudes towards animals via the mediators were incidental, explained instead by a general increase in moral concern across all groups, or whether the effects applied specifically to the animal groups studied. Overall, we found that the adjusted effects were in the same direction as those of the main models, with the effect sizes smaller by roughly one-third, rendering the indirect effects of the no-instructions versus perspective taking comparisons via self-other overlap on moral concern for farmed pigs and speciesism statistically nonsignificant. This suggests part of the effects are due to a general increase in moral concern and part of the effects are specific to nonhuman animals.

Second, we estimated models with personal distress as a third mediator alongside empathic concern and self-other overlap. Because of the other-oriented nature of the perspective taking manipulation, we did not expect to find an effect via personal distress. The sensitivity analysis allowed us to test this. As expected, we did not find that the manipulation affected personal distress, and we did not find any significant indirect effects via this path. We did find that there was a relatively large reduction in the size of the indirect effects on speciesism via empathic concern, but not for the other outcome variables of interest. This was because the effect of empathic concern on speciesism became nonsignificant when including personal distress, suggesting it may be a confounder of the initially observed relationship, which was correlational in nature. The inclusion of personal distress also rendered the marginally significant indirect effect on speciesism via self-other overlap for the perspective taking versus no-instructions comparison marginally nonsignificant.

As alluded to above, because of the correlational nature of the estimated relationships between the mediators and outcome variables in our models, it is possible that our estimates of the indirect effects are biased by unobserved confounders. We therefore ran models controlling for a

range of potential confounders: age, gender, ethnicity, education, diet, pet ownership, political views, and personal distress. The inclusion of these additional variables reduced the size of the indirect effects by a relatively small amount compared to the models with just personal distress, additionally rendering two marginally significant effects nonsignificant: the indirect effect on moral concern for all farmed animals via self-other overlap for the perspective taking versus no-instructions contrast, and the indirect effect on speciesism via self-other overlap for the perspective taking versus stay-objective contrast. nonsignificant.

Overall, the indirect effects associated with the perspective taking versus stay-objective comparisons and the moral concern for farmed pigs and all farmed animals dependent variables were most robust to the sensitivity checks. The indirect effects for the models with speciesism as a dependent variable and for the perspective taking versus no-instructions contrast were less robust.

Discussion

Contrary to our expectations, we did not find evidence in support of our hypotheses that moral attitudes towards animals would be more positive in the perspective taking condition compared to either the stay-objective condition (H1) or the no-instructions condition (H2).

We found evidence supporting our hypotheses that attitudes towards animals would be positively affected via both empathic concern (H3) and self-other overlap (H4) for the perspective taking versus stay-objective comparison. These indirect effects generalized to each of the dependent variables we tested: all farmed pigs, all farmed animals, and all animals (as measured by speciesism). The indirect effects via these mediators for the perspective taking versus no-instructions comparison were either marginally significant or marginally nonsignificant, with the effect sizes generally just over half of the perspective taking versus stay-objective comparison. This suggests the indirect effects are partly the result of encouraging perspective taking and partly the result of suppressing it (see Supplemental Materials for the results of the stay-objective versus no-instructions comparison which are similar in magnitude to the perspective taking versus no-instructions comparison). The results reported here largely persisted after accounting for effects on

general moral concern and the inclusion of personal distress and additional demographic control variables, though the indirect effects for the perspective taking versus no-instructions comparison and those associated with the speciesism models were more sensitive to these checks, as described in the sensitivity analysis section above.

In the models with speciesism and moral concern for all farmed animals as the dependent variables, we found that after accounting for the effects via empathic concern and self-other overlap, there were positive effects of staying objective compared to perspective taking on moral attitudes. That is, the stay-objective condition was associated with reduced speciesism and increased moral concern for farmed animals relative to the perspective taking condition. A possible explanation for this is competitive mediation, that there are benefits to staying objective that our models do not capture (Zhao et al., 2010). This would provide an explanation for the apparent inconsistency in support for H1 and H3–H4. Further possible explanations of these findings are explored in the General Discussion.

Study 2

Study 2 tested whether perspective taking extends to another non-human group: intelligent artificial entities. We presented participants with a hypothetical future scenario involving a technology called "whole brain emulation," where human-level artificial intelligences are created by scanning the structure of human brains in very close detail and creating software models of them (Hanson, 2016; Sandberg, 2013). In the scenario presented to participants, the artificial entities ("emulations") were described as being used by humans as workers. The goals of this study were to provide insights into human relations with a group (intelligent artificial entities) that are becoming increasingly prevalent in society, as well as to help to understand the boundaries of the effects of perspective taking on moral attitudes. It also served as a partial replication of Study 1 in a different context.

As with Study 1, Study 2 tested hypotheses H1–H4 with a different non-human group. We tested the effects on two dependent variables: emulations as a group, and all artificial beings.

Method

Participants

We recruited participants living in the United States from the online platform Prolific. *A priori* power analysis in G*Power ($\alpha = 0.05$, $\beta = 0.80$) indicated that we would need a sample of 250 to detect small to medium effects ($f^2 = 0.05$) in a linear regression model with four predictors, the largest number of predictors of the estimated models in this study. We recruited a sample of 273 participants, none of whom failed the attention checks (52.6% female, 46.7% male, 0.7% other; $M_{age} = 36.1$, $SD_{age} = 12.5$; 0.7% American Indian or Alaska Native, 4.8% Asian, 6.2% Black or African American, 3.3% Hispanic, Latino or Spanish, 0.4% Native Hawaiian or other Pacific Islander, 75.8% White, 8.4% other, 0.4% prefer not to say).

Procedure

The survey closely followed the procedure of Study 1. However, in this study, before being assigned to the experimental groups, participants read background information describing the future scenario. This was necessary due to the unfamiliar technology and scenario being discussed. Participants were then randomly assigned into either a perspective taking, stay-objective, or no-instructions condition, and read the same additional instructions (or lack thereof) as in Study 1. Participants in all three groups then read an article describing the life of an emulation created by humans as a worker in a modern-day factory. The article described the unpleasant working conditions the emulation faced, the negative psychological impacts of these conditions, and the emulation's eventual shutting down due to obsolescence.

Measures

The manipulation checks, and measures of empathic concern ($\alpha = .92$), personal distress ($\alpha = .92$), and self-other overlap were the same as in Study 1.

Moral concern. As with Study 1, we asked participants how much moral concern, on a seven-point scale (1 = *none at all*, 7 = *a great deal*) they think they should show seven groups. Embedded in the list of seven groups was the item "Emulations such as those described in the

articles." This was used as the dependent measure for moral concern for emulations. The scores for the other six groups (dogs, other people, farmed pigs, rocks, trees, and family) were averaged to create a measure of general moral concern. There was no measure of concern for a category analogous to "farmed pigs" because such groups are not well-established (e.g., artificial entities, but only those who work in factories and not elsewhere).

Substratism. Paralleling speciesism, we define "substratism" as prejudice against an entity because of the substrate in which its mind is instantiated. We devised a Substratism Scale to measure moral attitudes towards artificial beings as a group. The survey first defined "artificial beings," and then asked participants to report the extent to which they agree with six items relating to artificial beings on a seven-point scale (1 = *strongly disagree*, 7 = *strongly agree*). These six items closely followed the wording of the Speciesism Scale (Caviola et al., 2019). Examples of items used are "Morally, artificial beings always count for less than humans." and "Humans have the right to use artificial beings however they want to." The mean score of the six items (with one item reverse scored) was calculated to give an overall score with higher scores reflecting greater substratism ($\alpha = .92$).

Results

Descriptive statistics

Table 3 reports means, standard deviations, and bivariate Pearson correlations for the dependent variables and mediators in the study. The table shows that moral concern for emulations was lowest in the perspective taking condition, followed by the stay-objective condition and then the no-instructions condition. Substratism was lowest in the perspective taking condition, followed by the no-instructions condition and then the stay-objective condition. We statistically test for group differences in the sub-sections below. The correlations between the mediators and the dependent variables were in the expected directions: self-other overlap and empathic concern were positively correlated with moral concern for emulations and negatively correlated with substratism.

Table 3

Study 2 Means, Standard Deviations, and Pearson Correlations

	Perspective taking (N = 91)		No-instructions (N = 93)		Stay-objective (N = 89)		1	2	3
	Mean	*SD*	Mean	*SD*	Mean	*SD*	–	–	–
1. Emulations moral concern	3.95	1.80	4.05	1.95	4.04	1.80			
2. Substratism	3.96	1.38	4.14	1.51	4.16	1.41	-.67**		
3. Empathic concern	4.16	1.45	3.95	1.50	3.64	1.40	.61**	-.46**	
4. Self-other overlap	3.13	1.69	3.05	1.73	2.62	1.57	.57**	-.49**	.64**

Note: * $p < .05$, ** $p < .01$.

Manipulation checks

In line with our expectations, participants in the perspective taking condition reported greater focus on the feelings of the emulation (M = 3.80, SD = 1.04) than participants in the stay-objective condition (M = 2.71, SD = 1.10), $p < .001$, and participants in the no-instructions condition (M = 3.40, SD = 1.01), $p = .030$. As expected, the difference in focus on the feelings of the emulation between participants in the no-instructions and stay-objective condition was also significant and in the expected direction, $p < .001$. Participants in the perspective taking condition reported less focus on staying objective (M = 3.39, SD = 1.17) than participants in the stay-objective condition (M = 3.72, SD = 0.90), as expected, though the difference was not statistically significant, $p = .086$. Participants in the no-instructions condition reported less focus on staying objective than participants in the stay-objective condition (M = 3.33, SD = 1.08), $p = .038$. There was not a significant difference between participants in the perspective taking condition and the no-instructions condition, $p = .942$.

As with Study 1, these checks suggest that the perspective taking manipulation was more effective at generating the intended effects than the stay-objective manipulation, plausibly due to the greater difficulty participants had in staying objective (M = 3.16, SD = 1.03) than taking the perspective of the emulation (M = 2.33, SD = 1.15).

Mean believability of the vignette was lower than in Study 1 (M = 2.51, SD = 1.08, on a five-point scale). However, this is not surprising due to the hypothetical nature of the scenario described in Study 2.

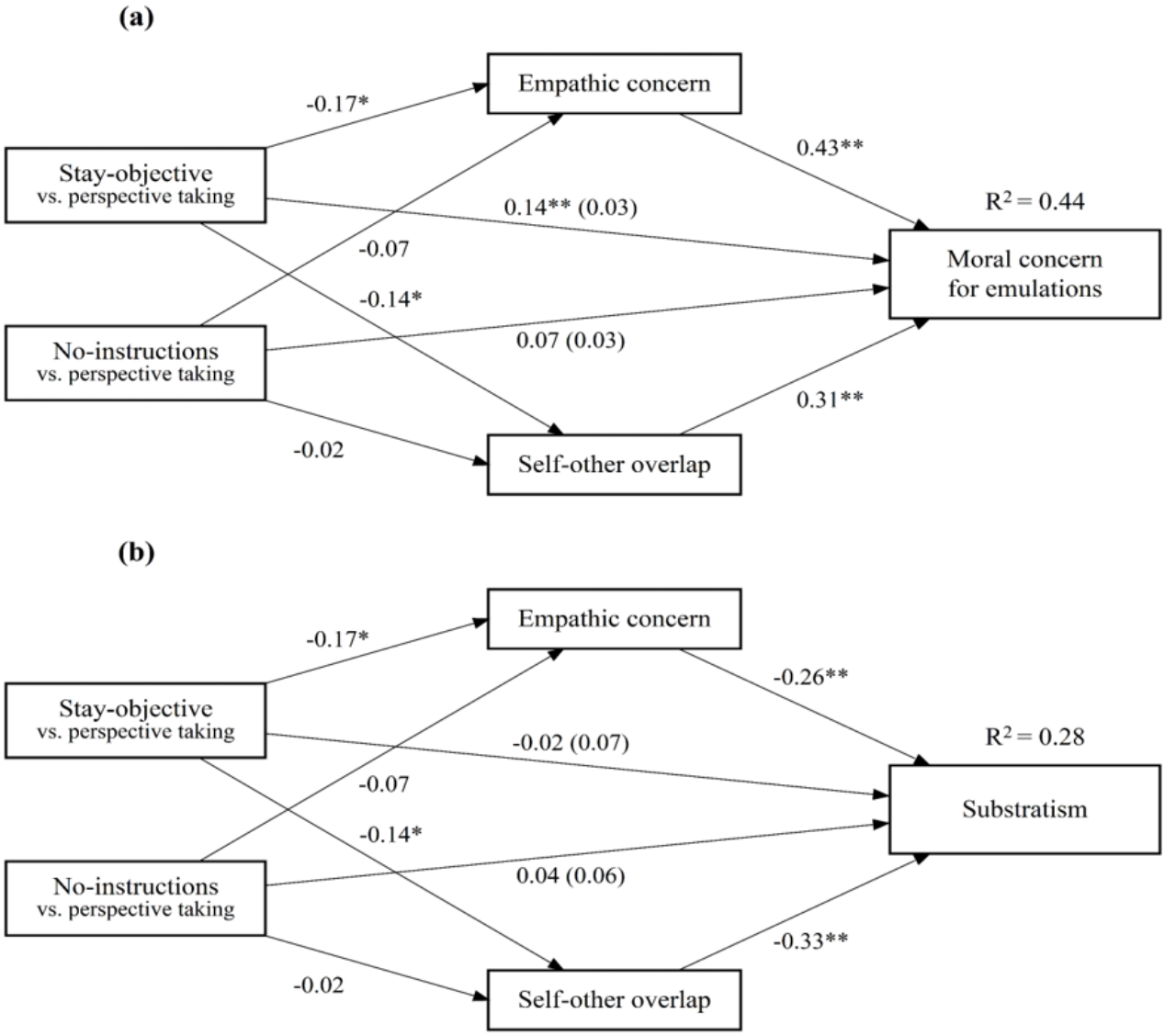

Figure 2. Study 2 mediation models of perspective taking via empathic concern and self-other overlap on (a) moral concern emulations and (b) substratism. All reported effects are standardized. Total effects are reported in parentheses. R^2 values refer to regressions estimating direct effects. * p < .05, ** p < .01. Plots created using the R package "DiagrammeR" (Version 1.0.6.1; Iannone, 2020).

Table 4

Study 2 Indirect Effects of Independent Variables via Mediators

	Moral concern for emulations				Substratism			
			95% CI				95% CI	
	β	*SE*	LL	UL	*β*	*SE*	LL	UL
Empathic concern								
Stay-objective	-0.07	0.03	-0.14	-0.01	0.04	0.02	0.01	0.09
No-instructions	-0.03	0.03	-0.09	0.03	0.02	0.02	-0.02	0.06
Self-other overlap								
Stay-objective	-0.05	0.02	-0.09	-0.003	0.05	0.02	0.003	0.10
No-instructions	-0.01	0.02	-0.05	0.04	0.01	0.02	-0.04	0.05

Note: Reference group in each case is perspective taking condition. Standardized effects reported. LL = confidence interval lower limit; UL = confidence interval upper limit. Statistical significance inferred from 95% CI not containing zero.

Moral concern for emulations

A one-way ANOVA indicated that there were no differences between the three groups on moral concern for emulations, $F(2, 270) = 0.10$, $p = .908$, $\eta^2 = 0.001$. This was supported by the mediation models: we did not find significant total effects on moral concern for emulations for either the stay-objective condition ($\beta = 0.03$, $SE = 0.07$ $p = .718$) or the no-instructions condition ($\beta = 0.03$, $SE = 0.07$, $p = .691$) compared to the perspective taking condition.

As with Study 1, however, we did find evidence of indirect effects in some cases. We found that participants in the stay objective condition reported lower empathic concern ($\beta = -0.17$, $SE = 0.07$, $p = .016$) and self-other overlap ($\beta = -0.14$, $SE = 0.07$, $p = .040$) than participants in the perspective taking condition. The difference between participants in the no-instructions condition and the perspective taking condition, however, were nonsignificant on both empathic concern ($\beta = -0.07$, $SE = 0.07$, $p = .320$) and self-other overlap ($\beta = -0.02$, $SE = 0.07$, $p = . 751$). In the models with moral concern for emulations as the dependent variable and condition and both mediators as independent variables, we found that empathic concern was positively associated with moral concern ($\beta = 0.43$, $SE = 0.06$, $p < .001$), as was self-other overlap ($\beta = 0.31$, $SE = 0.06$, $p < .001$). These estimates translated into significant indirect effects of being in the stay-objective condition

via both empathic concern (β = -0.07, *SE* = 0.03, 95% CI [-0.14; -0.01]) and self-other overlap (β = -0.05, *SE* = 0.02, 95% CI [-0.09; -0.003]). However, the indirect effects of the no-instructions condition effects via empathic concern (β = -0.03, *SE* = 0.03, 95% CI [-0.09; 0.03]) and self-other overlap (β = -0.01, *SE* = 0.02, 95% CI [-0.05; 0.04]) were both nonsignificant.

After accounting for the effect of the mediators, we found a positive direct effect of the stay-objective instructions on moral concern for emulations (β = 0.14, *SE* = 0.05, p = .008). We did not find this effect in the case of the no-instructions condition (β = 0.07, *SE* = 0.05, p = .223). As with Study 1, this suggests competitive mediation in the case of the stay-objective condition that the model does not capture.

Substratism

A one-way ANOVA indicated that there were no differences between the three groups on substratism, $F(2, 270) = 0.55$, p = .575, $\eta^2 = 0.004$. This was supported by the mediation analysis which showed no significant total effects of either the stay-objective condition (β = 0.07, *SE* = 0.07, p = .339) or the no-instructions condition (β = 0.06, *SE* = 0.07, p = .392) on substratism.

The first component of the indirect effects, the differences in the conditions on the two mediators, are the same as in the previous model. The second component, the effect of the mediators on substratism, were significant and in the expected direction for both empathic concern (β = -0.25, *SE* = 0.07, $p < .001$) and self-other overlap (β = -0.33, *SE* = 0.07, $p < .001$). These estimates translated to significant indirect effects of being in the stay-objective condition via both empathic concern (β = 0.04, *SE* = 0.02, 95% CI [0.01; 0.09]) and self-other overlap (β = 0.05, *SE* = 0.02, 95% CI [0.003; 0.10]). However, for the no-instructions condition there was no indirect effect via either empathic concern (β = 0.02, *SE* = 0.02, 95% CI [-0.02; 0.06]) or self-other overlap (β = 0.01, *SE* = 0.02, 95% CI [-0.04; 0.05]).

After accounting for the mediators, neither the objective condition (β = -0.02, *SE* = 0.06, p = .702) nor the control condition (β = 0.04, *SE* = 0.06, p = .558) were significantly associated with substratism.

Sensitivity Analysis

As with Study 1, we ran three sets of sensitivity analyses: models with control variables for general moral concern, models with personal distress as a third mediator, and models controlling for a range of potential confounders: age, gender, ethnicity, education, diet, pet ownership, political views, and personal distress. The inclusion of general moral concern did not materially change any of the coefficients, suggesting that the effects of taking the perspective of the emulation via our mediators generalizes to moral concern for artificial entities, but it does not result in a broader increase in moral concern. As with Study 1, we did not find a significant effect of the manipulation on personal distress, nor did we find any significant indirect effects via personal distress. However, consistent with the effects on speciesism in Study 1, we found that its inclusion rendered the indirect effect via empathic concern on substratism nonsignificant. The inclusion of the additional control variables had a small downward effect on the estimates, rendering the marginally significant indirect effect on substratism via self-other overlap for the perspective taking versus stay-objective comparison nonsignificant, but not affecting any of the other estimates. The full results of the sensitivity analysis can be found in the Supplemental Materials.

Discussion

Consistent with Study 1, we did not find evidence in support of our hypotheses that moral attitudes towards artificial entities would be more positive in the perspective taking condition compared to the stay-objective condition (H1) and the no-instructions condition (H2).

However, as in Study 1, we did find support for our hypothesized effects of perspective taking on moral attitudes towards artificial entities via both empathic concern (H3) and self-other overlap (H4). This finding was supported for both dependent variables we tested: moral concern for emulations and substratism. We only found these indirect effects for the perspective taking versus stay-objective comparison, not the perspective taking versus no-instructions comparison. Exploratory analysis (see Supplemental Materials) indicated that there were no indirect effects for the stay-objective versus no-instructions comparison either, suggesting the observed effects are

most plausibly a combination of both encouraging perspective taking and suppressing it through the stay-objective instructions, though they may be slightly more driven by the stay-objective instructions in this case. The findings reported here were not affected by the inclusion of a control variable for general moral concern. The inclusion of personal distress and additional demographic control variables in the models rendered the indirect effects on substratism nonsignificant, though the effects on moral concern for emulations were robust to these sensitivity checks.

After accounting for the effects via the empathic concern and self-other overlap, we found that moral concern for emulations was higher in the stay-objective condition compared to perspective taking condition. As with Study 1, a possible explanation for this is competitive mediation, that there are benefits to staying objective that our models do not capture (Zhao et al., 2010). This would partly explain the overall nonsignificant difference in moral attitudes between perspective taking and the stay-objective condition. Possible further explanations for these findings are discussed in the next section.

General Discussion

This research investigated the effects of encouraging perspective taking on moral attitudes towards two non-human groups: animals and artificial entities. We compared the effect of encouraging perspective taking to encouraging objectivity and a neutral condition. This allowed us to test whether there is a general effect of perspective taking, and whether these are driven by positive effects of perspective taking rather than negative effects of encouraging objectivity. We estimated mediation models of the relationships via empathic concern and self-other overlap. To test the scope of the effects, we included multiple dependent variables in each study, capturing moral attitudes towards increasingly broad groups (e.g., a farmed pig, farmed animals, animals in general).

We did not find evidence of total effects of encouraging perspective taking on the outcome variables in either experiment. That is, overall, there were no significant differences in moral attitudes towards animals or artificial entities between the perspective taking condition and either the stay-objective or the no-instructions conditions. This finding raises questions about the overall

effectiveness of encouraging perspective taking in the contexts studied in this paper, and is surprising in the context of a large body of existing studies showing positive effects of encouraging perspective taking in a range of contexts (Todd & Galinsky, 2014). However, the findings add support for recent suggestions that perspective taking encouragement is less effective than is currently believed, particularly compared to neutral instructions (McAuliffe et al., 2020).

While we did not find total effects, we did find evidence of indirect effects of perspective taking on moral attitudes via our hypothesized mediators in both studies. In Study 1, we found positive effects of taking the perspective of an individual farmed pig on moral attitudes towards animals via both empathic concern and self-other overlap, and in Study 2, we found positive effects of taking the perspective of a "whole brain emulation" on moral attitudes towards artificial entities via the same mechanisms. These findings show that the effects of perspective taking via empathic concern and self-other overlap generalize broadly, even to the unfamiliar contexts explored in this study.

That we consistently found indirect effects via both empathic concern and self-other overlap simultaneously is in contrast to studies that have found an effect via only one of these mediators (Batson, Sager, et al., 1997; Cialdini et al., 1997; Maner et al., 2002; McAuliffe et al., 2018), and to those that have suggested that imagine-other perspective taking is associated with only empathic concern (e.g., Myers et al., 2014). This may be partly due to the differing contexts—the cited studies were concerned with interactions between humans only. Further research should explore whether this finding is the result of subtle differences in the mechanisms of perspective taking in the context of non-human groups. Consistent with existing theory (Batson, Early, et al., 1997), sensitivity analysis showed that the manipulation in the present study had no effect on personal distress, nor was there a significant indirect effect via this variable.

A key question we aimed to address in this study was the extent to which the results could be attributed to encouraging perspective taking rather than suppressing it through the stay-objective instructions, a possibility raised by McAuliffe et al. (2020). We considered that encouraging

perspective taking may be relatively effective in the context of the non-human entities studied in this paper because humans tend to have lower baseline levels of baseline concern for more distant entities (Miralles et al., 2019). In Study 1, the indirect effects of perspective taking versus no-instructions comparison were generally just over half the effect size of the perspective taking versus stay-objective comparison, consistent with the hypothesis that part of the effect can be explained by the instructions encouraging perspective taking. However, consistent with McAuliffe et al. (2020), we did not find evidence of indirect effects of encouraging perspective taking compared to no-instructions via empathic concern, which is the comparison and mediator they focused on. In Study 2, we did not find any evidence that perspective taking affected attitudes towards artificial entities compared to the no-instructions condition via either self-other overlap or empathic concern. This difference may be partly due to the overall smaller effect size of the manipulation on the mediators in Study 2. However, we argue that this does not entirely account for our results, as the indirect effects of the perspective taking versus no-instructions comparison were also *proportionally* smaller than in Study 1.

One speculative explanation for this difference in the indirect effects of the perspective taking versus no-instructions comparisons between our two studies, consistent with the findings of this study and McAuliffe et al. (2020), is that there is a non-linear relationship between encouraging perspective taking and psychological distance. At very low levels of psychological distance, such as with in-group targets, perspective taking encouragement is not necessary because it is our natural response. At moderate levels of distance, such as in the case of the farmed pig, our natural response weakens, and encouraging perspective taking becomes important. However, when psychological distance is very high, perspective taking is so unnatural that the instructions are no longer effective in generating the desired responses in the perspective takers. Because the emulations were distant on multiple dimensions—socially, temporary, and probabilistically (Liberman et al., 2007)—it is possible that the manipulation did not significantly increase empathic concern or self-other overlap above their baseline levels.

Another question we aimed to address was how broadly or narrowly the effects generalize to groups that include the perspective taking targets. In both experiments, we found that the indirect effects via self-other overlap and empathic concern generalized to the broadest groups that we tested: in Study 1, to all animals, measured by speciesism, and in Study 2, to all artificial beings, measured by substratism. These findings suggest that the individual entities considered in each experiment—the farmed pig in Study 1 and the brain emulation in Study 2—were sufficiently representative of the broader superordinate groups to enable attitude generalization at these higher levels. However, given that all participants made judgments for every group, it is possible that their responses for the later groups were influenced by their responses to the earlier ones. This would provide an alternative explanation for the generalization effect, and should be tested in future research by randomly assigning participants to each dependent variable.

What explains the combination of the lack of significant total effects and the significant indirect effects via the mediators in the present study? This outcome can arise due to differential power to detect the effects, and may explain why we did not find a total effect for the perspective taking versus no-instructions comparison (Rucker et al., 2011). The lack of a significant total effect of perspective taking relative to the stay-objective condition likely has a different explanation. In three out of five models, we found evidence of competitive mediation: after controlling for the mediators in the models, we found positive direct effects of staying objective on moral attitudes. This suggests that in simple regressions of our dependent variables on perspective taking relative to staying objective, the positive effects of perspective taking and staying objective cancel each other out, rendering the total effects nonsignificant (Hayes, 2009).

This explanation, of course, raises the further question: what explains the positive effects of staying objective on moral attitudes? While there is evidence suggesting that people do have some degree of moral concern for nonhuman entities (e.g., Crimston et al., 2016), it is plausible that in the current study participants considered their moral values towards entities that they have likely spent relatively little time reflecting on before. Perhaps by staying objective, participants were able to

consider their values more carefully and reason their way to the conclusion that species or substrate is not relevant for moral consideration. This theory is consistent with the evidence that suggests moral reasoning can enable us to override our intuitive moral judgments (e.g., Paxton et al., 2012; Paxton & Greene, 2010). If correct, it also implies that encouraging objectivity in human relationships with distant non-humans may yield different results than objectivity in more typical contexts such as human-human relationships. We encourage more research into this possible explanation.

Limitations and Future Directions

Our study has several important limitations. First, as the finding of competitive mediation shows, our proposed models are not complete. Aside from the positive effect of staying objective, there may be other channels through which perspective taking affects moral attitudes towards non-human groups that are not captured by our models. Possible candidates for this include anger and indignation (Dovidio et al., 2004; Finlay & Stephan, 2000), intergroup anxiety (Pettigrew & Tropp, 2008), threat (Riek et al., 2006), attributions of humanness (Epley et al., 2007; Haslam, 2006), and, of particular relevance to non-human entities, perceived capacity for suffering (Bratanova et al., 2011; Gray et al., 2007; Loughnan et al., 2010).

A second limitation is the correlational nature of the estimated relationships between the mediators and the dependent variables in our models. While we relied on a large body of literature to inform the hypothesized relationships between these sets of variables, the results are still consistent with alternative models. For example, it is possible that an unobserved variable explains both the mediators and dependent variables in our models, rather than the mediators affecting the dependent variables as we hypothesized. Sensitivity analyses controlling for a range of potential confounders did not materially affect the results, however, we recommend that causal interpretations of this component of the models are made with caution.

A third limitation of this research is our measurement of moral attitudes towards artificial entities. We adapted the existing Speciesism Scale (Caviola et al., 2019) for our Substratism Scale

and found evidence of its statistical reliability and correlation with various measures in theoretically plausible directions. However, more research is needed to further develop, validate, and understand this and related constructs to enable future research on human relations with artificial entities to be carried out in a robust and consistent manner.

This is, as far as we are aware, the first study looking at the effects of perspective taking on attitudes towards non-human animals and artificial entities, and there are many remaining questions that need to be answered to fully understand how it extends to these contexts. In addition to the directions above, these include understanding the effects of using different experimental stimuli, the effects of encouraging perspective taking of other entities in these categories (e.g., different farmed animals), whether and the extent to which attitude changes persists over time, whether perspective taking in these contexts affects behavior, and for whom the effects are more or less pronounced.

Conclusions

The lack of evidence of total effects of perspective taking on moral attitudes towards non-human animals and artificial entities raises questions about its effectiveness in the context of the distant non-human groups studied in the present paper. However, we did find evidence of positive indirect effects on moral attitudes via empathic concern and self-other overlap, and that these positive effects generalized to wider groups including the perspective taking targets. In the case of non-human animals, we also found evidence in favor of the hypothesis that the effects were driven by encouraging perspective taking. The present study, therefore, suggests that there are paths through which perspective taking positively affects attitudes towards non-human animals and artificial entities. The lack of total effects can be partly explained by positive effects of encouraging objectivity, highlighting a potentially important difference in human interactions with the non-human groups in the present study compared to other more familiar groups. Our findings suggests that, in a context where society is increasingly concerned with whether and how to take into account the interests of distant non-human groups (e.g., Gunkel, 2018), both greater objectivity and perspective taking may provide support for expanding the circle of moral concern.

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