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Extending Perspective Taking to Non-Human Animals and Artificial Entities

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**Statement of Ethical Compliance**

All procedures were performed in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments for the treatment of human participants. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Declaration of Conflicting Interests**

The Authors declare that there is no conflict of interest.

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**Abstract**

Perspective taking can have positive effects in a range of intergroup contexts. In two experiments, we tested whether these effects generalize to two yet-to-be-studied nonhuman groups: animals and intelligent artificial entities. We found no overall 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, mediation analysis indicated that perspective taking positively affected moral attitudes via empathic concern and self-other overlap, supporting two mechanisms well-established in the literature. The lack of overall effects may be partly explained by positive effects of staying objective on moral attitudes that offset the positive effects of perspective taking via empathic concern and self-other overlap. These findings suggest that perspective taking functions differently in the context of non-human groups relative to typical intergroup contexts. We consider this an important area for future research.

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

### **Extending Perspective Taking to Non-Human Animals and Artificial Entities**

The moral circle, that is, the boundary around the entities that are granted moral consideration, has arguably expanded over time (Singer, 1981). Pinker (2011) suggests 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 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 (Clare & Jeffery, 1972), and the environment as a whole (Berenguer, 2007, 2010; Schultz, 2000; Sevillano et al., 2007; Swim & Bloodhart, 2015).

Two groups excluded from this list are non-human animals and intelligent artificial entities. There is increasing interest in understanding human moral relations with both of these groups (e.g., Gunkel, 2018; Harris & Anthis, 2021; 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 on human-AI relations (e.g., Pauketat & Anthis, 2022; Vanman & Kappas, 2019). In both cases, researchers have found evidence of many of the same psychological mechanisms that operate in human intergroup relations. 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 robots with emotional capacities are less likely to be sacrificed in moral dilemmas (Nijssen et al., 2019), and that positive and negative emotions predict people's willingness to interact with robots (Smith et al., 2020). Consistent with the literature on non-human animals, research also finds that negative attitudes towards artificial entities can generalize to

perceived human outgroups (Gamez-Djokic & Waytz, 2020), and that willingness to interact with robots can be increased by intergroup contact (Wullenkord et al., 2016).

Given the broad range of contexts in which perspective taking has been found to have positive effects, as well as the similar psychological mechanisms underpinning human relations with human outgroups, non-human animals, and artificial entities, we considered that the positive effects of perspective taking would extend to non-human animals and artificial entities. In the present paper we explored 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. Each of these goals are discussed 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 often 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. 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, 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. 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**

Several accounts of how perspective taking positively affects intergroup attitudes 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 and warmth, which, in turn, increases the extent to which the perspective taker cares about 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.

### **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 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 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).

## Overview of Present Research

In two experiments we tested the effects of perspective taking on moral attitudes towards two non-human groups: animals and intelligent artificial entities. Each study included three conditions: one that encouraged perspective taking, one that encouraged objectivity, and a neutral condition. 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. We hypothesized that the positive effects of perspective taking compared to staying objective would be mediated by (H3) empathic concern and (H4) self-other overlap, and that the positive effects of perspective taking compared to the neutral condition would also be mediated by (H5) empathic concern and (H6) self-other overlap. To understand the scope of the effects, we measured moral attitudes towards multiple, increasingly broad, groups (e.g., farmed pigs, all farmed animals, all animals). 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 full hypotheses were preregistered for Study 1 here: <https://osf.io/mhgba> and for Study 2 here: <https://osf.io/d6fgb>.<sup>1</sup> The datasets, experimental materials, and code to run the analyses, can be found here: <https://osf.io/srxgm>.

## Study 1

Study 1 tested 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 important group in the context of the present study which seeks to understand effects on moral

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<sup>1</sup> The numbering and combination of the hypotheses was changed through the review process to increase clarity, but the substance remains unchanged.



attitudes. Pigs have also been previously considered in psychological studies on human-animal relations (e.g., Caviola & Capraro, 2020; Wilks et al., 2021).

Study 1 tested H1–H6. We tested the effect 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 were excluded because they failed at least one of two attention checks, leaving 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 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. They were given additional instructions based on the condition they were in, following the standard approach in the perspective taking literature (Todd & Galinsky, 2014). Participants in the perspective taking condition were told: “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 (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 ( $\alpha = .91$ ). This measure was used in sensitivity analysis.

**Self-other overlap.** This was measured using the Inclusion of Other in the Self Scale (Aron et al., 1991), which asks participants to choose one of seven increasingly overlapping circles that best represents their relationship with another entity, in this case, the farmed pig in the article.

**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. Two of the seven groups were 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.

***Speciesism.*** Moral attitudes towards all animals was measured using the Speciesism Scale (Caviola et al., 2019). This asks participants to report the extent to which they agree, with six statements relating to animals (1 = *strongly disagree*, 7 = *strongly agree*), such as “Morally, animals always count for less than humans.” 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 ( $\alpha = .86$ ).

### ***Analysis Plan***

We estimated three separate mediation models for each of the dependent variables using the “mediate” function in the R “Psych” package (Revelle, 2020). We built our models following Hayes and Preacher (2014) for mediation models with categorical independent variables with more than two levels and Preacher and Hayes (2008) for models with multiple mediators. Each of our mediation models is made up of four linear regression models. Regression model (1) is a linear regression of the dependent variable on the perspective taking manipulation coded as 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 on the dependent variables relative to the perspective taking condition. Regression models (2) and (3) are linear regressions of each of our two mediators, empathic concern and self-other overlap, on the perspective taking manipulation coded in the same way as in regression model (1). Regression model (4) is a linear regression of the dependent variable on the perspective taking manipulation, coded as in regression models (1) to (3), and both mediators together.

From these four regression models we derive our parameters of interest. The coefficients on the two independent variables in regression models (1) give us the “total effects”—the overall effects of encouraging perspective taking compared to the stay-objective and no-instructions

conditions (H1 and H2, which we also estimated with one-way ANOVAs). The “indirect effects”—the effects of encouraging perspective taking on the dependent variables via empathic concern and self-other overlap (H3 to H6)—are derived from models (2) to (4). They are estimated as the product of the effects of the perspective taking manipulation on the mediators (the coefficients on the independent variables in models (2) and (3)) and the effects of the mediators on the dependent variables while controlling for the effects of the perspective taking manipulation (the coefficients on the mediators in model (4)). Statistical significance of the indirect effects was inferred based on 95% confidence intervals constructed from 10,000 bootstrap samples. The “direct effects”—the effects of the perspective taking manipulation when controlling for the mediators—are given by the coefficients on the independent variables for the perspective taking manipulation in regression model (4). The direct effects tell us the effects of the perspective taking manipulation on the dependent variables that are not explained by the mediators included in the model (i.e., empathic concern and self-other overlap). We report the total, indirect, and direct effects for each of our three mediation models in the next section, with all reported effects 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.

[Table 1 here]

### ***Manipulation checks***

As expected, 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,  $p < .001$ . 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,  $p = .252$ . These results suggest that the manipulation had the intended effects, though the perspective taking instructions were more effective than the stay-objective instructions. Finally, participants found the vignette believable ( $M = 4.32$ ,  $SD = 0.80$ , on a five-point scale).

[Figure 1 here]

*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” (Iannone, 2020).

[Table 2 here]

### ***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 supported by the mediation models: there was no 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. Put another way, the perspective taking manipulation had no overall effect on moral concern for farmed pigs.

However, we did find evidence of indirect effects—effects of the perspective taking manipulation on moral concern for farmed pigs via empathic concern and self-other overlap. For the stay-objective versus perspective taking comparison, we found indirect effects via both empathic concern ( $\beta = -0.09, SE = 0.03, 95\% CI [-0.15; -0.04]$ ) and self-other overlap ( $\beta = -0.07, SE = 0.03, 95\% CI [-0.13; -0.03]$ ). However, we did not find indirect effects for the no-instructions versus perspective taking comparison via either empathic concern ( $\beta = -0.05, SE = 0.03, 95\% CI [-0.11; 0.003]$ ) or self-other overlap ( $\beta = -0.04, SE = 0.02, 95\% CI [-0.09; 0.0003]$ ).

The direct effects—the effects of the perspective taking manipulation on moral concern for farmed pigs when controlling for empathic concern and self-other overlap—were nonsignificant for both the comparison of perspective taking with the stay-objective condition ( $\beta = 0.11, SE = 0.06, p = .075$ ) and the no-instructions condition ( $\beta = -0.04, SE = 0.06, p = .532$ ). Put another way, we did not find evidence of an effect of the perspective taking manipulation on moral concern for farmed pigs after accounting for the effects via empathic concern and self-other overlap.

### *Moral concern for all farmed animals*

A one-way ANOVA indicated that there were no differences in moral concern for all farmed animals between the three conditions,  $F(2, 268) = 0.61, p = .542, \eta^2 = .01$ . Estimates of the total effects supported this: there were no significant differences in moral concern for farmed animals between either the stay-objective condition ( $\beta = -0.04, SE = 0.07, p = .545$ ) or the no-instructions condition ( $\beta = -0.08, SE = 0.07, p = .269$ ) and the perspective taking condition. Put another way, the perspective taking manipulation had no overall effect on moral concern for all farmed animals.

However, we did find indirect effects of the perspective taking manipulation on moral concern for all farmed animals through our hypothesized mediators. The indirect effects of being in the stay-objective condition compared to the perspective taking condition via empathic concern was significant ( $\beta = -0.08, SE = 0.03, 95\% \text{ CI } [-0.14; -0.03]$ ), as was the indirect effect via self-other overlap ( $\beta = -0.09, SE = 0.03, 95\% \text{ CI } [-0.15; -0.04]$ ). For the no-instructions condition compared to the perspective taking condition, there was no indirect effect via empathic concern ( $\beta = -0.04, SE = 0.03, 95\% \text{ CI } [-0.10; 0.002]$ ), though we did find an effect via self-other overlap ( $\beta = -0.05, SE = 0.03, 95\% \text{ CI } [-0.11; -0.001]$ ).

In this model, we found a significant direct effect—a significant positive effect of the stay-objective instructions compared to perspective taking on moral concern for all farmed animals after controlling for the mediators ( $\beta = 0.13, SE = 0.06, p = .022$ ). We did not find this effect in the case of the no-instructions versus perspective taking comparison ( $\beta = 0.02, SE = 0.06, p = .784$ ). The significant direct effect for the stay-objective versus perspective taking comparison suggests that staying objective may positively affect moral concern for all farmed animals via a mechanism 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,  $F(2, 268) = 2.35, p = .097, \eta^2 = .02$ . This was supported by the mediation model: there were no total effects for either the stay-objective condition ( $\beta = -0.04, SE = 0.07, p = .541$ ) or the

no-instructions condition ( $\beta = 0.10$ ,  $SE = 0.07$ ,  $p = .137$ ) on speciesism. That is, the perspective taking manipulation had no overall effect on speciesism.

As with the previous models, we did find indirect effects of the perspective taking manipulation on speciesism via empathic concern and self-other overlap. The indirect effects of the stay-objective versus perspective taking condition via both empathic concern ( $\beta = 0.04$ ,  $SE = 0.02$ , 95% CI [0.01; 0.09]) and self-other overlap ( $\beta = 0.07$ ,  $SE = 0.03$ , 95% CI [0.02; 0.13]) were significant. For the no-instructions versus perspective taking condition, we did not find an indirect effect via empathic concern ( $\beta = 0.02$ ,  $SE = 0.02$ , 95% CI [-0.001; 0.06]), though the indirect effect via self-other overlap was significant ( $\beta = 0.04$ ,  $SE = 0.02$ , 95% CI [0.001; 0.09]).

As with the model with moral concern for all farmed animals as the dependent variable, we found a significant direct effect in this model—there was a significant positive effect of staying objective versus perspective taking on speciesism after controlling for the effect of empathic concern and self-other overlap ( $\beta = -0.16$ ,  $SE = 0.07$ ,  $p = .021$ ). There was no direct effect for the no-instructions versus perspective taking comparison ( $\beta = 0.05$ ,  $SE = 0.07$ ,  $p = .494$ ).

### ***Sensitivity Analysis***

We ran three sets of sensitivity analyses; the key findings are reported here with full results in the Supplementary Materials. First, we re-ran each of the three mediation models with a control variable for general moral concern, to understand whether the effects we found on attitudes towards animals via the mediators were due to a general increase in moral concern across all groups, or whether they applied specifically to the animal groups studied. We found that the adjusted effects were smaller by roughly one-third, rendering the indirect effects of the perspective taking versus no-instructions comparisons via self-other overlap on moral concern for all farmed animals and speciesism statistically nonsignificant. For the perspective taking versus stay-objective comparison, the indirect effect via empathic concern on speciesism became nonsignificant. These results suggest that part of the positive effects on moral attitudes towards non-human animals is due to a general increase in moral concern and part of the effects is specific to non-human animals.



Second, we re-ran the mediation models with personal distress as a third mediator alongside empathic concern and self-other overlap. As expected due to the other-oriented nature of our perspective taking manipulation, the manipulation did not affect personal distress, and there were no significant indirect effects of perspective taking on any of the three dependent variables via personal distress. There was a relatively large reduction in the size of the indirect effects on speciesism via empathic concern, but not for the other two dependent variables. 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 between empathic concern and speciesism, which was correlational. 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 dependent variables in our models, the estimates of the indirect effects of the perspective taking manipulation via the mediators may be biased by confounders. We therefore re-ran the mediation models controlling for a range of potential confounders: age, gender, ethnicity, education, diet, pet ownership, political views, and personal distress. The inclusion of these variables reduced the size of the indirect effects of perspective taking on the dependent variables via empathic concern and self-other overlap by a relatively small amount compared to the models with just personal distress, additionally rendering two marginally significant effects nonsignificant: the indirect effect of perspective taking versus no-instructions on moral concern for all farmed animals via self-other overlap, and the indirect effect of perspective taking versus stay-objective on speciesism via self-other overlap.

## **Discussion**

We did not find support for our hypotheses that moral attitudes towards animals would be more positive in the perspective taking condition compared to either the stay-objective (H1) or the

no-instructions condition (H2). This was the case for each of the three dependent variables we tested: all farmed pigs, all farmed animals, and all animals (measured by speciesism).

However, we did find that encouraging perspective taking, compared to staying objective, positively affected moral attitudes towards animals via our two hypothesized mediators, empathic concern (H3) and self-other overlap (H4). That is, we found evidence that perspective taking increases empathic concern and self-other overlap, which, in turn, positively affect moral attitudes towards animals. These positive effects were present for each of the three dependent variables we tested. We found mixed support for our hypotheses that encouraging perspective taking, compared to no-instructions, would positively affect moral attitudes towards animals via empathic concern (H5) and self-other overlap (H6). While the significance testing for H5 and H6 showed mixed support, the effect sizes were generally just over half of the perspective taking versus stay-objective comparisons, suggesting that the positive effects of perspective taking via empathic concern and self-other overlap are partly the result of encouraging perspective taking above its baseline level and partly the result of suppressing it below its baseline level (see Supplementary Materials for the results of the stay-objective versus no-instructions comparison, which also supports this interpretation). The results reported here largely persisted when controlling for general moral concern, personal distress, and a range of demographic variables, though the effects for the perspective taking versus no-instructions comparisons and those associated with the speciesism models were more sensitive to these checks, as detailed in the sensitivity analysis section.

In the models with speciesism and moral concern for all farmed animals as the dependent variables, we found that when controlling for the effects of empathic concern and self-other overlap, there were positive effects of staying objective compared to perspective taking on moral attitudes. A possible explanation for this is competitive mediation, that there are positive effects of staying objective on speciesism and moral concern for all farmed animals via a mechanism that our models do not capture (Zhao et al., 2010). This would provide an explanation for the apparent inconsistency in support for H1, that there were no overall differences in moral attitudes between the perspective

taking and stay-objective conditions, and H3–H4, that perspective taking, compared to staying objective, positively affected moral attitudes via empathic concern and self-other overlap. Further possible explanations of these findings are explored in the General Discussion.

## Study 2

Study 2 tested whether the effects of perspective taking extend to intelligent artificial entities. We presented participants with a future scenario involving a technology called “whole brain emulation,” where human-level artificial intelligences are created by scanning human brains and creating software models of them (Hanson, 2016; Sandberg, 2013). In the scenario, 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) for which the question of moral consideration is becoming increasingly prevalent (Gunkel, 2018), as well as to provide a partial replication of Study 1 in a different context.

As with Study 1, Study 2 tested hypotheses H1–H6. We tested the effects on two dependent variables: emulations as a group, and all artificial entities.

## Method

### *Participants*

We recruited participants living in the United States from 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, due to the unfamiliar scenario being discussed, in this study all participants first read background information describing the future scenario. 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 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. One of the groups was “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.

***Substratism.*** We define “substratism” as prejudice against an entity based on the substrate in which its mind is instantiated. We devised a Substratism Scale to measure moral attitudes towards all artificial entities. 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 (1 = *strongly disagree*, 7 = *strongly agree*). These items closely followed the wording of the Speciesism Scale (Caviola et al., 2019), for example, “Morally, artificial beings always count for less than humans.” 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 ( $\alpha = .92$ ).

### *Analysis Plan*

We estimated two separate mediation models for each of the dependent variables using the same method as in Study 1. All reported results of the mediation models below are standardized.

## **Results**

### *Descriptive statistics*

Table 3 reports means, standard deviations, and bivariate Pearson correlations for the dependent variables and mediators in the study.

[Table 3 here]

### *Manipulation checks*

As expected, 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 ( $M = 3.40$ ,  $SD = 1.01$ ),  $p = .030$ . 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 nonsignificant,  $p = .086$ . 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 no 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. 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 in Study 2.

[Figure 2 here]

*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” ( Iannone, 2020).

[Table 4 here]

### ***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: there were no 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. Put another way, the perspective taking manipulation had no overall effect on moral concern for emulations.

As with Study 1, we did find some evidence of indirect effects—effects of the perspective taking manipulation on moral concern for emulations via empathic concern and self-other overlap. There were significant indirect effects of being in the stay-objective condition compared to the perspective taking condition via both empathic concern ( $\beta = -0.07, SE = 0.03, 95\% \text{ CI } [-0.14; -0.01]$ ) and self-other overlap ( $\beta = -0.05, SE = 0.02, 95\% \text{ CI } [-0.09; -0.003]$ ). However, the indirect effects of the no-instructions condition compared to the perspective taking condition via empathic concern ( $\beta = -0.03, SE = 0.03, 95\% \text{ CI } [-0.09; 0.03]$ ) and self-other overlap ( $\beta = -0.01, SE = 0.02, 95\% \text{ CI } [-0.05; 0.04]$ ) were both nonsignificant.

We found a positive direct effect of the stay-objective instructions on moral concern for emulations ( $\beta = 0.14, SE = 0.05, p = .008$ ). That is, when controlling for empathic concern and self-other overlap, there was a positive effect of staying objective compared to perspective taking on moral concern for emulations. We did not find this effect in the case of the no-instructions versus perspective taking comparison ( $\beta = 0.07, SE = 0.05, p = .223$ ). As with Study 1, this suggests competitive mediation in the case of the stay-objective versus perspective taking comparison.

### ***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 ( $\beta = 0.07, SE = 0.07, p = .339$ ) or the no-instructions condition ( $\beta = 0.06, SE = 0.07, p = .392$ ) on substratism. Put another way, the perspective taking manipulation had no overall effect on substratism.

We found significant indirect effects of being in the stay-objective condition versus the perspective taking condition via both empathic concern ( $\beta = 0.04, SE = 0.02, 95\% CI [0.01; 0.09]$ ) and self-other overlap ( $\beta = 0.05, SE = 0.02, 95\% CI [0.003; 0.10]$ ). However, for the no-instructions versus perspective taking condition there were no indirect effects via either empathic concern ( $\beta = 0.02, SE = 0.02, 95\% CI [-0.02; 0.06]$ ) or self-other overlap ( $\beta = 0.01, SE = 0.02, 95\% CI [-0.04; 0.05]$ ).

We found no evidence of direct effects: when controlling for empathic concern and self-other overlap, the effects of the stay-objective versus perspective taking comparison ( $\beta = -0.02, SE = 0.06, p = .702$ ) and the no-instructions versus perspective taking comparison ( $\beta = 0.04, SE = 0.06, p = .558$ ) on substratism were nonsignificant. In other words, we did not find evidence that the perspective taking manipulation affected substratism after accounting for the effects via empathic concern and self-other overlap.

### ***Sensitivity Analysis***

As with Study 1, we ran three sets of sensitivity analyses: (1) mediation models with control variables for general moral concern, (2) mediation models with personal distress as a third mediator, and (3) mediation models controlling for potential confounders: age, gender, ethnicity, education, diet, pet ownership, political views, and personal distress. We report the key findings here; the full results are reported in the Supplementary Materials. The inclusion of general moral concern as a control variable did not materially change any of the coefficients in the models, suggesting that the effects of taking the perspective of the individual emulation via empathic concern and self-other

overlap apply to moral concern for artificial entities as a group, but do not increase moral concern towards entities more broadly. As with Study 1, we did not find an effect of the perspective taking manipulation on personal distress, nor did we find indirect effects on moral attitudes towards artificial entities via personal distress. However, consistent with the effects on speciesism in Study 1, we found that its inclusion rendered the indirect effect of the perspective taking manipulation 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 moral concern for emulations via self-other overlap for the perspective taking versus stay-objective comparison nonsignificant, but not affecting any of the other estimates.

## **Discussion**

Consistent with Study 1, we did not find support for 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). This was the case for both dependent variables tested: moral concern for emulations and substratism.

However, as in Study 1, we did find positive effects of perspective taking compared to staying objective on moral attitudes towards artificial entities via both empathic concern (H3) and self-other overlap (H4). We did not find these effects for the perspective taking versus no-instructions comparison; the study did not support H5 and H6. However, exploratory analysis (see Supplementary Materials) indicated that there were no indirect effects on moral attitudes towards artificial entities via empathic concern or self-other overlap for the stay-objective versus no-instructions comparison either, suggesting the support for H3 and H4 are most plausibly a combination of both encouraging perspective taking above its baseline level and suppressing it below its baseline level through the stay-objective instructions. The findings reported here were not affected by the inclusion of a control variable for general moral concern, suggesting that they apply specifically to the groups tested and cannot be explained by a general increase in moral concern for all entities. The inclusion of personal distress and additional demographic controls in the models



nullified the positive effects of perspective taking via empathic concern on substratism, but otherwise only marginally affected the estimates.

When controlling for 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 positive effects of staying objective on moral concern for emulations through a mechanism that our models do not capture (Zhao et al., 2010). Possible further explanations are discussed in the next section.

### **General Discussion**

This research investigated the effects of encouraging perspective taking on moral attitudes towards two yet-to-be-studied non-human groups: animals and intelligent 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 more positive attitudes resulting from encouraging perspective taking rather than more negative attitudes resulting from 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.

We did not find evidence of overall effects of encouraging perspective taking on the dependent variables in either experiment. That is, 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 support 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 overall effects, we did find evidence that perspective taking positively affects moral attitudes via our hypothesized mediators in both studies. We found that taking the perspective of a farmed pig (Study 1) and whole brain emulation (Study 2) positively affected moral attitudes via both empathic concern and self-other overlap. These findings indicate that the positive effects of perspective taking via empathic concern and self-other overlap that have been found in a range of human intergroup contexts generalize broadly, even to the unfamiliar contexts explored in this study.

That we consistently found positive effects of perspective taking 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.

A key question we aimed to address in this study was the extent to which the results could be attributed to encouraging perspective taking above its baseline level rather than suppressing it through the typical comparison instructions which encourage objectivity, a possibility raised by McAuliffe et al. (2020). We predicted that we would find effects through increasing perspective taking in the context of the non-human entities studied in this paper because humans tend to have lower levels of baseline concern for more distant entities (Miralles et al., 2019). In Study 1, the positive effects of perspective taking versus the no-instructions control condition via empathic concern and self-other overlap were generally just over half the effect size of the effects for the perspective taking versus stay-objective comparison, suggesting that part of the effect can be explained by encouraging perspective taking above its baseline level. However, consistent with McAuliffe et al. (2020), the effects of encouraging perspective taking compared to no-instructions

via empathic concern, the comparison and mediator they focused on, were nonsignificant. In Study 2, the evidence that the effects of perspective taking via the mediators were driven by encouraging perspective taking above its baseline level were weaker than in Study 1. This may be partly due to the smaller effect sizes in Study 2, however, this likely does not entirely explain the difference, as the effects of the perspective taking versus no-instructions comparison via the mediators in Study 2 were also *proportionally* smaller than in Study 1.

One speculative explanation for this difference between the two studies is that there is a non-linear relationship between encouraging perspective taking and psychological distance. At very low levels of 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 response. Because the emulations were distant on multiple dimensions—socially, temporary, and probabilistically (Lieberman et al., 2007)—it is possible that the manipulation did not significantly increase empathic concern or self-other overlap above their baseline levels. That perspective taking would have little effect at high levels of psychological distance is consistent with Chambers and Davis (2012), who found that the ease with which we are able to imagine ourselves in the situation of a perspective taking target affects how much empathy we feel.

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 positive effects of perspective taking 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 entities, measured by substratism. These findings suggest that the individual entities considered in each experiment—the farmed pig in Study 1 and the emulation in Study 2—were sufficiently representative of the 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 also explain the observed generalization, and should be tested in future research by randomly assigning participants to each dependent variable.

What explains the combination of the lack of overall effects of perspective taking on moral attitudes and the positive effects of perspective taking via empathic concern and self-other overlap in the present study? This outcome can arise due to lesser statistical power to detect the overall effects than the effects via the mediators (Rucker et al., 2011), which may explain why we did not find overall differences in moral attitudes between the perspective taking and no-instructions conditions. The lack of overall effects 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 empathic concern and self-other overlap, we found positive effects of staying objective compared to perspective taking on moral attitudes. This suggests that we did not find overall effects in moral attitudes between the perspective taking and stay-objective conditions because the positive effects of encouraging perspective taking via empathic concern and self-other overlap were offset by positive effects of encouraging objectivity (Hayes, 2009).

This raises the further question: what explains the positive effects of staying objective on moral attitudes? While there is evidence that people have some degree of moral concern for non-human entities (e.g., Crimston et al., 2016), it is plausible that in the current study participants considered their moral values about entities that they have 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 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.

### **Implications**

Much has been learned about the effects of encouraging perspective taking on relations between human groups (Todd & Galinsky, 2014). One implication of the present study is that these findings do not straightforwardly generalize to intergroup contexts involving nonhuman groups. To summarize: (1) we found effects of encouraging perspective taking on moral attitudes via both empathic concern and self-other overlap simultaneously, whereas studies involving human perspective taking targets typically support an effect only via one of these paths, (2) we found that the positive effects of encouraging perspective taking via empathic concern and self-other overlap may vary with the psychological distance of the perspective taking target, and (3) we found that encouraging objectivity may have some positive effects, unlike in human intergroup contexts where it is the typical control condition. While we theorized about the reasons for these differences in the previous section, psychologists should aim to further understand them in future empirical studies.

A second implication of the present study concerns the effects of perspective taking on society's moral circle. In the introduction we noted that perspective taking has been hypothesized as a cause of the historic expansion of humanity's moral circle (Pinker, 2011), and we cited several studies on perspective taking in the context of human intergroup relations that provide some support for this hypothesis. While perspective taking may be an important factor explaining historic moral circle expansion, our findings suggest that the positive effects of encouraging perspective taking of entities at the fringes of society's current moral circle (i.e., farmed animals and artificial entities) may be more limited and less straightforward than expected. In fact, the present study raises a new hypothesis that should be studied by researchers in this field: that encouraging objectivity promotes the inclusion of nonhuman entities in the moral circle.

A third implication concerns the design of artificial entities to increase their acceptability. While the present study does not find that encouraging perspective taking overall improves attitudes towards artificial entities, it does find that encouraging perspective taking increases the extent to which people feel empathic concern and perceive themselves to be close with (i.e., self-other overlap) artificial entities. To the extent that feeling empathic concern and closeness with artificial entities would improve interactions with them (and there are reasons to think they would, e.g. Darling et al., 2015; Leite et al., 2013), designing artificial entities that encourage users to take their perspective may be beneficial. For example, human-computer interaction researchers could design them with a more human-like appearance, as this has been found to increase perspective taking (Zhao & Malle, 2022). Of course, given the above discussion of the limitations of past findings, we suggest that more work is needed to confirm these suggestions.

### **Limitations and Future Directions**

Our study has several important limitations. First, as the findings of competitive mediation shows, there may be other channels through which perspective taking affects moral attitudes that are not captured by our models. Possible candidates 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 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 consistent with alternative explanations. Sensitivity analyses controlling for personal distress in the mediation models nullified the effects of perspective taking on specieism and substratism via empathic concern, but controlling for additional potential confounders did not otherwise 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 develop this and related constructs to enable future research on human-AI relations to be carried out in a robust and consistent manner.

The present study raises multiple directions for future research. As commented on throughout this discussion, the study suggests several possible differences in the effects of perspective taking in the context of the distant non-human groups studied compared to existing studies largely focused on human intergroup relations. These include positive effects of encouraging objectivity, indirect effects via empathic concern and self-other overlap simultaneously, and potential non-linear effects of perspective taking as the target becomes more distant. We encourage future researchers to explore these differences, for example, by testing perspective taking for a range of entities varying in their psychological distance to humans, and by re-testing the effects of encouraging objectivity on moral attitudes and collecting data on potential mechanisms through which it may have positive effects. This would give a more complete understanding of how perspective taking works across different contexts.

## **Conclusions**

The lack of overall effects of perspective taking on moral attitudes towards non-human animals and artificial entities raises questions about its effectiveness in the context of these two groups. However, we found evidence that perspective taking positively affects moral attitudes towards these groups via empathic concern and self-other overlap, and that these positive effects generalized to wider groups including the perspective taking targets. We also found evidence that the effects were driven by encouraging perspective taking above its baseline level rather than suppressing it, particularly in the case of non-human animals. 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 overall effects can be partly explained by positive effects

of encouraging objectivity on moral attitudes towards animals and artificial entities, which offset the positive effects of perspective taking via empathic concern and self-other overlap. This is one of several potentially important differences in the effects of perspective taking in the context of human interactions with the non-human groups in the present study compared to more familiar groups, which should be explored further in future studies. 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 (Anthis & Paez, 2021; Gunkel, 2018), both greater objectivity and perspective taking may provide some support for the expansion of humanity's moral circle.

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