1

2

3   **Extending Perspective Taking to Non-Human Animals and Artificial Intelligence**

4

5

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

7

8   [1]Sentience Institute

9   [2]School of Philosophy, Psychology and Language Sciences, University of Edinburgh

10   [3]Department of Sociology, University of Chicago

11

12

13   Author Note: Correspondence concerning this article should be addressed to Ali Ladak at

14   ali@sentienceinstitute.org. All data, code, and experimental materials are available for download at:

15   https://osf.io/srxgm. Supplemental Materials can be found here.

16

17

18

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 encouraging perspective taking and objectivity can positively affect attitudes towards animals and artificial entities.

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

Introduction

34

35   The moral circle, that is, the boundary around the entities that are granted moral

36   consideration, has arguably expanded over time (Singer, 1981). Pinker (2011) suggests that one

37   factor explaining this expansion is perspective taking, the active consideration of another

38   individual's mental states, such as their thoughts and feelings (Todd & Galinsky, 2014). There is

39   evidence to support this theory: experimental studies have found positive effects of encouraging

40   perspective taking in a range of intergroup contexts, including race (Dovidio et al., 2004; Finlay &

41   Stephan, 2000; Shih et al., 2009; Todd et al., 2011; Vescio et al., 2003), gender (Simon et al., 2019),

42   the elderly (Galinsky & Moskowitz, 2000), disability (Clore & Jeffery, 1972), people with AIDS,

43   homeless people, and convicted murderers (Batson, Polycarpou, et al., 1997), and the environment

44   as a whole (Berenguer, 2007, 2010; Schultz, 2000; Sevillano et al., 2007; Swim & Bloodhart,

45   2015).

46   Two non-human groups that currently lie on the frontiers of society's moral circle (Anthis &

47   Paez, 2021) are excluded from this list: nonhuman animals and intelligent artificial entities. There is

48   increasing interest in understanding human moral relations with both of these groups (e.g., Gunkel,

49   2018; Sunstein & Nussbaum, 2004). Moreover, there is now a well-established literature on the

50   psychology of human-animal relations (e.g., Amiot & Bastian, 2015; Dhont et al., 2019), and a

51   growing literature studying human-AI interaction from an intergroup relations perspective (Vanman

52   & Kappas, 2019). In both cases, researchers have found evidence of many of the same

53   psychological mechanisms that operate in human intergroup relations. For example, common

54   psychological factors underlie speciesism and forms of prejudice towards human outgroups (Dhont

55   et al., 2016), and attitudes towards animals can be improved in some contexts through interventions

56   such as imagined intergroup contact (Auger & Amiot, 2019). In the case of artificial entities, studies

57   have found, for example, that the extent to which people discriminate against robots depends on

58   whether they are framed as ingroup versus outgroup members (Eyssel & Kuchenbrandt, 2012;

59   Fraune, 2020) and that positive and negative emotions predict people's willingness to interact with

60   robots (Smith et al., 2020). Consistent with the literature on non-human animals, research also finds

61   that negative attitudes towards artificial entities can generalize to perceived human outgroups

62   (Gamez-Djokic & Waytz, 2020), and that willingness to interact with robots can be increased by

63   intergroup contact (Wullenkord et al., 2016).

64   Given the broad range of contexts in which perspective taking has been found to have

65   positive effects, as well as the similar psychological mechanisms underpinning attitudes towards

66   human outgroups, non-human animals, and artificial entities, we consider that the positive effects of

67   perspective taking may extend to non-human animals and artificial entities. In the present paper we

68   explore three overarching questions: (1) whether perspective taking affects moral attitudes towards

69   these two groups overall, including the extent to which the effects can be attributed to its

70   encouragement (rather than its suppression; see next section); (2) the mechanisms through which

71   perspective taking affects attitudes; and (3), how broadly or narrowly the effects generalize to

72   groups that include the perspective taking targets. We discuss each of these goals in more detail

73   below.

The Effectiveness of Encouraging Perspective Taking

75   Perspective taking is typically manipulated in experimental studies by encouraging a

76   treatment group to take the perspective of another individual and a control group to stay objective

77   (Todd & Galinsky, 2014). Researchers then compare the two groups on outcomes such as attitudes

78   and helping behavior, attributing the differences to the effects of perspective taking. However, this

79   experimental design means that differences in outcomes between the two conditions could be driven

80   by the negative effects of the instructions to stay objective, rather than the positive effects of the

81   perspective taking instructions. A meta-analysis by McAuliffe et al. (2020) found that the effect of

82   perspective taking on empathic concern is largely driven by instructions to stay objective, indicating

83   that people empathize less in the condition encouraging objectivity, rather than more in the

84   perspective taking condition. This suggests that encouraging perspective taking may be less

85   effective at improving intergroup relations than is currently believed.

86   Importantly, in the context of the present study, McAuliffe et al. (2020) only included

87   studies that used human perspective taking targets. They suggested that encouraging perspective

88   taking may be more effective when directed at targets who do not usually elicit empathy because

89   baseline levels of empathy are lower. Given that the perspective taking targets in the present study,

90   non-human animals and artificial entities, are more distant than those considered in McAuliffe et al.

91   (2020), humans likely have a weaker natural empathic response to them (Krebs, 1975; Miralles et

92   al., 2019). We may, therefore, be more likely to find a positive effect of encouraging perspective

93   taking in the current contexts. To test this hypothesis, we compared perspective taking to a neutral

94   condition that encouraged neither objectivity or perspective taking. In addition to this, we compared

95   perspective taking to a condition that encouraged objectivity. This latter comparison is consistent

96   with the existing literature, and gives us an understanding of the overall effect of perspective taking,

97   whether induced by the instructions encouraging perspective taking or suppressed by the

98   instructions encouraging objectivity. Given the research outlined in the previous section, as well as

99   the possibility of greater effectiveness in more distant contexts, we predicted that people

100   encouraged to perspective-take will show more positive attitudes towards animals and artificial

101   entities than those who are encouraged to stay objective or given neutral instructions.

102   **Perspective Taking Mechanisms**

103   What are the mechanisms through which perspective taking positively affects intergroup

104   attitudes? Several accounts have been proposed in the literature. Batson and colleagues (1997)

105   proposed a model whereby taking the perspective of an individual generates empathic concern, a

106   form of other-focused empathy characterized by emotions such as compassion, warmth and

107   tenderness, which, in turn, increases the value the perspective taker places on that person's welfare.

108   If the individual's group membership is salient, the positive effect generalizes to their whole group.

109   A competing account is that perspective taking increases self-other overlap, a measure of

110   psychological closeness that reflects how much another entity is mentally represented as part of

111   oneself, by increasing the extent to which the other person is considered "self-like," (Davis et al.,

112   1996; Cialdini et al., 1997, Galinsky and Moskowitz, 2000). Other accounts emphasize mediating

113   roles for anger and indignation (Finlay and Stephen, 2000; Dovidio et al., 2004), personal distress

114   (Batson, Early, et al., 1997), and situational attributions (Vescio et al., 2003).

115   Some studies have attempted to adjudicate between the different mediators (Batson, Sager,

116   et al., 1997; Cialdini et al., 1997; Maner et al., 2002), while others have evaluated the circumstances

117   under which different mediators play a role. Batson, Early, et al. (1997) found that "imagine-other"

118   perspective taking, that is, imagining the experience of another person, results in other-focused

119   emotions such as empathic concern, whereas "imagine-self" perspective taking, such as imagining

120   oneself in the situation of another person, results in both empathic concern and self-focused

121   emotions such as personal distress. Consistent with this, Myers et al. (2014) found that imagine-self

122   perspective taking resulted in both self-other overlap and empathic concern, whereas imagine-other

123   perspective taking triggered only empathic concern. In the present study, we limited our attention to

124   imagine-other perspective taking and therefore expected to find a key effect via empathic concern.

125   Given its prominence in the literature even in the context of imagine-other instructions (e.g., Maner

126   et al., 2002), we also hypothesized an effect through self-other overlap. We did not expect to find an

127   effect via personal distress because we did not test imagine-self perspective taking and there is

128   weaker evidence of a role for it in the literature; however, we collected data on it and included it as

129   part of sensitivity analyses testing alternative models.

130   **Scope of Generalization**

131   The present study also considered the scope of the generalization effects—how broadly or

132   narrowly do attitudes generalize when taking the perspective of an individual non-human entity?

133   Several studies have tested whether the benefits of perspective taking spill over to adjacent

134   outgroups (e.g., Todd et al., 2011; Vescio et al., 2003). In the present study we addressed a related,

135   less studied question, termed "superordinate generalization" by Auger and Amiot (2019). This asks

136   whether the effects generalize to the broader categories that include the perspective taking target.

137   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 intelligent 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.

<div align="center">

Study 1

</div>

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

164   they are typically granted lower moral concern than other animals (Bratanova et al., 2011), making

165   them an interesting and important group in the context of the present study which seeks to

166   understand effects on moral attitudes. Pigs have also been considered in psychological studies on

167   human-animal relations in previous studies (e.g., Caviola & Capraro, 2020; Wilks et al., 2021).

168   Study 1 tested H1–H4. We tested the impact on moral attitudes towards three groups: all

169   farmed pigs, all farmed animals, and all animals.

170   **Method**

171   *Participants*

172   We recruited participants from the United States from Prolific. *A priori* power analysis in

173   G*Power ($\alpha = 0.05$, $\beta = 0.80$) indicated that a sample size of 250 would enable us to detect small to

174   medium effects ($f^2 = 0.05$) in a linear regression model with four predictors, which was the largest

175   number of predictors in all the models we ran. To account for data exclusions, we recruited 276

176   participants. Five participants, three in the perspective taking condition, one in the objective

177   condition, and one in the neutral condition, were excluded because they failed at least one of two

178   attention checks. This left a final sample of 271 participants (50.7% female, 48.5% male, 0.7%

179   other; $M_{age} = 35.2$, $SD_{age} = 12.3$; 5.2% Asian, 6.6% Black or African American, 4.1% Hispanic,

180   Latino or Spanish, 76.4% White, 7% other, 0.7% prefer not to say).

181   *Procedure*

182   After giving their consent to take part in the study, participants were randomly assigned into

183   one of three conditions: "perspective taking," "stay-objective," and "no-instructions." All

184   participants were told that they would read an article about a farmed pig and were encouraged to

185   take their time and read the article carefully. They were given additional instructions to manipulate

186   perspective taking based on the condition they were in, following the standard approach in the

187   literature (Todd & Galinsky, 2014). Participants in the perspective taking condition were given the

188   following additional instructions: "While reading the article, please try and take the perspective of

189   the pig, imagining how it feels about its situation and how its experiences have affected its life. Try

190 to feel the full impact of what the pig has been through and how it feels as a result." Participants in

191 the stay-objective condition were told: "While reading the article, please try and be as objective as

192 possible about the situation of the pig and how its experiences have affected its life. Try not to get

193 caught up in how the pig feels; instead try and remain objective and detached." Participants in the

194 no-instructions condition were not given any additional instructions.

195   Participants in all conditions then read an article that described the life of a farmed pig. The

196 article described the pig's confinement in a crowded indoor space, the negative physical and

197 psychological impacts of this confinement, and the pig's eventual slaughter.

198 ***Measures***

199   ***Manipulation checks.*** In line with the standard approach in the literature (e.g., Batson,

200 Polycarpou, et al., 1997; Todd et al., 2011), participants were asked to report the extent to which

201 they focused on the feelings of the farmed pig while reading the article, and the extent to which they

202 stayed objective about the pig's situation. These were measured on five-point scales (1 = *not at all*,

203 5 = *extremely*). Participants were also asked how believable they found the article (1 = *not at all*, 5

204 = *extremely*), and, depending on the condition they were in, how easy or difficult they found taking

205 the perspective of the pig or staying objective while reading the article (1 = *very easy*, 5 = *very*

206 *difficult*).

207   ***Empathic concern.*** Participants were asked to respond, on a seven-point scale (1 = *not at*

208 *all*, 7 = *extremely*), the extent to which they felt 14 emotions while reading the article. The list of

209 emotions included six items which, following the standard approach in the literature (e.g., Batson,

210 Polycarpou, et al., 1997), were averaged to create a measure of empathic concern: compassionate,

211 sympathetic, tender, warm, moved, and soft-hearted ($\alpha = .88$).

212   ***Personal distress.*** Following Dovidio et al. (2004), the list of 14 emotions also included four

213 items that were averaged to create a measure of personal distress: distressed, disturbed, upset,

214 grieved ($\alpha = .91$). This measure was not included in the main models; it was tested as part of

215 sensitivity analysis.

216   ***Self-other overlap.*** This was measured using the Inclusion of Other in the Self Scale (Aron

217   et al., 1991), a one-item scale that involves asking participants to choose one of seven increasingly

218   overlapping circles that best represents their relationship with another entity. In this case,

219   participants were asked to indicate the pair of circles that best reflected the extent to which they felt

220   connected to the pig after reading the article.

221   ***Moral concern.*** Following a brief introduction to the concept of "moral concern,"

222   participants were asked to report their degree of moral concern, on a seven-point scale (1 = *none at*

223   *all*, 7 = *a great deal*), for seven groups. Embedded in the list of seven groups were two groups used

224   as dependent measures in the study: farmed pigs and farmed animals in general. The responses for

225   the other five groups (dogs, other people, rocks, trees, and family) were averaged to create a

226   measure of general moral concern that was used in the sensitivity analysis in this study.

227   ***Speciesism.*** Moral attitudes towards all animals was measuring using the Speciesism Scale

228   (Caviola et al., 2019). The scale asks participants to report the extent to which they agree, on a

229   seven-point scale (1 = *strongly disagree*, 7 = *strongly agree*), with six statements relating to

230   animals, such as "Morally, animals always count for less than humans," and "Humans have the right

231   to use animals however they want to." The mean score of the six items (with one item reverse

232   scored) was calculated to give an overall score with higher scores reflecting greater speciesism (α =

233   .86).

234   ***Analysis Plan***

235   To test our hypotheses, we estimated three separate mediation models for each of the

236   dependent variables using the "mediate" function in the R "Psych" package (Revelle, 2020). We

237   built our models following the methods set out in Hayes and Preacher (2014) for models with

238   multicategorical independent variables and Preacher and Hayes (2008) for models with multiple

239   mediators. Each model included two dummy-coded independent variables: one for the stay-

240   objective condition (1 = stay-objective, 0 = otherwise) and one for the no-instructions condition (1

241   = no-instructions, 0 = otherwise), allowing us to interpret their effects relative to the perspective

242   taking condition. The two mediators, empathic concern and self-other overlap, were included

243   simultaneously in all the models. The "indirect effects"—the effects of the independent variables on

244   the dependent variables via the mediators (H3 and H4)—are calculated as the product of two

245   effects: the effect of the independent variables on the mediators, and the effect of the mediators on

246   the dependent variables controlling for the independent variables. Given that our models included

247   two independent variable and two mediators, we estimated four indirect effects. Statistical

248   significance of the indirect effects was inferred based on 95% confidence intervals constructed from

249   10,000 bootstrap samples. We also estimated the effects of the independent variables on the

250   outcome variables without controlling for the mediators (the "total effects", H1 and H2, which we

251   also estimated with one-way ANOVAs), and the effects of the independent variables on the outcome

252   variables controlling for the mediators (the "direct effects"). All reported effects of the mediation

253   models are standardized.

254   **Results**

255   *Descriptive statistics*

256   Means, standard deviations, and bivariate Pearson correlations for the dependent variables

257   and mediators used in the main analysis are presented in Table 1. The pattern of results shows that

258   moral concern for pigs and for all farmed animals was highest in the perspective taking condition,

259   followed by the stay-objective condition and then the no-instructions condition. Speciesism was

260   lowest in the stay-objective condition, followed by the perspective taking condition and then the no-

261   instructions condition. We statistically test for group differences with reference to our hypotheses in

262   the sub-sections below. The correlations between the mediators and the dependent variables were in

263   the expected directions: both self-other overlap and empathic concern and positively correlated with

264   moral concern for farmed pigs and for farmed animals, and negatively correlated with speciesism.

265

266

267   Table 1

268   *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**

269   *Note: * p < .05, ** p < .01.*
270
271   ***Manipulation checks***

272   In line with our expectations, we found that participants in the perspective taking condition

273   reported greater focus on the pig's feelings ($M = 4.17$, $SD = 0.85$) than participants in the stay-

274   objective condition ($M = 2.73$, $SD = 1.17$) and participants in the no-instructions condition ($M =$

275   3.44, $SD = 1.09$), both $p < .001$. The difference between the no-instructions and the stay-objective

276   condition was also significant and in the expected direction, $p < .001$. We also found that

277   participants in the perspective taking condition reported less focus on staying objective ($M = 3.02$,

278    $SD = 1.32$) than participants in the stay-objective condition ($M = 3.64$, $SD = 0.91$), $p = .001$.

279   However, we did not find significant differences in focus on staying objective between participants

280   in the stay-objective condition and participants in the no-instructions condition ($M = 3.23$, $SD =$

281   1.15), $p = .098$, or between participants in the perspective taking condition and participants in the

282   no-instructions condition, $p = .252$.

283   Overall, these results suggest that the manipulation had the intended effects, though the

284   perspective taking instructions were more effective than the stay-objective instructions. This may be

285   explained by the greater reported difficulty of staying objective while reading the article ($M = 3.45$,

286    $SD = 1.10$) than taking the perspective of the pig ($M = 2.06$, $SD = 0.95$).

287   Finally, participants found the vignette believable; the mean across the whole sample was

288   4.32 ($SD = 0.80$) on a five-point scale.
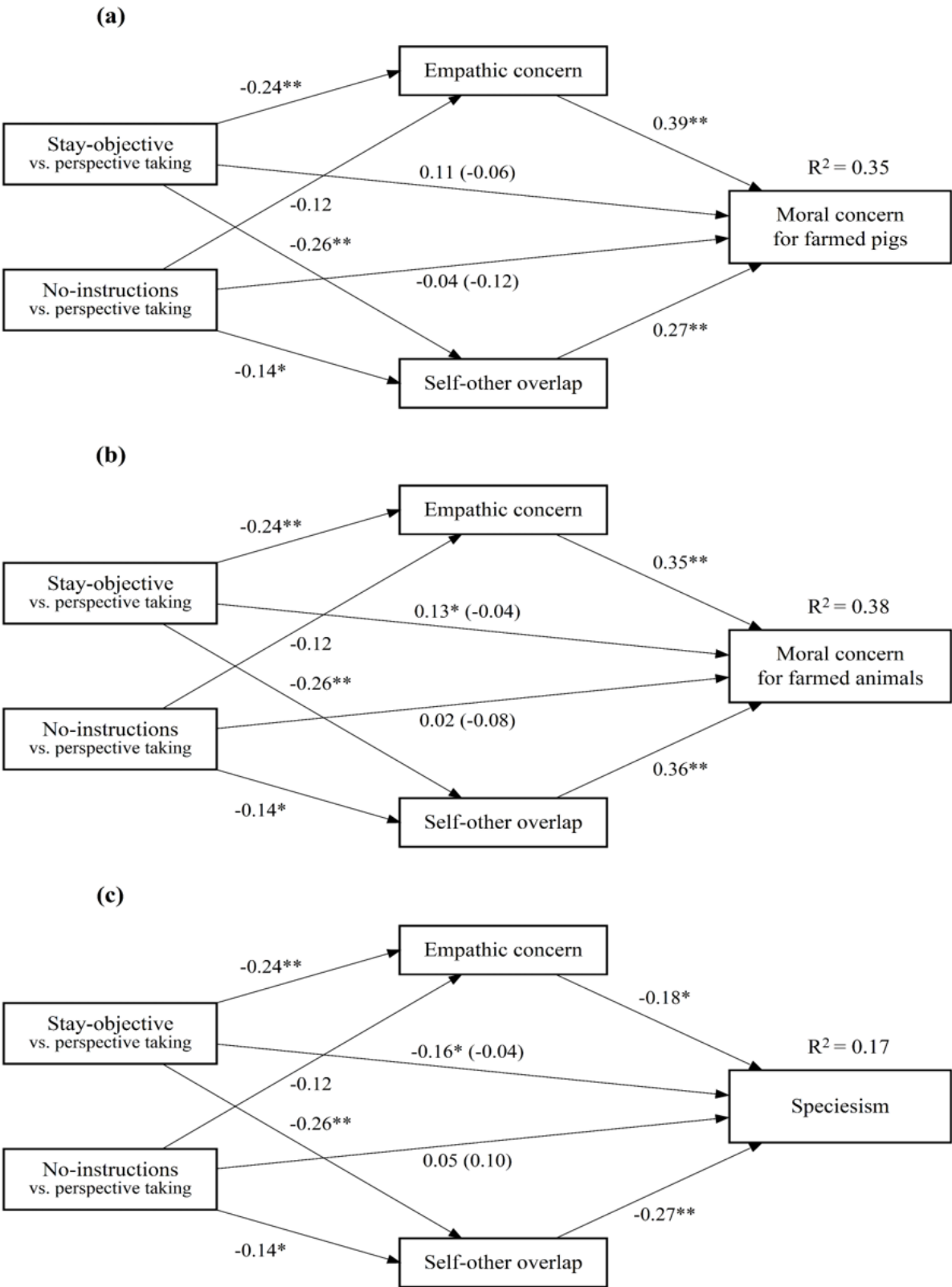
289

(a)

(b)

(c)

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).

298   Table 2

299   *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

300   *Note: Reference group in each case is perspective taking condition. Standardized effects reported. LL = confidence*
301   *interval lower limit; UL = confidence interval upper limit. Statistical significance inferred from 95% CI not containing*
302   *zero.*
303

304   ***Moral concern for farmed pigs***

305   A one-way ANOVA indicated that there were no differences in moral concern for farmed

306   pigs between the three conditions, $F(2, 268) = 1.53$, $p = .219$, $\eta^2 = .01$. This was also supported by

307   the mediation models: we did not find evidence of a total effect of either the stay-objective

308   condition ($\beta = -0.06$, $SE = 0.07$, $p = .414$) or the no-instructions condition ($\beta = -0.12$, $SE = 0.07$, $p = $

309   .082) relative to the perspective taking condition on moral concern for farmed pigs. However,

310   significant total effects are not necessary for mediation (see Hayes, 2009). Therefore, we estimated

311   the indirect effects.

312   The indirect effects are made up of two components: the effect of the independent variables

313   on the mediators, and the effect of the mediators on the dependent variable. We found that

314   participants in the stay objective condition reported lower empathic concern ($\beta = -0.24$, $SE = 0.07$,

315    $p = .001$) and self-other overlap ($\beta = -0.26$, $SE = 0.07$, $p < .001$) than participants in the perspective

316   taking condition. Participants in the no instructions condition reported lower self-other overlap ($\beta = $

317   -0.14, $SE = 0.07$, $p = .042$) than participants in the perspective taking condition but the difference in

318   empathic concern was nonsignificant ($\beta = -0.12$, $SE = 0.07$, $p = .077$). In the models with moral

319   concern for pigs as the dependent variable and condition and both mediators as independent

320 variables, we found that empathic concern was positively associated with moral concern ($\beta = 0.39$,

321 $SE = 0.06$, $p < .001$), as was self-other overlap ($\beta = 0.27$, $SE = 0.06$, $p < .001$). For the stay-

322 objective versus perspective taking comparison, we found that there were indirect effects via both

323 empathic concern ($\beta = -0.09$, $SE = 0.03$, 95% CI [-0.15; -0.04]) and self-other overlap ($\beta = -0.07$, SE

324 $= 0.03$, 95% CI [-0.13; -0.03]). However, we did not find indirect effects for the no-instructions

325 versus perspective taking comparison via either empathic concern ($\beta = -0.05$, $SE = 0.03$, 95% CI [-

326 0.11; 0.003]) or self-other overlap ($\beta = -0.04$, $SE = 0.02$, 95% CI [-0.09; 0.0003]).

327   After accounting for the effects of the mediators, the direct effects were nonsignificant for

328 both the stay-objective condition ($\beta = 0.11$, $SE = 0.06$, $p = .075$) and the no-instructions condition (β

329 $= -0.04$, $SE = 0.06$, $p = .532$).

330 ***Moral concern for all farmed animals***

331   A one-way ANOVA indicated that there were no differences in the group means for this

332 dependent variable, $F(2, 268) = 0.61$, $p = .542$, $\eta^2 = .01$. Estimates of the total effects supported

333 this: there were no significant differences in moral concern for farmed animals between either the

334 stay-objective condition ($\beta = -0.04$, $SE = 0.07$, $p = .545$) or the no-instructions condition ($\beta = -$

335 0.08, $SE = 0.07$, $p = .269$) and the perspective taking condition.

336   However, we did find evidence of indirect effects through our hypothesized mediators. The

337 differences between the conditions on the mediators are the same as in the previous model. There

338 was a positive association between moral concern for all farmed animals and both empathic concern

339 ($\beta = 0.35$, $SE = 0.06$, $p < .001$) and self-other overlap ($\beta = 0.36$, $SE = 0.06$, $p < .001$). The indirect

340 effects of being in the stay-objective condition via empathic concern was statistically significant (β

341 $= -0.08$, $SE = 0.03$, 95% CI [-0.14; -0.03]), as was the indirect effect via self-other overlap ($\beta = -$

342 0.09, $SE = 0.03$, 95% CI [-0.15; -0.04]). For the no-instructions condition, we did not find an

343 indirect effect via empathic concern ($\beta = -0.04$, $SE = 0.03$, 95% CI [-0.10; 0.002]), though we did

344 find an effect via self-other overlap ($\beta = -0.05$, $SE = 0.03$, 95% CI [-0.11; -0.001]).

345   In this model, after accounting for the effect of the mediators, there was a significant

346   positive effect of the stay-objective instructions on moral concern for farmed animals (β = 0.13, *SE*

347   = 0.06, *p* = .022). We did not find this effect in the case of the no-instructions condition (β = 0.02,

348   *SE* = 0.06, *p* = .784). The significant direct effect for the stay-objective condition suggests there

349   may be positive effects of staying objective on moral concern for farmed animals that the model

350   does not capture (Zhao et al., 2010).

351   ***Speciesism***

352   A one-way ANOVA indicated that there were no differences between the three groups on

353   speciesism, $F(2, 268)$ = 2.35, *p* = .097, η^2 = .02. This was supported by the mediation model: we did

354   not find total effects for either the stay-objective condition (β = -0.04, *SE* = 0.07, *p* = .541) or the

355   no-instructions condition (β = 0.10, *SE* = 0.07, *p* = .137) on speciesism.

356   As with the previous models, however, we did find evidence of indirect effects through our

357   hypothesized mediators. The differences between the conditions on the mediators are the same as in

358   the previous models. There was a positive association between speciesism and both empathic

359   concern (β = -0.18, *SE* = 0.07, *p* = .011) and self-other overlap (β = -0.27, *SE* = 0.07, *p* < .001). The

360   indirect effects of the stay-objective condition via both empathic concern (β = 0.04, *SE* = 0.02, 95%

361   CI [0.01; 0.09]) and self-other overlap (β = 0.07, *SE* = 0.03, 95% CI [0.02; 0.13]) were also

362   significant. For the no-instructions condition, we did not find evidence of an indirect effect via

363   empathic concern (β = 0.02, *SE* = 0.02, 95% CI [-0.001; 0.06]), though the indirect effect via self-

364   other overlap was significant (β = 0.04, *SE* = 0.02, 95% CI [0.001; 0.09]).

365   As with the case for all farmed animals, after accounting for the effect of the mediators

366   included in the model, we found a significant direct effect of the stay-objective condition on

367   speciesism (β = -0.16, *SE* = 0.07, *p* = .021), but not for the no-instructions condition (β = 0.05, *SE*

368   = 0.07, *p* = .494), suggesting that there may be positive effects of staying objective that are not

369   captured by the model.

370   *Sensitivity Analysis*

371   We ran three sets of sensitivity analyses; the key findings are reported here with full results

372   in the Supplemental Materials. First, we ran each of the main models with a control variable for

373   general moral concern. This shed light on whether the effects we found on attitudes towards animals

374   via the mediators were incidental, explained instead by a general increase in moral concern across

375   all groups, or whether the effects applied specifically to the animal groups studied. Overall, we

376   found that the adjusted effects were in the same direction as those of the main models, with the

377   effect sizes smaller by roughly one-third, rendering the indirect effects of the perspective taking

378   versus no-instructions comparisons via self-other overlap on moral concern for all farmed animals

379   and speciesism statistically nonsignificant. For the perspective taking versus stay-objective

380   comparison, the indirect effect via empathic concern on speciesism became nonsignificant. These

381   results suggest that part of the effects are due to a general increase in moral concern and part of the

382   effects are specific to nonhuman animals.

383   Second, we estimated models with personal distress as a third mediator alongside empathic

384   concern and self-other overlap. Because of the other-oriented nature of the perspective taking

385   manipulation, we did not expect to find an effect via personal distress. The sensitivity analysis

386   allowed us to test this. As expected, we did not find that the manipulation affected personal distress,

387   and we did not find any significant indirect effects via this path. We did find that there was a

388   relatively large reduction in the size of the indirect effects on speciesism via empathic concern, but

389   not for the other outcome variables of interest. This was because the effect of empathic concern on

390   speciesism became nonsignificant when including personal distress, suggesting it may be a

391   confounder of the initially observed relationship, which was correlational in nature. The inclusion

392   of personal distress also rendered the marginally significant indirect effect on speciesism via self-

393   other overlap for the perspective taking versus no-instructions comparison marginally

394   nonsignificant.

395   As alluded to above, because of the correlational nature of the estimated relationships

396   between the mediators and outcome variables in our models, it is possible that our estimates of the

397   indirect effects are biased by unobserved confounders. We therefore ran models controlling for a

398   range of potential confounders: age, gender, ethnicity, education, diet, pet ownership, political

399   views, and personal distress. The inclusion of these additional variables reduced the size of the

400   indirect effects by a relatively small amount compared to the models with just personal distress,

401   additionally rendering two marginally significant effects nonsignificant: the indirect effect on moral

402   concern for all farmed animals via self-other overlap for the perspective taking versus no-

403   instructions comparison, and the indirect effect on speciesism via self-other overlap for the

404   perspective taking versus stay-objective comparison.

405   Overall, the indirect effects associated with the perspective taking versus stay-objective

406   comparisons and the moral concern for farmed pigs and all farmed animals dependent variables

407   were most robust to the sensitivity checks. The indirect effects for the models with speciesism as a

408   dependent variable and for the perspective taking versus no-instructions contrast were less robust.

409   **Discussion**

410   Contrary to our expectations, we did not find evidence in support of our hypotheses that

411   moral attitudes towards animals would be more positive in the perspective taking condition

412   compared to either the stay-objective condition (H1) or the no-instructions condition (H2).

413   We found evidence supporting our hypotheses that attitudes towards animals would be

414   positively affected via both empathic concern (H3) and self-other overlap (H4) for the perspective

415   taking versus stay-objective comparison. These indirect effects generalized to each of the dependent

416   variables we tested: all farmed pigs, all farmed animals, and all animals (as measured by

417   speciesism). The indirect effects via these mediators for the perspective taking versus no-

418   instructions comparison were either marginally significant or marginally nonsignificant, with the

419   effect sizes generally just over half of the perspective taking versus stay-objective comparison. This

420   suggests the indirect effects are partly the result of encouraging perspective taking and partly the

421   result of suppressing it (see Supplemental Materials for the results of the stay-objective versus no-

422   instructions comparison which are similar in magnitude to the perspective taking versus no-

423   instructions comparison). The results reported here largely persisted after accounting for effects on

424   general moral concern and the inclusion of personal distress and additional demographic control

425   variables, though the indirect effects for the perspective taking versus no-instructions comparison

426   and those associated with the speciesism models were more sensitive to these checks, as described

427   in the sensitivity analysis section above.

428   In the models with speciesism and moral concern for all farmed animals as the dependent

429   variables, we found that after accounting for the effects via empathic concern and self-other

430   overlap, there were positive effects of staying objective compared to perspective taking on moral

431   attitudes. That is, the stay-objective condition was associated with reduced speciesism and increased

432   moral concern for farmed animals relative to the perspective taking condition. A possible

433   explanation for this is competitive mediation, that there are benefits to staying objective that our

434   models do not capture (Zhao et al., 2010). This would provide an explanation for the apparent

435   inconsistency in support for H1 and H3–H4. Further possible explanations of these findings are

436   explored in the General Discussion.

437   **Study 2**

438   Study 2 tested whether perspective taking extends to another non-human group: intelligent

439   artificial entities. We presented participants with a hypothetical future scenario involving a

440   technology called "whole brain emulation," where human-level artificial intelligences are created

441   by scanning the structure of human brains in very close detail and creating software models of them

442   (Hanson, 2016; Sandberg, 2013). In the scenario presented to participants, the artificial entities

443   ("emulations") were described as being used by humans as workers. The goals of this study were to

444   provide insights into human relations with a group (intelligent artificial entities) that are becoming

445   increasingly prevalent in society, as well as to help to understand the boundaries of the effects of

446   perspective taking on moral attitudes. It also served as a partial replication of Study 1 in a different

447   context.

448   As with Study 1, Study 2 tested hypotheses H1–H4 with a different non-human group. We

449   tested the effects on two dependent variables: emulations as a group, and all artificial beings.

450   **Method**

451   *Participants*

452   We recruited participants living in the United States from the online platform Prolific. *A*

453   *priori* power analysis in G*Power ($\alpha = 0.05$, $\beta = 0.80$) indicated that we would need a sample of

454   250 to detect small to medium effects ($f^2 = 0.05$) in a linear regression model with four predictors,

455   the largest number of predictors of the estimated models in this study. We recruited a sample of 273

456   participants, none of whom failed the attention checks (52.6% female, 46.7% male, 0.7% other;

457    $M_{age} = 36.1$, $SD_{age} = 12.5$; 0.7% American Indian or Alaska Native, 4.8% Asian, 6.2% Black or

458   African American, 3.3% Hispanic, Latino or Spanish, 0.4% Native Hawaiian or other Pacific

459   Islander, 75.8% White, 8.4% other, 0.4% prefer not to say).

460   *Procedure*

461   The survey closely followed the procedure of Study 1. However, in this study, before being

462   assigned to the experimental groups, participants read background information describing the future

463   scenario. This was necessary due to the unfamiliar technology and scenario being discussed.

464   Participants were then randomly assigned into either a perspective taking, stay-objective, or no-

465   instructions condition, and read the same additional instructions (or lack thereof) as in Study 1.

466   Participants in all three groups then read an article describing the life of an emulation created by

467   humans as a worker in a modern-day factory. The article described the unpleasant working

468   conditions the emulation faced, the negative psychological impacts of these conditions, and the

469   emulation's eventual shutting down due to obsolescence.

470   ***Measures***

471   The manipulation checks, and measures of empathic concern (α = .92), personal distress (α

472   = .92), and self-other overlap were the same as in Study 1.

473   ***Moral concern.*** As with Study 1, we asked participants how much moral concern, on a

474   seven-point scale (1 = *none at all*, 7 = *a great deal*) they think they should show seven groups.

475   Embedded in the list of seven groups was the item "Emulations such as those described in the

476   articles." This was used as the dependent measure for moral concern for emulations. The scores for

477   the other six groups (dogs, other people, farmed pigs, rocks, trees, and family) were averaged to

478   create a measure of general moral concern. There was no measure of concern for a category

479   analogous to "farmed pigs" because such groups are not well-established (e.g., artificial entities, but

480   only those who work in factories and not elsewhere).

481   ***Substratism.*** Paralleling speciesism, we define "substratism" as prejudice against an entity

482   because of the substrate in which its mind is instantiated. We devised a Substratism Scale to

483   measure moral attitudes towards artificial beings as a group. The survey first defined "artificial

484   beings," and then asked participants to report the extent to which they agree with six items relating

485   to artificial beings on a seven-point scale (1 = *strongly disagree*, 7 = *strongly agree*). These six

486   items closely followed the wording of the Speciesism Scale (Caviola et al., 2019). Examples of

487   items used are "Morally, artificial beings always count for less than humans." and "Humans have

488   the right to use artificial beings however they want to." The mean score of the six items (with one

489   item reverse scored) was calculated to give an overall score with higher scores reflecting greater

490   substratism (α = .92).

491   **Results**

492   ***Descriptive statistics***

493   Table 3 reports means, standard deviations, and bivariate Pearson correlations for the

494   dependent variables and mediators in the study. The table shows that moral concern for emulations

495   was lowest in the perspective taking condition, followed by the stay-objective condition and then

496   the no-instructions condition. Substratism was lowest in the perspective taking condition, followed

497   by the no-instructions condition and then the stay-objective condition. We statistically test for group

498   differences in the sub-sections below. The correlations between the mediators and the dependent

499   variables were in the expected directions: self-other overlap and empathic concern were positively

500   correlated with moral concern for emulations and negatively correlated with substratism.

501   Table 3

502   *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**

503   *Note: * p < .05, ** p < .01.*
504

505   ***Manipulation checks***

506   In line with our expectations, participants in the perspective taking condition reported

507   greater focus on the feelings of the emulation ($M = 3.80$, $SD = 1.04$) than participants in the stay-

508   objective condition ($M = 2.71$, $SD = 1.10$), $p < .001$, and participants in the no-instructions

509   condition ($M = 3.40$, $SD = 1.01$), $p = .030$. As expected, the difference in focus on the feelings of

510   the emulation between participants in the no-instructions and stay-objective condition was also

511   significant and in the expected direction, $p < .001$. Participants in the perspective taking condition

512   reported less focus on staying objective ($M = 3.39$, $SD = 1.17$) than participants in the stay-

513   objective condition ($M = 3.72$, $SD = 0.90$), as expected, though the difference was not statistically

514   significant, $p = .086$. Participants in the no-instructions condition reported less focus on staying

515   objective than participants in the stay-objective condition ($M = 3.33$, $SD = 1.08$), $p = .038$. There

516   was not a significant difference between participants in the perspective taking condition and the no-

517   instructions condition, $p = .942$.

518   As with Study 1, these checks suggest that the perspective taking manipulation was more

519   effective at generating the intended effects than the stay-objective manipulation, plausibly due to

520   the greater difficulty participants had in staying objective ($M = 3.16$, $SD = 1.03$) than taking the

521   perspective of the emulation ($M = 2.33$, $SD = 1.15$).

522   Mean believability of the vignette was lower than in Study 1 ($M = 2.51$, $SD = 1.08$, on a

523   five-point scale). However, this is not surprising due to the hypothetical nature of the scenario
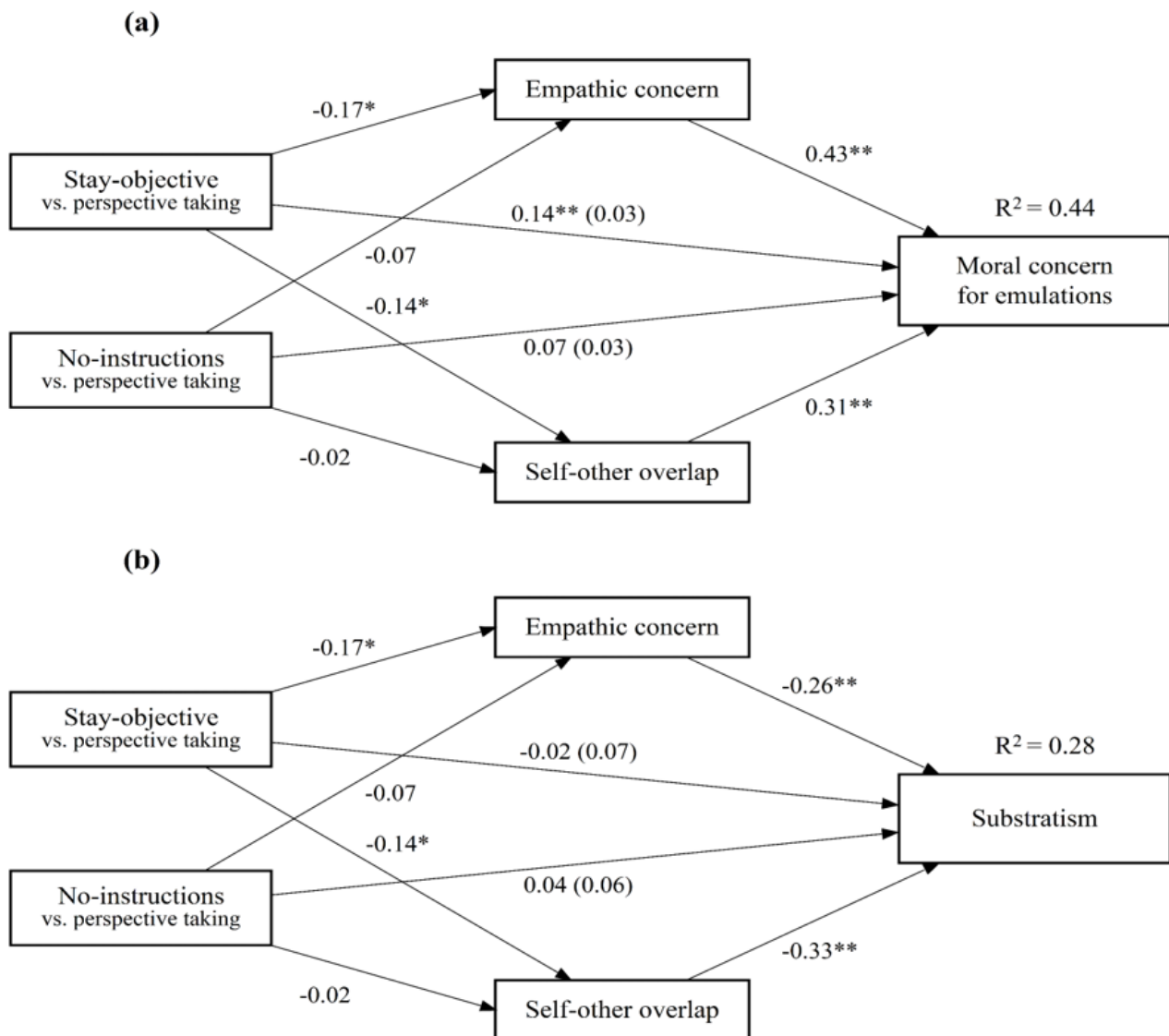
524   described in Study 2.

525
526
527   *Figure 2.* Study 2 mediation models of perspective taking via empathic concern and self-other
528   overlap on (a) moral concern emulations and (b) substratism. All reported effects are standardized.
529   Total effects are reported in parentheses. R^2 values refer to regressions estimating direct effects. * p
530   < .05, ** p < .01. Plots created using the R package "DiagrammeR" (Iannone, 2020).
531
532

533   Table 4

534   *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

535   *Note: Reference group in each case is perspective taking condition. Standardized effects reported. LL = confidence*
536   *interval lower limit; UL = confidence interval upper limit. Statistical significance inferred from 95% CI not containing*
537   *zero.*
538

539   ***Moral concern for emulations***

540   A one-way ANOVA indicated that there were no differences between the three groups on

541   moral concern for emulations, $F(2, 270) = 0.10$, $p = .908$, $\eta^2 = 0.001$. This was supported by the

542   mediation models: we did not find significant total effects on moral concern for emulations for

543   either the stay-objective condition ($\beta = 0.03$, *SE* = 0.07 $p = .718$) or the no-instructions condition (β

544    $= 0.03$, *SE* = 0.07, $p = .691$) compared to the perspective taking condition.

545   As with Study 1, however, we did find evidence of indirect effects in some cases. We found

546   that participants in the stay objective condition reported lower empathic concern ($\beta = -0.17$, *SE* =

547   0.07, $p = .016$) and self-other overlap ($\beta = -0.14$, *SE* = 0.07, $p = .040$) than participants in the

548   perspective taking condition. The difference between participants in the no-instructions condition

549   and the perspective taking condition, however, were nonsignificant on both empathic concern (β = -

550   0.07, *SE* = 0.07, $p = .320$) and self-other overlap ($\beta = -0.02$, *SE* = 0.07, $p = .751$). In the models

551   with moral concern for emulations as the dependent variable and condition and both mediators as

552   independent variables, we found that empathic concern was positively associated with moral

553   concern ($\beta = 0.43$, *SE* = 0.06, $p < .001$), as was self-other overlap ($\beta = 0.31$, *SE* = 0.06, $p < .001$).

554   These estimates translated into significant indirect effects of being in the stay-objective condition

555   via both empathic concern (β = -0.07, SE = 0.03, 95% CI [-0.14; -0.01]) and self-other overlap (β =

556   -0.05, SE = 0.02, 95% CI [-0.09; -0.003]). However, the indirect effects of the no-instructions

557   condition effects via empathic concern (β = -0.03, SE = 0.03, 95% CI [-0.09; 0.03]) and self-other

558   overlap (β = -0.01, SE = 0.02, 95% CI [-0.05; 0.04]) were both nonsignificant.

559   After accounting for the effect of the mediators, we found a positive direct effect of the stay-

560   objective instructions on moral concern for emulations (β = 0.14, SE = 0.05, p = .008). We did not

561   find this effect in the case of the no-instructions condition (β = 0.07, SE = 0.05, p = .223). As with

562   Study 1, this suggests competitive mediation in the case of the stay-objective condition that the

563   model does not capture.

564   ***Substratism***

565   A one-way ANOVA indicated that there were no differences between the three groups on

566   substratism, $F(2, 270)$ = 0.55, p = .575, η^2 = 0.004. This was supported by the mediation analysis

567   which showed no significant total effects of either the stay-objective condition (β = 0.07, SE = 0.07,

568   p = .339) or the no-instructions condition (β = 0.06, SE = 0.07, p = .392) on substratism.

569   The first component of the indirect effects, the differences in the conditions on the two

570   mediators, are the same as in the previous model. The second component, the effect of the

571   mediators on substratism, were significant and in the expected direction for both empathic concern

572   (β = -0.26, SE = 0.07, p < .001) and self-other overlap (β = -0.33, SE = 0.07, p < .001). These

573   estimates translated to significant indirect effects of being in the stay-objective condition via both

574   empathic concern (β = 0.04, SE = 0.02, 95% CI [0.01; 0.09]) and self-other overlap (β = 0.05, SE =

575   0.02, 95% CI [0.003; 0.10]). However, for the no-instructions condition there was no indirect effect

576   via either empathic concern (β = 0.02, SE = 0.02, 95% CI [-0.02; 0.06]) or self-other overlap (β =

577   0.01, SE = 0.02, 95% CI [-0.04; 0.05]).

578   After accounting for the mediators, neither the objective condition (β = -0.02, SE = 0.06, p

579   = .702) nor the control condition (β = 0.04, SE = 0.06, p = .558) were significantly associated with

580   substratism.

581   *Sensitivity Analysis*

582   As with Study 1, we ran three sets of sensitivity analyses: models with control variables for

583   general moral concern, models with personal distress as a third mediator, and models controlling for

584   a range of potential confounders: age, gender, ethnicity, education, diet, pet ownership, political

585   views, and personal distress. The inclusion of general moral concern did not materially change any

586   of the coefficients, suggesting that the effects of taking the perspective of the emulation via our

587   mediators generalizes to moral concern for artificial entities, but it does not result in a broader

588   increase in moral concern. As with Study 1, we did not find a significant effect of the manipulation

589   on personal distress, nor did we find any significant indirect effects via personal distress. However,

590   consistent with the effects on speciesism in Study 1, we found that its inclusion rendered the

591   indirect effect via empathic concern on substratism nonsignificant. The inclusion of the additional

592   control variables had a small downward effect on the estimates, rendering the marginally significant

593   indirect effect on moral concern for emulations via self-other overlap for the perspective taking

594   versus stay-objective comparison nonsignificant, but not affecting any of the other estimates. The

595   full results of the sensitivity analysis can be found in the Supplemental Materials.

596   **Discussion**

597   Consistent with Study 1, we did not find evidence in support of our hypotheses that moral

598   attitudes towards artificial entities would be more positive in the perspective taking condition

599   compared to the stay-objective condition (H1) and the no-instructions condition (H2).

600   However, as in Study 1, we did find support for our hypothesized effects of perspective

601   taking on moral attitudes towards artificial entities via both empathic concern (H3) and self-other

602   overlap (H4). This finding was supported for both dependent variables we tested: moral concern for

603   emulations and substratism. We only found these indirect effects for the perspective taking versus

604   stay-objective comparison, not the perspective taking versus no-instructions comparison.

605   Exploratory analysis (see Supplemental Materials) indicated that there were no indirect effects for

606   the stay-objective versus no-instructions comparison either, suggesting the observed effects are

607   most plausibly a combination of both encouraging perspective taking and suppressing it through the

608   stay-objective instructions, though they may be slightly more driven by the stay-objective

609   instructions in this case. The findings reported here were not affected by the inclusion of a control

610   variable for general moral concern. The inclusion of personal distress and additional demographic

611   control variables in the models rendered the indirect effects on substratism nonsignificant, though

612   the effects on moral concern for emulations were robust to these sensitivity checks.

613   After accounting for the effects via the empathic concern and self-other overlap, we found

614   that moral concern for emulations was higher in the stay-objective condition compared to

615   perspective taking condition. As with Study 1, a possible explanation for this is competitive

616   mediation, that there are benefits to staying objective that our models do not capture (Zhao et al.,

617   2010). This would partly explain the overall nonsignificant difference in moral attitudes between

618   perspective taking and the stay-objective condition. Possible further explanations for these findings

619   are discussed in the next section.

General Discussion

621   This research investigated the effects of encouraging perspective taking on moral attitudes

622   towards two non-human groups: animals and artificial entities. We compared the effect of

623   encouraging perspective taking to encouraging objectivity and a neutral condition. This allowed us

624   to test whether there is a general effect of perspective taking, and whether these are driven by

625   positive effects of perspective taking rather than negative effects of encouraging objectivity. We

626   estimated mediation models of the relationships via empathic concern and self-other overlap. To test

627   the scope of the effects, we included multiple dependent variables in each study, capturing moral

628   attitudes towards increasingly broad groups (e.g., a farmed pig, farmed animals, animals in general).

629   We did not find evidence of total effects of encouraging perspective taking on the outcome

630   variables in either experiment. That is, overall, there were no significant differences in moral

631   attitudes towards animals or artificial entities between the perspective taking condition and either

632   the stay-objective or the no-instructions conditions. This finding raises questions about the overall

633   effectiveness of encouraging perspective taking in the contexts studied in this paper, and is

634   surprising in the context of a large body of existing studies showing positive effects of encouraging

635   perspective taking in a range of contexts (Todd & Galinsky, 2014). However, the findings add

636   support for recent suggestions that perspective taking encouragement is less effective than is

637   currently believed, particularly compared to neutral instructions (McAuliffe et al., 2020).

638   While we did not find total effects, we did find evidence of indirect effects of perspective

639   taking on moral attitudes via our hypothesized mediators in both studies. In Study 1, we found

640   positive effects of taking the perspective of an individual farmed pig on moral attitudes towards

641   animals via both empathic concern and self-other overlap, and in Study 2, we found positive effects

642   of taking the perspective of a "whole brain emulation" on moral attitudes towards artificial entities

643   via the same mechanisms. These findings show that the effects of perspective taking via empathic

644   concern and self-other overlap generalize broadly, even to the unfamiliar contexts explored in this

645   study.

646   That we consistently found indirect effects via both empathic concern and self-other overlap

647   simultaneously is in contrast to studies that have found an effect via only one of these mediators

648   (Batson, Sager, et al., 1997; Cialdini et al., 1997; Maner et al., 2002; McAuliffe et al., 2018), and to

649   those that have suggested that imagine-other perspective taking is associated with only empathic

650   concern (e.g., Myers et al., 2014). This may be partly due to the differing contexts—the cited

651   studies were concerned with interactions between humans only. Further research should explore

652   whether this finding is the result of subtle differences in the mechanisms of perspective taking in the

653   context of non-human groups. Consistent with existing theory (Batson, Early, et al., 1997),

654   sensitivity analysis showed that the manipulation in the present study had no effect on personal

655   distress, nor was there a significant indirect effect via this variable.

656   A key question we aimed to address in this study was the extent to which the results could

657   be attributed to encouraging perspective taking rather than suppressing it through the stay-objective

658   instructions, a possibility raised by McAuliffe et al. (2020). We considered that encouraging

659   perspective taking may be relatively effective in the context of the non-human entities studied in

660   this paper because humans tend to have lower baseline levels of baseline concern for more distant

661   entities (Miralles et al., 2019). In Study 1, the indirect effects of perspective taking versus no-

662   instructions comparison were generally just over half the effect size of the perspective taking versus

663   stay-objective comparison, consistent with the hypothesis that part of the effect can be explained by

664   the instructions encouraging perspective taking. However, consistent with McAuliffe et al. (2020),

665   we did not find evidence of indirect effects of encouraging perspective taking compared to no-

666   instructions via empathic concern, which is the comparison and mediator they focused on. In Study

667   2, we did not find any evidence that perspective taking affected attitudes towards artificial entities

668   compared to the no-instructions condition via either self-other overlap or empathic concern. This

669   difference may be partly due to the overall smaller effect size of the manipulation on the mediators

670   in Study 2. However, we argue that this does not entirely account for our results, as the indirect

671   effects of the perspective taking versus no-instructions comparison were also *proportionally* smaller

672   than in Study 1.

673   One speculative explanation for this difference in the indirect effects of the perspective

674   taking versus no-instructions comparisons between our two studies, consistent with the findings of

675   this study and McAuliffe et al. (2020), is that there is a non-linear relationship between encouraging

676   perspective taking and psychological distance. At very low levels of psychological distance, such as

677   with in-group targets, perspective taking encouragement is not necessary because it is our natural

678   response. At moderate levels of distance, such as in the case of the farmed pig, our natural response

679   weakens, and encouraging perspective taking becomes important. However, when psychological

680   distance is very high, perspective taking is so unnatural that the instructions are no longer effective

681   in generating the desired responses in the perspective takers. Because the emulations were distant

682   on multiple dimensions—socially, temporary, and probabilistically (Liberman et al., 2007)—it is

683   possible that the manipulation did not significantly increase empathic concern or self-other overlap

684   above their baseline levels.

685   Another question we aimed to address was how broadly or narrowly the effects generalize to

686   groups that include the perspective taking targets. In both experiments, we found that the indirect

687   effects via self-other overlap and empathic concern generalized to the broadest groups that we

688   tested: in Study 1, to all animals, measured by speciesism, and in Study 2, to all artificial beings,

689   measured by substratism. These findings suggest that the individual entities considered in each

690   experiment—the farmed pig in Study 1 and the brain emulation in Study 2—were sufficiently

691   representative of the broader superordinate groups to enable attitude generalization at these higher

692   levels. However, given that all participants made judgments for every group, it is possible that their

693   responses for the later groups were influenced by their responses to the earlier ones. This would

694   provide an alternative explanation for the generalization effect, and should be tested in future

695   research by randomly assigning participants to each dependent variable.

696   What explains the combination of the lack of significant total effects and the significant

697   indirect effects via the mediators in the present study? This outcome can arise due to differential

698   power to detect the effects, and may explain why we did not find a total effect for the perspective

699   taking versus no-instructions comparison (Rucker et al., 2011). The lack of a significant total effect

700   of perspective taking relative to the stay-objective condition likely has a different explanation. In

701   three out of five models, we found evidence of competitive mediation: after controlling for the

702   mediators in the models, we found positive direct effects of staying objective on moral attitudes.

703   This suggests that in simple regressions of our dependent variables on perspective taking relative to

704   staying objective, the positive effects of perspective taking and staying objective cancel each other

705   out, rendering the total effects nonsignificant (Hayes, 2009).

706   This explanation, of course, raises the further question: what explains the positive effects of

707   staying objective on moral attitudes? While there is evidence suggesting that people do have some

708   degree of moral concern for nonhuman entities (e.g., Crimston et al., 2016), it is plausible that in the

709   current study participants considered their moral values towards entities that they have likely spent

710   relatively little time reflecting on before. Perhaps by staying objective, participants were able to

711 consider their values more carefully and reason their way to the conclusion that species or substrate

712 is not relevant for moral consideration. This theory is consistent with the evidence that suggests

713 moral reasoning can enable us to override our intuitive moral judgments (e.g., Paxton et al., 2012;

714 Paxton & Greene, 2010). If correct, it also implies that encouraging objectivity in human

715 relationships with distant non-humans may yield different results than objectivity in more typical

716 contexts such as human-human relationships. We encourage more research into this possible

717 explanation.

718 **Limitations and Future Directions**

719   Our study has several important limitations. First, as the finding of competitive mediation

720 shows, our proposed models are not complete. Aside from the positive effect of staying objective,

721 there may be other channels through which perspective taking affects moral attitudes towards non-

722 human groups that are not captured by our models. Possible candidates for this include anger and

723 indignation (Dovidio et al., 2004; Finlay & Stephan, 2000), intergroup anxiety (Pettigrew & Tropp,

724 2008), threat (Riek et al., 2006), attributions of humanness (Epley et al., 2007; Haslam, 2006), and,

725 of particular relevance to non-human entities, perceived capacity for suffering (Bratanova et al.,

726 2011; Gray et al., 2007; Loughnan et al., 2010).

727   A second limitation is the correlational nature of the estimated relationships between the

728 mediators and the dependent variables in our models. While we relied on a large body of literature

729 to inform the hypothesized relationships between these sets of variables, the results are still

730 consistent with alternative models. For example, it is possible that an unobserved variable explains

731 both the mediators and dependent variables in our models, rather than the mediators affecting the

732 dependent variables as we hypothesized. Sensitivity analyses controlling for a range of potential

733 confounders did not materially affect the results, however, we recommend that causal

734 interpretations of this component of the models are made with caution.

735   A third limitation of this research is our measurement of moral attitudes towards artificial

736 entities. We adapted the existing Speciesism Scale (Caviola et al., 2019) for our Substratism Scale

737   and found evidence of its statistical reliability and correlation with various measures in theoretically

738   plausible directions. However, more research is needed to further develop, validate, and understand

739   this and related constructs to enable future research on human relations with artificial entities to be

740   carried out in a robust and consistent manner.

741   This is, as far as we are aware, the first study looking at the effects of perspective taking on

742   attitudes towards non-human animals and artificial entities, and there are many remaining questions

743   that need to be answered to fully understand how it extends to these contexts. In addition to the

744   directions above, these include understanding the effects of using different experimental stimuli, the

745   effects of encouraging perspective taking of other entities in these categories (e.g., different farmed

746   animals), whether and the extent to which attitude changes persists over time, whether perspective

747   taking in these contexts affects behavior, and for whom the effects are more or less pronounced.

748   **Conclusions**

749   The lack of evidence of total effects of perspective taking on moral attitudes towards non-

750   human animals and artificial entities raises questions about its effectiveness in the context of the

751   distant non-human groups studied in the present paper. However, we did find evidence of positive

752   indirect effects on moral attitudes via empathic concern and self-other overlap, and that these

753   positive effects generalized to wider groups including the perspective taking targets. In the case of

754   non-human animals, we also found evidence in favor of the hypothesis that the effects were driven

755   by encouraging perspective taking. The present study, therefore, suggests that there are paths

756   through which perspective taking positively affects attitudes towards non-human animals and

757   artificial entities. The lack of total effects can be partly explained by positive effects of encouraging

758   objectivity, highlighting a potentially important difference in human interactions with the non-

759   human groups in the present study compared to other more familiar groups. Our findings suggests

760   that, in a context where society is increasingly concerned with whether and how to take into account

761   the interests of distant non-human groups (e.g., Gunkel, 2018), both greater objectivity and

762   perspective taking may provide support for expanding the circle of moral concern.

References

763 Amiot, C. E., & Bastian, B. (2015). Toward a psychology of human–animal relations. *Psychological*

765   *Bulletin*, *141*(1), 6–47. https://doi.org/10.1037/a0038147

766 Aron, A., Aron, E., Tudor, M., & Nelson, G. (1991). Close Relationships as Including Other in the

767   Self. *Journal of Personality and Social Psychology*, *60*(2), 241–253.

768   https://doi.org/10.1037/0022-3514.60.2.241

769 Auger, B., & Amiot, C. E. (2019). The impact of imagined contact in the realm of human-animal

770   relations: Investigating a superordinate generalization effect involving both valued and

771   devalued animals. *Journal of Experimental Social Psychology*, *85*.

772   https://doi.org/10.1016/j.jesp.2019.103872

773 Batson, C. D., Early, S., & Salvarani, G. (1997). Perspective Taking: Imagining How Another Feels

774   Versus Imaging How You Would Feel. *Personality and Social Psychology Bulletin*, *23*(7),

775   751–758. https://doi.org/10.1177/0146167297237008

776 Batson, C. D., Polycarpou, M. P., Harmon-Jones, E., Imhoff, H. J., Mitchener, E. C., Bednar, L. L.,

777   Klein, T. R., & Highberger, L. (1997). Empathy and attitudes: Can feeling for a member of a

778   stigmatized group improve feelings toward the group? *Journal of Personality and Social*

779   *Psychology*, *72*(1), 105–118. https://doi.org/10.1037/0022-3514.72.1.105

780 Batson, C. D., Sager, K., Garst, E., Kang, M., Rubchinsky, K., & Dawson, K. (1997). Is Empathy-

781   Induced Helping Due to Self–Other Merging? *Journal of Personality and Social*

782   *Psychology*, *73*(3), 495–509.

783 Berenguer, J. (2007). The Effect of Empathy in Proenvironmental Attitudes and Behaviors.

784   *Environment and Behavior*, *39*(2), 269–283. https://doi.org/10.1177/0013916506292937

785 Berenguer, J. (2010). The Effect of Empathy in Environmental Moral Reasoning. *Environment and*

786   *Behavior*, *42*(1), 110–134. https://doi.org/10.1177/0013916508325892

787 Bratanova, B., Loughnan, S., & Bastian, B. (2011). The effect of categorization as food on the

788   perceived moral standing of animals. *Appetite*, *57*(1), 193–196.

789   https://doi.org/10.1016/j.appet.2011.04.020

790 Brown, R., & Hewstone, M. (2005). An Integrative Theory of Intergroup Contact. In *Advances in*

791   *experimental social psychology, Vol. 37* (pp. 255–343). Elsevier Academic Press.

792   https://doi.org/10.1016/S0065-2601(05)37005-5

793 Caviola, L., & Capraro, V. (2020). Liking but Devaluing Animals: Emotional and Deliberative Paths

794   to Speciesism. *Social Psychological and Personality Science*, *11*(8), 1080–1088.

795   https://doi.org/10.1177/1948550619893959

796 Caviola, L., Everett, J. A. C., & Faber, N. S. (2019). The moral standing of animals: Towards a

797   psychology of speciesism. *Journal of Personality and Social Psychology*, *116*(6), 1011–

798   1029. https://doi.org/10.1037/pspp0000182

799 Cialdini, R. B., Brown, S. L., Lewis, B. P., Luce, C., & Neuberg, S. L. (1997). Reinterpreting the

800   empathy-altruism relationship: When one into one equals oneness. *Journal of Personality*

801   *and Social Psychology*, *73*(3), 481–494. https://doi.org/10.1037/0022-3514.73.3.481

802 Clore, G. L., & Jeffery, K. M. (1972). Emotional role playing, attitude change, and attraction toward

803   a disabled person. *Journal of Personality and Social Psychology*, *23*(1), 105–111.

804   https://doi.org/10.1037/h0032867

805 Crimston, C. R., Bain, P. G., Hornsey, M. J., & Bastian, B. (2016). Moral expansiveness: Examining

806   variability in the extension of the moral world. *Journal of Personality and Social*

807   *Psychology*, *111*(4), 636–653. https://doi.org/10.1037/pspp0000086

808 Dhont, K., Hodson, G., & Leite, A. C. (2016). Common Ideological Roots of Speciesism and

809   Generalized Ethnic Prejudice: The Social Dominance Human–Animal Relations Model

810   (SD-HARM). *European Journal of Personality*, *30*(6), 507–522.

811   https://doi.org/10.1002/per.2069

812   Dhont, K., Hodson, G., Loughnan, S., & Amiot, C. E. (2019). Rethinking Human-Animal

813   Relations: The Critical Role of Social Psychology. *Group Processes & Intergroup Relations*,

814   *22*(6), 769–784. https://doi.org/10.1177/1368430219864455

815   Dovidio, J. F., ten Vergert, M., Stewart, T. L., Gaertner, S. L., Johnson, J. D., Esses, V. M., Riek, B.

816   M., & Pearson, A. R. (2004). Perspective and Prejudice: Antecedents and Mediating

817   Mechanisms. *Personality and Social Psychology Bulletin*, *30*(12), 1537–1549.

818   https://doi.org/10.1177/0146167204271177

819   Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: A three-factor theory of

820   anthropomorphism. *Psychological Review*, *114*(4), 864–886. https://doi.org/10.1037/0033-

821   295X.114.4.864

822   Eyssel, F., & Kuchenbrandt, D. (2012). Social categorization of social robots: Anthropomorphism

823   as a function of robot group membership. *British Journal of Social Psychology*, *51*(4), 724–

824   731. https://doi.org/10.1111/j.2044-8309.2011.02082.x

825   Finlay, K. A., & Stephan, W. G. (2000). Improving Intergroup Relations: The Effects of Empathy on

826   Racial Attitudes. *Journal of Applied Social Psychology*, *30*(8), 1720–1737.

827   https://doi.org/10.1111/j.1559-1816.2000.tb02464.x

828   Fraune, M. R. (2020). Our Robots, Our Team: Robot Anthropomorphism Moderates Group Effects

829   in Human–Robot Teams. *Frontiers in Psychology*, *11*.

830   https://doi.org/10.3389/fpsyg.2020.01275

831   Galinsky, A. D., & Moskowitz, G. B. (2000). Perspective-taking: Decreasing stereotype expression,

832   stereotype accessibility, and in-group favoritism. *Journal of Personality and Social*

833   *Psychology*, *78*(4), 708–724. https://doi.org/10.1037//0022-3514.78.4.708

834   Gamez-Djokic, M., & Waytz, A. (2020). Concerns About Automation and Negative Sentiment

835   Toward Immigration. *Psychological Science*, *31*(8), 987–1000.

836   https://doi.org/10.1177/0956797620929977

837   Gray, H. M., Gray, K., & Wegner, D. M. (2007). Dimensions of Mind Perception. *Science*,

838   *315*(5812), 619–619. https://doi.org/10.1126/science.1134475

839   Gunkel, D. J. (2018). *Robot Rights*. MIT Press.

840   Hanson, R. (2016). *The Age of Em: Work, Love, and Life when Robots Rule the Earth*. Oxford

841   University Press.

842   Haslam, N. (2006). Dehumanization: An Integrative Review. *Personality and Social Psychology*

843   *Review*, *10*(3), 252–264. https://doi.org/10.1207/s15327957pspr1003_4

844   Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical Mediation Analysis in the New

845   Millennium. *Communication Monographs*, *76*(4), 408–420.

846   https://doi.org/10.1080/03637750903310360

847   Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical

848   independent variable. *The British Journal of Mathematical and Statistical Psychology*,

849   *67*(3), 451–470. https://doi.org/10.1111/bmsp.12028

850   Iannone, R. (2020). *DiagrammeR: Graph/Network Visualization* (1.0.6.1) [Computer software].

851   https://CRAN.R-project.org/package=DiagrammeR

852   Krebs, D. (1975). Empathy and altruism. *Journal of Personality and Social Psychology*, *32*(6),

853   1134–1146. https://doi.org/10.1037/0022-3514.32.6.1134

854   Liberman, N., Trope, Y., & Stephan, E. (2007). Psychological distance. In *Social psychology:*

855   *Handbook of basic principles, 2nd ed* (pp. 353–381). The Guilford Press.

856   Loughnan, S., Haslam, N., & Bastian, B. (2010). The role of meat consumption in the denial of

857   moral status and mind to meat animals. *Appetite*, *55*(1), 156–159.

858   https://doi.org/10.1016/j.appet.2010.05.043

859   Maner, J. K., Luce, C. L., Neuberg, S. L., Cialdini, R. B., Brown, S., & Sagarin, B. J. (2002). The

860   Effects of Perspective Taking on Motivations for Helping: Still No Evidence for Altruism.

861   *Personality and Social Psychology Bulletin*, *28*(11), 1601–1610.

862   https://doi.org/10.1177/014616702237586

McAuliffe, W. H. B., Carter, E. C., Berhane, J., Snihur, A. C., & McCullough, M. E. (2020). Is Empathy the Default Response to Suffering? A Meta-Analytic Evaluation of Perspective Taking's Effect on Empathic Concern. *Personality and Social Psychology Review*, *24*(2), 141–162. https://doi.org/10.1177/1088868319887599

McAuliffe, W. H. B., Forster, D. E., Philippe, J., & McCullough, M. E. (2018). Digital altruists: Resolving key questions about the empathy–altruism hypothesis in an Internet sample. *Emotion*, *18*(4), 493–506. https://doi.org/10.1037/emo0000375

Miralles, A., Raymond, M., & Lecointre, G. (2019). Empathy and compassion toward other species decrease with evolutionary divergence time. *Scientific Reports*, *9*(1), 19555. https://doi.org/10.1038/s41598-019-56006-9

Myers, M. W., Laurent, S. M., & Hodges, S. D. (2014). Perspective taking instructions and self-other overlap: Different motives for helping. *Motivation and Emotion*, *38*(2), 224–234. https://doi.org/10.1007/s11031-013-9377-y

Paxton, J. M., & Greene, J. D. (2010). Moral Reasoning: Hints and Allegations. *Topics in Cognitive Science*, *2*(3), 511–527. https://doi.org/10.1111/j.1756-8765.2010.01096.x

Paxton, J. M., Ungar, L., & Greene, J. D. (2012). Reflection and Reasoning in Moral Judgment. *Cognitive Science*, *36*(1), 163–177. https://doi.org/10.1111/j.1551-6709.2011.01210.x

Pettigrew, T. F., & Tropp, L. R. (2008). How does intergroup contact reduce prejudice? Meta-analytic tests of three mediators. *European Journal of Social Psychology*, *38*(6), 922–934. https://doi.org/10.1002/ejsp.504

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

Revelle, W. (2020). *psych: Procedures for Psychological, Psychometric, and Personality Research* (2.0.9) [Computer software]. https://CRAN.R-project.org/package=psych

888   Riek, B. M., Mania, E. W., & Gaertner, S. L. (2006). Intergroup Threat and Outgroup Attitudes: A

889   Meta-Analytic Review. *Personality and Social Psychology Review*, *10*(4), 336–353.

890   https://doi.org/10.1207/s15327957pspr1004_4

891   Rucker, D. D., Preacher, K. J., Tormala, Z. L., & Petty, R. E. (2011). Mediation Analysis in Social

892   Psychology: Current Practices and New Recommendations. *Social and Personality*

893   *Psychology Compass*, *5*(6), 359–371. https://doi.org/10.1111/j.1751-9004.2011.00355.x

894   Sandberg, A. (2013). Feasibility of Whole Brain Emulation. In V. C. Müller (Ed.), *Philosophy and*

895   *Theory of Artificial Intelligence* (pp. 251–264). Springer. https://doi.org/10.1007/978-3-642-

896   31674-6_19

897   Schultz, P. W. (2000). New Environmental Theories: Empathizing With Nature: The Effects

898   ofPerspective Taking on Concern for Environmental Issues. *Journal of Social Issues*, *56*(3),

899   391–406. https://doi.org/10.1111/0022-4537.00174

900   Sevillano, V., Aragonés, J. I., & Schultz, P. W. (2007). Perspective Taking, Environmental Concern,

901   and the Moderating Role of Dispositional Empathy. *Environment and Behavior*, *39*(5), 685–

902   705. https://doi.org/10.1177/0013916506292334

903   Shih, M., Wang, E., Trahan Bucher, A., & Stotzer, R. (2009). Perspective Taking: Reducing

904   Prejudice Towards General Outgroups and Specific Individuals. *Group Processes &*

905   *Intergroup Relations*, *12*(5), 565–577. https://doi.org/10.1177/1368430209337463

906   Simon, S., Magaldi, M. E., & O'Brien, L. T. (2019). Empathy versus evidence: Does perspective-

907   taking for a discrimination claimant bias judgments of institutional sexism? *Group*

908   *Processes & Intergroup Relations*, *22*(8), 1109–1123.

909   https://doi.org/10.1177/1368430218818731

910   Smith, E. R., Sherrin, S., Fraune, M. R., & Šabanović, S. (2020). Positive Emotions, More Than

911   Anxiety or Other Negative Emotions, Predict Willingness to Interact With Robots.

912   *Personality and Social Psychology Bulletin*, *46*(8), 1270–1283.

913   https://doi.org/10.1177/0146167219900439

914   Sunstein, C. R., & Nussbaum, M. C. (2004). *Animal Rights: Current Debates and New Directions*.

915   Oxford University Press.

916   Swim, J. K., & Bloodhart, B. (2015). Portraying the Perils to Polar Bears: The Role of Empathic

917   and Objective Perspective-taking Toward Animals in Climate Change Communication.

918   *Environmental Communication*, *9*(4), 446–468.

919   https://doi.org/10.1080/17524032.2014.987304

920   Todd, A. R., Bodenhausen, G. V., Richeson, J. A., & Galinsky, A. D. (2011). Perspective taking

921   combats automatic expressions of racial bias. *Journal of Personality and Social Psychology*,

922   *100*(6), 1027–1042. https://doi.org/10.1037/a0022308

923   Todd, A. R., & Galinsky, A. D. (2014). Perspective-Taking as a Strategy for Improving Intergroup

924   Relations: Evidence, Mechanisms, and Qualifications. *Social and Personality Psychology*

925   *Compass*, *8*(7), 374–387. https://doi.org/10.1111/spc3.12116

926   Vanman, E. J., & Kappas, A. (2019). "Danger, Will Robinson!" The challenges of social robots for

927   intergroup relations. *Social and Personality Psychology Compass*, *13*(8), e12489.

928   https://doi.org/10.1111/spc3.12489

929   Vescio, T. K., Sechrist, G. B., & Paolucci, M. P. (2003). Perspective taking and prejudice reduction:

930   The mediational role of empathy arousal and situational attributions. *European Journal of*

931   *Social Psychology*, *33*(4), 455–472. https://doi.org/10.1002/ejsp.163

932   Wilks, M., Caviola, L., Kahane, G., & Bloom, P. (2021). Children Prioritize Humans Over Animals

933   Less Than Adults Do. *Psychological Science*, *32*(1), 27–38.

934   https://doi.org/10.1177/0956797620960398

935   Wullenkord, R., Fraune, M. R., Eyssel, F., & Šabanović, S. (2016). Getting in Touch: How

936   imagined, actual, and physical contact affect evaluations of robots. *2016 25th IEEE*

937   *International Symposium on Robot and Human Interactive Communication (RO-MAN)*,

938   980–985. https://doi.org/10.1109/ROMAN.2016.7745228

939   Zhao, X., Lynch, J. G., Jr., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and Truths

940   about Mediation Analysis. *Journal of Consumer Research*, *37*(2), 197–206.

941   https://doi.org/10.1086/651257

942