Children value animals more than adults do — a conceptual replication and extension

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Abstract

Recent psychological research finds that US American children have a weaker tendency than US American adults to value humans more than animals. We aimed to conceptually replicate and extend this finding in a preregistered study (N = 412). We investigated whether 6-9-year-old Polish children (Study 1a) are less likely to prioritize humans over animals than Polish adults are (Studies 1b, 1c). We presented participants with moral dilemmas where they had to prioritize either humans or animals (dogs or chimpanzees) in situations that involved harming (i.e., a trolley problem) or benefitting (i.e., giving a snack). We found that Polish children prioritized humans over animals less than Polish adults did. This was the case both in dilemmas that involved preventing harm and in dilemmas that involved providing snacks. Both children and adults prioritized humans over chimpanzees more than humans over dogs.

Keywords: speciesism, moral judgment, children, animals, moral circle

Most people believe that the life of a human is more valuable than the life of an animal — an intuition that has been empirically demonstrated in recent psychological research (Amiot & Bastian, 2015; Caviola et al., 2019). For example, in the 'moral machine' experiment, where participants decide who should be killed by an autonomous car, adults in 233 countries and territories prioritize humans over non-human animals (Awad et al., 2018)[1]. Similarly, research shows that people are more willing to kill animals to save humans than the other way around (Caviola et al., 2021). Further, people seem to value humans more than animals, even in cases where humans have equal or even lower cognitive capacities than animals (Caviola et al., 2022). This suggests that people, at least in part, morally prioritize humans over animals based merely on species membership — a phenomenon referred to as speciesism (Caviola et al., 2019; Dhont et al., 2016; Dhont, Hodson, Leite et al., 2019; Dhont, Hodson, Loughnan, et al., 2019).

Much of the work in this domain has focused on adults' judgments. Only recently has research begun to examine how children think about the moral status of animals (Collado et al., 2022; Henseler Kozachenko & Piazza, 2021; Hussar & Harris, 2018; McGuire et al., 2022a; McGuire et al., 2022b; Neldner et al., 2018; Neldner et al., 2023; Neldner & Wilks, 2022; Piazza et al., 2023; Wilks & Caviola et al., 2021). In a recent study, Wilks and colleagues (2021) found that US American children prioritized humans over animals to a lesser extent than US American adults. The authors found that children as young as five and as old as nine years would often choose to save two dogs or six pigs over one human being. No age-related differences between children were observed. By contrast, adults would save one human over even 100 dogs or pigs. However, it is unclear how generalizable this effect is and whether it appears only in harming scenarios or also in new contexts such as resource allocation (Schein, 2020).

[1] As humans are also animals, we should use the term "non-human animals" when describing animals. However, to avoid a long phrasing later in the manuscript, we use the term "animals" instead of "non-human animals".

Understanding the nature of speciesism in children and adults is important for several reasons. First, animals play a relevant role in the social lives of humans, for example, as pets, entertainment, equipment, or consumption (Alves & Barboza, 2018). Adults are strongly speciesist; this has been corroborated by research (Caviola et al., 2019; 2022) and statistics illustrating that people exploit billions of animals each year for food, materials, and entertainment (e.g., Rustemovich, 2017). But what is the nature of speciesism? Is it something people are born with or acquire later? Is speciesism a strong and universal attitude for all people? Understanding children's level of speciesism could shed light on these questions.

Second, studying children may offer insight into the cognitive (Killen et al., 2011) and emotional (Saarni, 2010) factors associated with the development of speciesism, as well as other moral judgments (e.g., moral expansiveness; Neldner et al., 2018). The fact that children appeared less speciesist than adults in past studies (Wilks & Caviola et al., 2021) was surprising. This result (Wilks & Caviola et al., 2021) is contrary to the view held by many philosophers and psychologists that children have an initially narrow "moral circle," which gradually expands with age (Horta, 2010; but see more discussion on children's moral circle: Neldner et al., 2018; Reinecke et al., 2021; McGuire et al., 2022a; Marshall et al., 2022).

The moral circle is a concept used in ethics to explore questions of who or what should be the subject of moral consideration, rights, and ethical treatment. It often involves discussions about the extension of moral consideration to beings or entities beyond humans, such as animals, the environment, or even artificial intelligence (Laham, 2009; Singer, 2011). In developmental psychology, it was assumed that small children care more about ingroup members as their cognitive abilities are limited — they are not able to weigh multiple classifications simultaneously, such as those involved in the logical classification of objects or people (Aboud, 2008; Rutland et al., 2010). Children develop moral principles of fairness and

equality from an early age, but they also develop implicit and explicit prejudice toward others from different groups (Rutland et al., 2010).

Theoretically, animals could be an example of such an outgroup, so they should not be treated equally as an ingroup (i.e., humans), but the findings of Wilks and colleagues (2021) do not support this claim. Instead, their findings are consistent with the integrative social-cognitive developmental approach to prejudice (Rutland et al., 2010). According to this approach, children's attitudes can encompass both concerns related to group dynamics and moral considerations from a very young age. What shapes the specific character and early emergence of prejudice in childhood is influenced by a range of intricate factors. These include the social environment, interpersonal relationships, and the development of social cognition, all of which either make certain conflicts between groups and group identities highly noticeable or highlight the universal application of moral principles such as fairness and equality. Finally, understanding the emergence of speciesism could inform philosophical debate, e.g., in the form of moral debunking arguments (Jaquet, 2019).

The Current Research

We aimed to conceptually replicate and extend Wilks & Caviola et al. (2021). We investigated whether 6-9-year-old Polish children (Study 1a) have a lower tendency to prioritize humans over animals (i.e., prioritizing humans over animals to a lesser extent) than Polish adults (Study 1b, Study 1c). Following Wilks and colleagues (2021), we presented participants with a range of moral dilemmas.

By studying a sample in a different country than the US (Wilks & Caviola et al., 2021), we tried to overcome sampling limitations common in developmental psychology (Nielsen et al., 2017; Nielsen & Haun, 2016). While Poland and US America are both considered WEIRD countries, i.e., Western, Educated, Industrialized, Rich, and Democratic (Henrich et al., 2010), they show some cultural variation. For instance, Poland is a religiously

homogeneous country (i.e., about 85% are part of the Catholic church) with predominantly white citizens (Centre for Public Opinion Research, 2019). Religious engagement is early-emerging; Polish children usually start taking part in religious courses when they are three years old. Past work shows that religion, especially Catholicism, is related to lower perceptions of the moral status of animals as animals were treated impersonally in religious teachings, where they were often depicted as resources for human use rather than sentient beings deserving of ethical consideration. Some Christian religions even assert that animals were created for people to use them (e.g., Gross, 2017; Scanes & Chengzhong, 2018). For example, the Bible reads: "And the fear of you and the dread of you shall be on every beast of the earth, on every bird of the air, on all that move on the earth, and on all the fish of the sea. They are given into your hand. Every moving thing that lives shall be food for you" (Genesis 9: 2-3). Thus, attitudes towards animals might be more negative in Poland than in the United States.

There are also a number of cross-cultural reasons why we might expect higher rates of speciesism in Poland than in the US. Although Poland and the US are not very psychologically distanced from each other (their distance score is 0.079; Muthukrishna et al., 2020), Polish and US American cultures can be differentiated based on their prioritized values. For instance, Poland is described as emphasizing survival, which means that it strongly emphasizes materialistic values. US American culture emphasizes self-expression values, often associated with pursuing personal goals beyond basic survival needs (Inglehart & Baker, 2000). We may suspect that people from a culture focused on material survival must care first about themselves (i.e., humans) and later animals. Second, as Poland has a higher power distance than the US (Hofstede, 2001), we may suspect that an animal's life may be seen as less relevant than the life of a human to maintain the hierarchy of beings. Third, Poland is higher than the US in the uncertainty avoidance index (Hofstede, 2001), and we

may suspect that higher uncertainty (so lower stability and trust) would predict less concern for animals. Lastly, Poland is a tighter culture than the US (Uz, 2015). We may expect that in tighter cultures, children would be more speciesist, as people there prefer clear rules and there is lower tolerance for any deviations (and some rules may be about animals, e.g., "The dog's place is in the kennel").

We modified Wilks and colleagues' (2021) original study to test whether the findings generalize to scenarios involving harming rather than helping or vary by animal species. First, we employed a Switch case trolley dilemma in which participants had to decide whether to direct an oncoming train onto a track with humans or a track with animals. This meant that participants decided whom to harm (by contrast, Wilks and Caviola et al. asked participants to decide whom to save from sinking ships). Relying on the trolley dilemma thus allows us to examine whether the findings from Wilks and Caviola et al. generalize to another context involving potentially different intuitions. Moreover, it offers a more direct comparison to other moral psychology research, which has relied heavily on trolley dilemmas (e.g., Caviola et al., 2021).

Second, while Wilks and Caviola et al. pitted humans against dogs or pigs, we pitted humans against dogs or chimpanzees to test whether their findings would extend to animals more genetically similar to humans. Although chimpanzees are considered highly intelligent and are more closely related to humans, many adults still value them considerably less than humans (Caviola et al., 2019), and it has already been stated that diverse species should be included in such research (Caviola et al., 2019). We thus were interested in whether children would also, like adults, prioritize humans over chimpanzees. Moreover, we suspected that children might grant more moral worth to chimpanzees for the reasons above — chimpanzees may also be seen as rarer than pigs to many children (i.e., only seen in zoos or on television).

Third, we used a scenario involving distributing benefits (i.e., a snack) rather than harms to explore whether children also value benefitting animals over humans more than adults do.

Finally, we conducted a laboratory study with toy figurines (from LEGO) rather than images presented on iPads (though adults saw images of the same figurines online). Thus, we intended to examine whether these results generalize to another context, as we followed suggestions about the importance of context in moral psychology research – simply put, we should conduct studies using more real-life cases or materials, and LEGO meets this criterion (Bostyn et al., 2018; Schein, 2020). Research shows that playing with Lego toys is still one of the most popular plays among young children. LEGO is the first among the top 5 toy brands and the best seller among children's toys, which popularity increased during the COVID-19 pandemic (*Is LEGO the Most Popular Toy?*, 2021).

All studies were approved by the Ethics Committee of [masked for peer review]. The preregistration is available at https://osf.io/3tr4x/?view_only=d0463b23e237463f9f63b9db8651c182. Data, analysis codes, and study materials are available at https://osf.io/ecxyn/?view_only=c890fc0aaf5048e79b1ea7f773a1bac0. We report all measures, manipulations, and exclusions.

Preregistered Hypotheses

In line with Wilks and colleagues (2021), we hypothesized that children would prioritize humans over animals (dogs and chimpanzees) (Hypothesis 1); that children would prioritize humans over chimpanzees less than they prioritize humans over dogs (Hypothesis 2); and that children would prioritize humans over animals to a lesser extent than adults (Hypothesis 3). Finally, we did not expect age-related changes in the tendency to prioritize humans over animals among children, according to results from Wilks and colleagues' research (2021) (Hypothesis 4).

Power Analysis

Following Wilks and Caviola et al. (2021), we conducted two power analyses using G*Power to determine our sample size. For hypothesis 1, we conducted power analysis for a one-sample *t*-test to detect a small to medium effect (d = 0.3), which indicated that we would need 71 children to test this hypothesis with 80% power. Hypotheses 2 and 4 were tested as part of multiple linear regression with 6 predictors. To obtain 80% power to detect a small to medium effect (f^2 = .075) with an alpha of .05 in a multiple linear regression with six predictors (animal species, animal exposure, age, sex, sentience, intelligence, Table 1), G*Power specified a sample size of 189. For hypothesis 3, we conducted a power analysis for a small to medium main effect (f = .175, partial η^2 = .03) with an alpha of .05, numerator *df* of 1 and 2 groups (children and adults); G*Power specified a total sample size of 259. To account for possible attrition from failing control checks and ensure that we were sufficiently powered, we aimed to collect 200 participants for each group (200 children and 200 adults).

Study 1a: Polish Children

Method

Participants

Participants were native Polish speakers from the urban part of the Silesian region in Poland who had no daily access to farms with animals or other places created for producing food or other animal benefits. Following our preregistered stopping rule, we ended the data collection on the day we reached our target sample of 200 participants but included the data from all participants who had an appointment on the same day. This procedure led to a total sample of 212 participants.

Following our preregistered exclusion criteria, data from 42 participants were excluded from analyses because they failed to pass one or more of our attention checks or

gave incomplete responses. Children with Autism Spectrum Condition or other related conditions were allowed to participate in the study, but their data were not saved.

The final sample included 170 participants (82 girls, 88 boys), whose ages ranged from 6 to 9 years (M = 7.57, SD = 1.13). One hundred four children indicated that they have a dog at home or interact with a friend's or family member's dog regularly, and 73 indicated that they had seen a chimpanzee in real life before. We did not directly ask children about their faith, but all children took part in the school Catholic religion course in their schools, which was confirmed by their teachers. The course includes classes on the Catholic religion, its history, rules, praying, singing religious songs, etc. Children often enroll in the course if they come from a religious family, as it is not an obligatory school course.

Procedure

Participants were recruited from schools and kindergartens. Written parental consent and verbal child assent were obtained for each participant. Children participated individually in a private room at their schools and classrooms. Two trained research assistants conducted all testing.

Harming Dilemma. Participants were presented with a toy version of the switch case trolley dilemma (Foot, 1967). Children stood at a table and were presented with plastic LEGO figures (Figure 1). These figures represented trolley dilemmas—two train tracks with varying numbers of people and dogs or chimpanzees at the end of each (a full setup visual is available on the OSF). The experimenter explained how the dilemma worked, stating, "*There is a runaway trolley barreling down the railway tracks. Ahead, there is one person on the left track, and on the right track, there is one dog. Show us where the train should go. You can also tell us that you can't decide*". Children were asked to decide whether the train should go left or right or whether they could not decide[2]. Half of the female and half of the male

[2] In the preregistered version, we planned to ask children to move the train ("Please move the train"). However, because the study was conducted during the COVID pandemic in 2021, we instead, for safety reasons, asked children to show by finger in which direction the train should go.

figurines were used to represent humans. When one human was used in a dilemma, gender matching was applied (i.e., girls saw a female figurine, and boys saw a male figurine).

When the child made the decision, the researcher repeated the child's choice by either saying: "*You chose X side. That means you will save Y, but you won't save Z,"* or "*You chose that you can't decide. That means it's too hard to choose one or the other*".

In sum, children saw fourteen dilemmas in randomized order: 1 human vs. 1 animal, 1 human vs. 2 animals, 1 human vs. 10 animals, 1 human vs. 50 animals, 2 humans vs. 1 animal, 10 humans vs. 1 animal, 50 humans vs. 1 animal for each human vs. dog and human vs. chimpanzee. All dilemmas were presented in randomized order, and the figures were randomized (left-right) for each dilemma[3].

Figure 1

Photo of Lego Figurines (1 dog vs. 50 humans)

Benefitting Dilemma. We also included a measure focused on distributing benefits. Participants were asked whether to give a snack to a human, a dog, or a chimpanzee. They were told that all humans and animals love the snack but that the participant could choose

[3] We preregistered that the highest number of individuals in the dilemmas was 100, following the procedure of Wilks and colleagues (2021). However, we then decided for practical reasons to keep the maximum number of individuals 50 instead of 100. This is because 100 Lego toys were too many for our setup.

only one species to give the snack to. Participants could choose between four categorical options: human, dog, chimpanzee, or "can't decide." All options were represented by LEGO toys, with humans matched to the participant's gender. This question, which was not included in the study by Wilks and Caviola et al. (2021), enabled us to investigate the tendency to prioritize humans over animals in the context of distributing benefits rather than preventing harm.

Additional Questions. In addition to the above tasks, children responded to several other questions.

Using the trolley procedure, we asked children to choose between saving one dog and one chimpanzee to directly measure their relative preferences for these two animals. We also included two control questions: one human vs. ten humans and one human vs. ten plates. We excluded participants who chose one human in the first question and ten plates in the second question. If participants chose plates, it would indicate they were just choosing based on the larger number and maybe did not understand the instruction correctly (for the number of exclusions, see the participants section).

In line with Wilks and Caviola et al. (2021), we asked participants three separate questions about how (1) smart, (2) capable of feeling pain, and (3) capable of feeling emotions humans, dogs, and chimpanzees are on a four-point scale from *not at all* to *a lot*. The first question assessed participants' "perceived intelligence", and the average of the two latter assessed "perceived sentience" (as in Wilks & Caviola et al., 2021). Finally, we measured whether children had contact with animals by asking two questions: "Do you have a dog at home (Or interact with a family/friend's dog regularly?)" (yes/no), and "Have you ever seen a chimpanzee in your life?" (yes/no).

At the end of the study, children were thanked and offered a prize.

Coding

Following Wilks and colleagues' (2021) scoring system[4], we calculated two scores per participant: the human-over-dog bias score and the human-over-chimpanzee bias score. Each participant has a certain point for each comparison question, depending on their choice. Points were summed for each animal species and participant. The point scoring system was the following: (X stands for dog or chimpanzee): 1 human vs. 50 X (human: 6.64, can't decide: 3.32, animal: 0), 1 human vs. 10 X (human: 4.32, can't decide: 2.16, animal: 0), 1 human vs. 2 X (human: 2, can't decide: 1, animal: 0), 1 human vs. 1 X (human: 1, can't decide: 0, animal: -1), 1 X vs. 2 humans (human: 0, can't decide: -1, animal: -2), 1 X vs. 10 humans (human: 0, can't decide: -2.16, animal: -4.32), 1 X vs. 50 humans (human: 0, can't decide: -3.32, animal: -6.64).

The maximum score was 13.96, and the minimum score was -13.96. Higher scores suggest that participants more strongly favored humans over animals. A score of 0 suggests equal value attribution. A negative score suggests a preference for animals over humans.

We also calculated a "sentience score," which combined the physical and emotional pain questions for each target (person, dog, chimpanzee) by averaging these two items. From here, we calculated a difference score for both intelligence and sentience by subtracting the dog and chimpanzee intelligence scores from the human intelligence score per participant. We did the same for the sentience score.

Methodological Note

Since only one child chose the "can't decide" option, we decided to slightly adjust our preregistered analysis plan. First, we removed this one participant from the analysis. Second, we conducted a study with adults in which participants did not have a "can't decide" option

[4] The point-scoring system was based on the function log2(2x), where x stands for the larger number of beings of the respective dilemma. This would ensure that the scores were weighted by the numbers of beings at stake in the dilemma but not so much that the dilemmas involving a higher number of beings completely dominated the score. For example, it meant that prioritizing one person over 100 dogs contributed more to the humans-overdogs score than prioritizing one human over 10 dogs, but not 10 times more. The maximum score (absolute prioritization of humans) was 14.96, and the minimum score was –14.96. A score of zero meant that the participants attributed the same moral status to both types of beings. See the Supplementary Materials of Wilks et al. (2021) for more details about this scoring system.

available (see Study 1b) and published this as well as the original methodology with adults (Study 1c; presented in supplementary material). Note that we also conducted the study and analyses exactly as we preregistered them and found the same pattern of results.

Study 1b: Polish Adults

Method

Participants

Consistent with the power analyses from Study 1a, we aimed to collect 200 participants for this study via the Prolific platform among Polish participants located in Poland to ensure that we were sufficiently powered. Data from 14 participants were excluded from analyses because they failed to pass one or two of our attention checks (1 person *vs.* 10 plates, 1 person *vs.* 10 people), did not complete the survey, or gave unrealistically high estimates for their age (e.g., 100 and 190 years). The final sample included 178 participants (79 women, 99 men), whose ages ranged from 18 to 50 years (M = 25.92, SD = 7.29). One hundred forty participants indicated that they have a dog at home or regularly interact with a friend's or family member's dog. One hundred forty-six participants indicated they had seen a chimpanzee in real life.

Measures and Procedure

The measures were identical to Study 1a. The procedure was the same, except that the study was conducted as an online survey using written rather than verbal instructions and displaying photos of the figurines used in the children's study[5].

Comparison of Polish Children and Polish Adults

[5] As noted earlier, we ran two versions of this study with adults: one version without a "can't decide" option (Study 1b; reported here) and one version with a "can't decide" option (Study 1c; reported in the Supplementary Materials). We did so because adults were much more likely than children to choose "can't decide". This may be an artifact of the study design—children did not have a physical representation of the "can't decide" dilemma, as they only saw the two tracks on the table while the adults saw all three options in writing. Nonetheless, children were given verbal instructions each time, thus the option was made available to them. The analyses of both versions of the study yielded the same pattern of results (see Supplementary Materials).

Figure 2 visualizes the answer pattern for the individual moral dilemmas. For example, In Study 1b, 83% of adults prioritized one human over one dog, and 89% of adults prioritized one human over one chimpanzee. By contrast, in Study 1a, 58% of children prioritized one human over one dog, and 72% of children prioritized one human over one chimpanzee. Adults' mean human-over-dog bias score was 7.34 (*SD* = 7.81), and their mean human-over-chimpanzee bias score was 8.01 (*SD* = 6.93), which were significantly larger than zero for both species (dog: $t(177) = 12.53$, $p < .001$, $d = 0.94$; chimpanzee: $t(177) = 15.42$, $p < .001$, $d = 1.16$). Children's mean human-over-dog bias score was 2.18 (*SD* = 6.42), and their mean human-over-chimpanzee bias score was 4.38 (*SD* = 6.42), which were significantly larger than zero for both species (dog: $t(169) = 4.42$, $p < .001$, $d = 0.33$; chimpanzee: $t(169) = 8.90$, $p < .001$, $d = 0.68$). We further find that physical and emotional pain ratings are correlated, except children's rating for dog emotional and physical pain ratings (For adults: humans, $r(176) = .76$, $p < .001$; chimpanzees, $r(176) = .38$, $p < .001$; dogs, $r(176) = .49$, $p < .001$; for children: humans, $r(168) = 0.23$, $p = .003$; chimpanzees, $r(168) = 0.31$, $p < .001$; dogs, $r(168) = 0.103$, $p = .181$).

Figure 3 visualizes the results of a 2*2 ANOVA with factors species (dogs vs. chimpanzees) and group (adults vs. children) using the human-over-animals score as a dependent variable. The analysis showed the significant main effect of species and age. As predicted, children prioritized humans over animals less than adults did, $F(1, 346) = 45.99$, $p < .001$, partial $\eta^2 = .12$. In addition, participants had a stronger tendency to prioritize humans over chimpanzees than over dogs, $F(1, 346) = 15.38$, $p < .001$, partial $\eta^2 = .04$. Moreover, we found a significant interaction between species and group, $F(1, 346) = 4.44$, $p = .036$, partial $\eta^2 = .01$, such that the difference in how much adults (vs. children) prioritize humans over animals is larger for dogs than chimpanzees.

Figure 2

Answer Pattern for Individual Moral Dilemmas (Children and Adults)

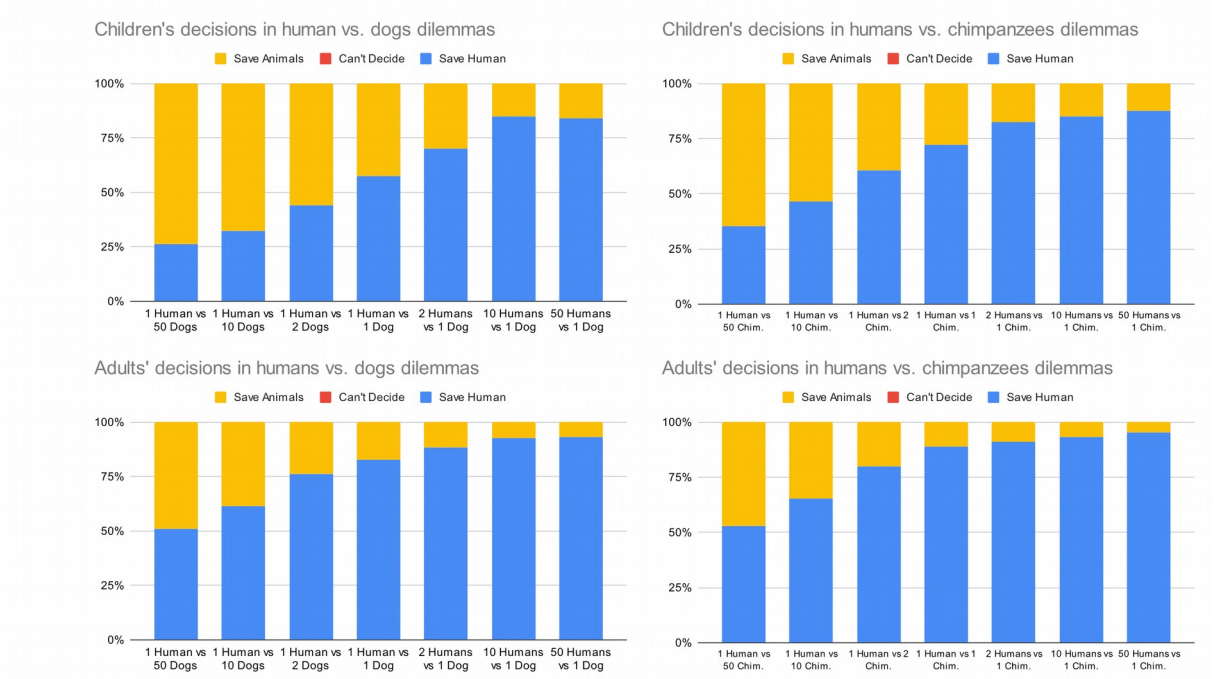
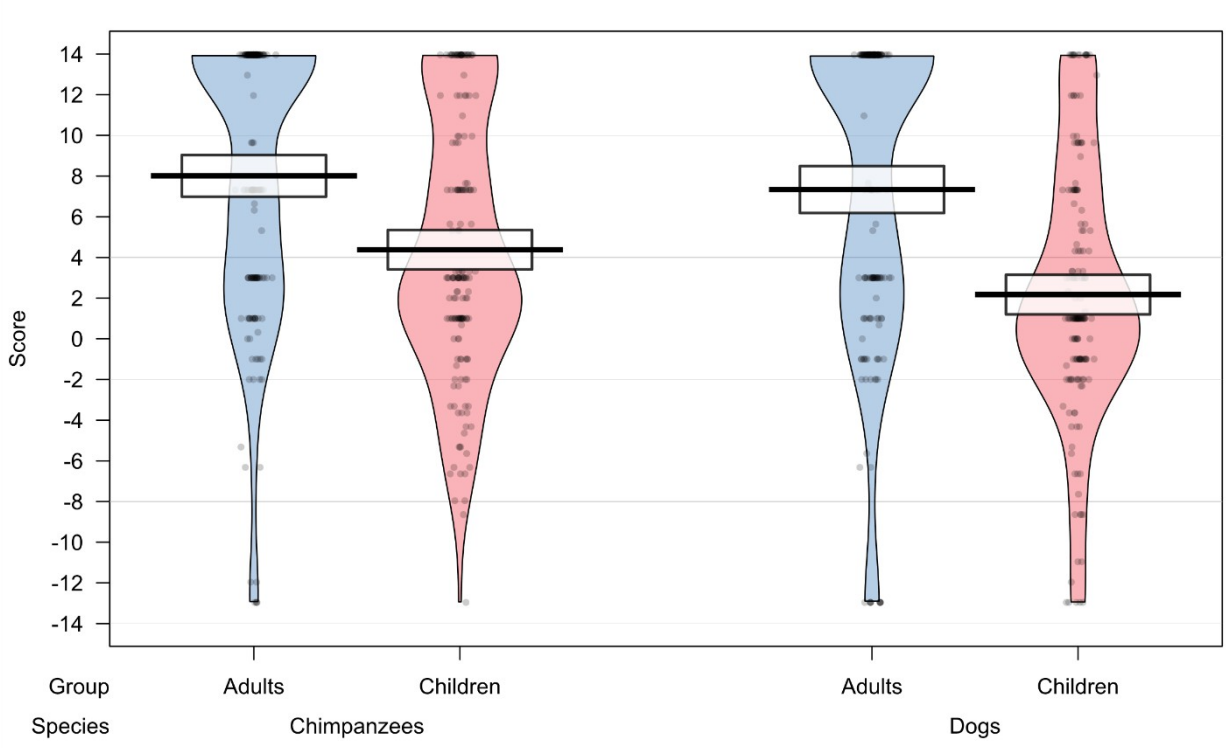


Figure 3

Violin Plot of Bias Scores (Polish Children and Polish Adults)



Note. Black lines indicate means, and white areas indicate confidence intervals.

We conducted two mixed linear regressions to further investigate the determinants of speciesism in both adults and children with bias score (humans over dogs and humans over chimpanzees) as a dependent variable and species, age, gender, perceived intelligence (as the difference in perceived sentience between humans and dogs or chimpanzees), perceived sentience (again as the difference between humans and animals), and animal exposure as predictors. Table 1 shows the standardized coefficients with CIs for the different predictors. Table 2 shows the means and standard deviations for perceived intelligence and sentience.

Table 1

Standardized Regression Coefficients With 95% CI From a Multiple Regression Predicting Speciesism in Polish Participants From Different Explanatory Variables (Studies 1a and 1b)

Predictor	Children	Adults
Species	0.36 [0.17, 0.54]	0.17 [0.05, 0.29]
Age	0.03 [-0.09, 0.15]	0.15 [0.02, 0.27]
Gender	-0.08 [-0.20, 0.04]	0.01 [-0.12, 0.13]
Perceived Intelligence	0.02 [-0.09, 0.13]	0.17 [0.05, 0.28]
Perceived Sentience	-0.01 [-0.12, 0.11]	0.07 [-0.04, 0.18]
Exposure to Animal	-0.04 [-0.14, 0.06]	0.07 [0.00, 0.14]

Note. Separate models were run for adults and children. For gender, men were coded as zero, and women were coded as one. For species, dogs were coded as one, and chimpanzees were coded as zero.

Table 2

Predictor	Children *M* (*SD*)			Adults *M* (*SD*)			Cohen's *d* (adults vs. children)		
	Chimpanzees	Dogs	Humans	Chimpanzees	Dogs	Humans	Chimpanzees	Dogs	Humans
Perceived Intelligence	2.77 (0.81)	3.09 (0.67)	3.52 (0.59)	3.27 (0.61)	2.94 (0.74)	3.82 (0.48)	0.70	-0.21	0.56
Perceived Sentience	2.87 (0.62)	3.16 (0.52)	3.52 (0.5)	3.75 (0.44)	3.73 (0.47)	3.97 (0.24)	1.63	1.15	1.13

Means and SDs for Perceived Intelligence and Sentience for Polish Adults and Pol

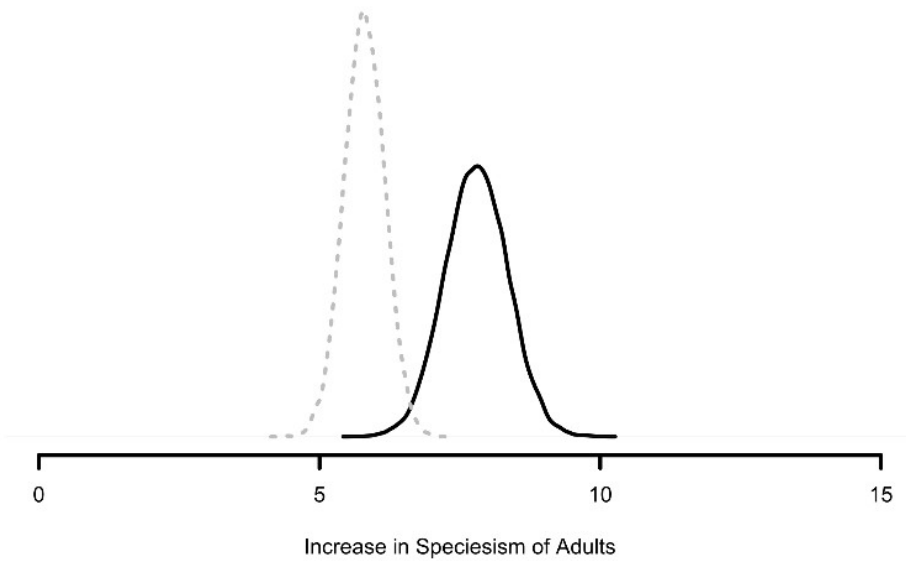
As shown in Table 1, species membership was the strongest predictor of speciesism among children (children were more speciesist towards chimpanzees than dogs). For adults, species (more speciesism towards chimpanzees), perceived intelligence, and age were the strongest predictors. As we can see in Table 2, both adults and children assessed that humans are the most intelligent. However, while adults assessed that chimpanzees are more intelligent than dogs, children did the opposite, seeing dogs as more intelligent than chimpanzees. Regarding perceived sentience, both adults and children perceived humans to have the highest levels of sentience, followed by dogs and chimpanzees. However, for adults, these ratings were only marginally different.

Replication Bayes Factor

We conducted a replication Bayes factor analysis (Bürkner, 2017; Kass & Raftery, 1995; Ly et al., 2019; Verhagen & Wagenmakers, 2014) to assess whether the effect of age category (adults vs. children) on speciesism is more in line with Wilks and Caviola et al. (2021) or the null hypothesis of no effect. Figure 4 visualizes the result. We can see that the posterior is much closer to the previous study than the null of no effect. This is also supported by the Bayes factor, which indicates overwhelming evidence for a successful replication ($BF_{10} = 1.39 \times 10^{18}$).

Figure 4

Prior and Posterior Distributions for the Replication Bayes Factor Analysis (Studies 1a and 1b)



Note: Black indicates the posterior distribution for higher speciesism in adults after updating on the study of Wilks and Caviola et al. (2021); Grey indicates the posterior distribution after updating on our study using Wilks and Caviola et al. (2021) as the prior. The height of the distribution indicates the density.

Providing Benefits to Different Species

We also studied the benefit provision dilemma. Table 3 summarizes the snack allocation responses of adults and children. Adults differ from children in how they allocate the snack, $X^2(2) = 69.62$, $p < .001$, Cramer's $V = 0.44$, and are most likely to give the snack to a dog, then to a person and then to a chimpanzee. The same pattern also holds for children, where the proclivity to provide the snack to the dog is even stronger, $X^2(2) = 106.32$, $p < .001$, Cramer's $V = 0.56$.

A chi-square test also indicates that the snack allocation differs between the two age groups, $X^2(2) = 8.97$, $p = .011$, Cramer's $V = 0.16$. When directly comparing snack allocation to humans *vs*. animals—not taking into account differences between animals—we find evidence that children are more likely to assign the snack to animals, $X^2(1) = 8.01$, $p = .005$, Cramer's $V = 0.16$.

Table 3

Allocation of the Snack by Polish Children and Polish Adults (Studies 1a and 1b)

	Person	Dog	Chimpanzee
Adults	52 (29%)	108 (61%)	18 (10%)
Children	27 (16%)	120 (71%)	23 (13%)

Discussion

Most people value human lives much more than animal lives (Awad et al., 2018; Caviola et al., 2019, 2021). However, recent research has raised the question of whether children have different intuitions about the relative value of animals and humans. Wilks and colleagues (2021) examined how children and adults in the United States differ in their tendency to prioritize humans over animals in tragic trade-off dilemmas, finding that children were much less likely to prioritize humans over dogs and pigs. In the current set of studies, we aimed to conceptually replicate and extend their work by examining these intuitions in a Polish sample. We also used different methodologies; testing whether children also prefer benefitting animals (over humans), testing the effect with a different type of animal species (chimpanzees instead of pigs), employing toy figurines rather than images, and using traditional trolley dilemma (e.g., choosing whom to sacrifice rather than whom to save).

We replicated the main effect, showing that children (Study 1a) prioritize humans over animals less than adults (Study 1b). This was the case in both harming scenarios (trolley dilemma) and benefitting scenarios (choosing whom to give a snack to) and when participants did (Study 1b) or did not have the option to choose "can't decide" (Study 1c; Supplementary Materials). Thus, the key findings from Wilks and colleagues (2021) hold in several contexts and across different cultural samples.

In contrast to our predictions, both children and adults prioritized humans over chimpanzees more than humans over dogs. While this mirrors past findings with adults (Caviola et al., 2021), it is still surprising, given that chimpanzees have more advanced cognitive capacities than dogs and are one of our closest living relatives. Future studies could tease out possible explanations for this preference, such as our social relationships with dogs,

familiarity, or beauty (see Henseler Kozachenko & Piazza, 2021). This finding suggests that factors beyond perceived mental capacities play an important role in shaping how we think about the moral worth of different entities. One possible explanation may be the human-dog co-evolution (Hare & Tomasello, 2005). Since humans and dogs have long relied on one another for survival, humans might value dogs more than other species, and our results support this argument. Moreover, dogs have evolved specialized skills for reading human social and communicative behavior (Cooper et al., 2023; Miklósi & Topál, 2004), and these skills seem more human-like than those of other animals more closely related to humans phylogenetically, such as chimpanzees (Hare & Tomasello, 2005). Our results suggest that we judge different animals differently; thus, we cannot generalize our results to all animals. Notably, this persisted in both children's and adults' judgments. Future studies should consider testing a broader range of animals to understand better the role of species category in our ascriptions of moral worth.

Children and adults had human-over-animal-bias scores significantly above zero for both dogs and chimpanzees. This contrasts with Wilks and colleagues (2021), where children showed almost no bias for humans over dogs. This suggests that children in Poland may have a stronger tendency to prioritize humans over animals than children in the United States. However, a direct comparison to Wilks and colleagues is difficult as there were methodological differences. However, ultimately, children in both countries had a much weaker tendency to prioritize humans over animals than adults did. Thus, the overall pattern appears roughly the same in US and Polish populations.

Both adults and children preferred to give animals snacks over people. However, this tendency was stronger in children than in adults. This is noteworthy when considering that children slightly prioritized humans over animals in the main task. It is possible that children considered the animals to be more in need (i.e., unable to get their own food) and were thus

more likely to choose to give them the snack. This aligns with past research suggesting that children see animals as vulnerable (Hussar & Harris, 2010). This result is the first evidence that children also value animals more than adults in benefitting scenarios. Future research could study whether children also display less speciesism in other benefitting dilemmas, such as in providing helping behaviors or allocating different resources. We interpret all such "benefitting" behaviors towards animals, like feeding, as moral behaviors. However, it should be pointed out that this does not have to be the case for everyone. Behaviors like feeding can be an example of prosociality or caring about others, but they also may be a type of playing with animals. Future studies should pay more attention to participant's interpretations or intentions about their decisions. Another alternative that may be fruitful to investigate is donation behavior (e.g., donations to human versus animal causes).

We also tested possible predictors of speciesism among children and adults. The most relevant factor was just a species, and factors like the participant's gender, perceived animal's sentience, and exposure to animals did not matter. However, the participant's age did matter in the case of adults (not in the case of children). Older adults were more speciesist. Moreover, perceived animal intelligence did matter for adults, not for children, suggesting that the higher perceived intelligence, the higher the tendency to be speciesist. The analogous findings can be observed in Wilks & Caviola et al. (2021) and Kozachenko & Piazza (2021). This would suggest that different factors play a role for children and adults, and we need future investigations to understand why we observed this result and what else may be relevant for being more speciesist.

Our study contributes several new data points to our understanding of speciesism and sheds light on questions like: What is the nature of speciesism? Is it something people are born with or acquire later? Is speciesism a strong and universal attitude for all people? We add to a growing body of evidence (e.g., Wilks & Caviola et al., 2021) that children value

animals differently than adults. We show this using different animals and scenarios. Our results provide a new piece of evidence that speciesism is acquired (not innate) and culturally universal. However, much more research across diverse samples is needed to fully understand how people perceive ascribing moral worth to humans and animals. This is relevant not only to the debate about speciesism (Horta, 2010) but also to children's moral development (McGuire et al., 2022a), including their moral circles (Laham, 2009; Singer, 2011). In addition, this knowledge may contribute to the long-standing debate in philosophy about how people shape their thinking about their place in the world in contrast to animals (Jaquet, 2019). That is why conducting more replications of our findings is crucial, especially in more diverse cultures, including the less industrialized ones, where children are raised closer to using animals to produce meat or other benefits like clothes. Polish adults, like US Americans, may start rationalizing the meat-production process once they become more aware of how meat is produced, resulting in the moral devaluation of non-human animals (Wilks & Caviola et al., 2021). It is still possible that children who are more involved in using animals in the meat-production process (e.g., through involvement in ranching or hunting) early in life could begin to show adult-like patterns.

In sum, our study sheds some light on the questions about the nature of speciesism. We provide support for the notion that we are not born speciesist but instead acquire it later in life and also that speciesism may be universal. Of course, much more research is needed to answer these questions. A number of questions remain: Will these findings generalize to other cultures? At what age do children become more speciesist? What factors play a role here? Would our results replicate for all types of animals? And many more.

Limitations

There are several limitations of the current research. First, we used a different procedure for Polish children compared to the past study of Wilks and colleagues (2021),

limiting our direct cross-cultural comparison. However, this comparison was not the primary aim of our study, and our procedure and data analyses were very similar. Future studies could directly compare children's responses from different cultures to test the tentative finding that culture and age interact.

We were also limited in the scope of our experiments. We only tested participants in one culture, included two animals in our stimuli (dogs and chimpanzees), and included two tasks (trolley scenario and snack provision task). Although this is a substantial expansion of previous research, the generalizability of the findings is still limited. For example, participants may respond differently to dangerous or scary animals (Piazza et al., 2014; Prokop et al., 2021; Neldner & Wilks, 2022), or depending on culture (Hofstede, 2010; Uz, 2015; Muthukrishna et al., 2020).

It is particularly important to acknowledge the limitations of the cultural scope. Research has already identified that people from different cultures make different moral decisions (Misiak et al., 2018; Sorokowski et al., 2020; Turpin et al., 2021), and there is increasing awareness of the limitations of WEIRD samples in psychology (Henrich et al., 2010; Nielsen et al., 2017), also for the impact of culture on caring about animals (Małecki et al., 2020). Thus, we can expect that moral judgments about animals may also vary as a function of culture, especially between WEIRD and non-WEIRD countries. Given that we are investigating the potential role of social learning in shaping children's moral views about animals, it is critical to conduct this type of work with an even broader range of participants going forward.

Finally, we want to highlight the specific nature of benefitting dilemmas. In real life, it is much more common to feed an animal than another person (especially dogs). We do not know whether experience in feeding animals could have impacted the results obtained here. Given this, future research should examine benefitting scenarios using more ecologically

valid scenarios. Nonetheless, our research shows that different acts (e.g., preventing harm and offering a benefit) can yield different results. This demonstrates the need to use various tasks and scenarios when examining moral concerns for different beings.

Conclusions

We examined how children and adults differ in their tendency to prioritize humans over animals. We found that Polish children prioritized humans over animals less than Polish adults. This replicates past work, which found the same pattern of results in children from the US and the UK (McGuire et al., 2022a; Wilks & Caviola et al., 2021). We also observed this effect in both harming and benefitting scenarios. Additionally, we observed this effect not only for dogs but also for chimpanzees. These findings offer new insight into the differences in how children and adults from different countries value animals and contribute to a small but growing body of literature demonstrating young children's greater propensity to grant moral status to distant others.

Open Practices

Because of our dedication to open science, data, analysis codes, and study materials are available at https://osf.io/ecxyn/?view_only=c890fc0aaf5048e79b1ea7f773a1bac0. This study was preregistered: https://osf.io/3tr4x/?view_only=d0463b23e237463f9f63b9db8651c182.

References

Aboud, F.E. (2008). A social-cognitive developmental theory of prejudice. In S.M. Quintana & C. McKown (Eds.), Handbook of race, racism, and the developing child (pp. 55–71). Hoboken, NJ: Wiley.

Alves, R. R. N., & Barboza, R. R. D. (2018). Chapter 15—The Role of Animals in Human Culture∗. In R. R. Nóbrega Alves & U. P. Albuquerque (Eds.), *Ethnozoology* (pp. 277–301). Academic Press. https://doi.org/10.1016/B978-0-12-809913-1.00015-6

Amiot, C. E., & Bastian, B. (2015). Toward a psychology of human–animal relations. *Psychological Bulletin*, *141*, 6–47. https://doi.org/10.1037/a0038147

Awad, E., Dsouza, S., Kim, R., Schulz, J., Henrich, J., Shariff, A., Bonnefon, J.-F., & Rahwan, I. (2018). The Moral Machine experiment. *Nature*, *563*, 59–64. https://doi.org/10.1038/s41586-018-0637-6

Blake, P. R., McAuliffe, K., Corbit, J., Callaghan, T. C., Barry, O., Bowie, A., Kleutsch, L., Kramer, K. L., Ross, E., Vongsachang, H., Wrangham, R., & Warneken, F. (2015). The ontogeny of fairness in seven societies. *Nature*, *528*, 258–261. https://doi.org/10.1038/nature15703

Bostyn, D. H., Sevenhant, S., & Roets, A. (2018). Of mice, men, and trolleys: Hypothetical judgment versus real-life behavior in trolley-style moral dilemmas. *Psychological Science*, *29*, 1084–1093. https://doi.org/10.1177/0956797617752640

Bürkner, P.-C. (2017). brms: An R Package for Bayesian Multilevel Models Using Stan. *Journal of Statistical Software*, *80*, 1–28. https://doi.org/10.18637/jss.v080.i01

Caviola, L., Everett, J. A. C., & Faber, N. S. (2019). The moral standing of animals: Towards a psychology of speciesism. *Journal of Personality and Social Psychology*, *116*, 1011–1029. https://doi.org/10.1037/pspp0000182

Caviola, L., Kahane, G., Everett, J. A. C., Teperman, E., Savulescu, J., & Faber, N. S. (2021). Utilitarianism for animals, Kantianism for people? Harming animals and humans for the greater good. *Journal of Experimental Psychology: General*, *150*, 1008–1039. https://doi.org/10.1037/xge0000988

Caviola, L., Schubert, S., Kahane, G., & Faber, N. (2022). *Humans First: Why people value animals less than humans*. PsyArXiv. https://doi.org/10.31234/osf.io/x42v6

Collado, S., Rodríguez-Rey, R., & Sorrel, M. A. (2022). Does Beauty Matter? The Effect of Perceived Attractiveness on Children's Moral Judgments of Harmful Actions against

Animals. *Environment and Behavior, 54,* 247–275. https://doi.org/10.1177/00139165211014626

Cooper, J. J., Ashton, C., Bishop, S., West, R., Mills, D. S., & Young, R. J. (2003). Clever hounds: Social cognition in the domestic dog (Canis familiaris). *Applied Animal Behaviour Science, 81,* 229–244. https://doi.org/10.1016/S0168-1591(02)00284-8

Dhont, K., Hodson, G., & Leite, A. C. (2016). Common ideological roots of speciesism and generalized ethnic prejudice: The social dominance human–animal relations model (sd-harm). *European Journal of Personality*, *30*, 507–522. https://doi.org/10.1002/per.2069

Dhont, K., Hodson, G., Leite, A. C., & Salmen, A. (2019). The Psychology of Speciesism. In *Why We Love and Exploit Animals*. Routledge.

Dhont, K., Hodson, G., Loughnan, S., & Amiot, C. E. (2019). Rethinking human-animal relations: The critical role of social psychology. *Group Processes & Intergroup Relations*, *22*, 769–784. https://doi.org/10.1177/1368430219864455

Foot, P. (1967). The Problem of Abortion and the Doctrine of the Double Effect. *Oxford Review*, *5*, 5–15.

Gross, A. S. (2017). *Religion and Animals*. Oxford Handbooks Online. https://doi.org/10.1093/oxfordhb/9780199935420.013.10

Hare, B., & Tomasello, M. (2005). Human-like social skills in dogs? *Trends in Cognitive Sciences, 9,* 439–444. https:// https://doi.org/10.1016/j.tics.2005.07.003

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). Most people are not WEIRD. *Nature*, *466*, 29–29. https://doi.org/10.1038/466029a

Henseler Kozachenko, H., & Piazza, J. (2021). How children and adults value different animal lives. *Journal of Experimental Child Psychology*, *210*, 105204. https://doi.org/10.1016/j.jecp.2021.105204

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations*. SAGE.

Horta, O. (2010). What is Speciesism? *Journal of Agricultural and Environmental Ethics*, *23*, 243–266. https://doi.org/10.1007/s10806-009-9205-2

Hussar, K. M., & Harris, P. L. (2010). Children who choose not to eat meat: A study of early moral decision-making. *Social Development*, *19*, 627–641. https://doi.org/10.1111/j.1467-9507.2009.00547.x

Hussar, K. M., & Harris, P. L. (2018). Vegetarian and nonvegetarian children's judgments of harm to animals and humans. *Ecopsychology, 10,* 36–43. https://doi.org/10.1089/eco.2017.0039

Inglehart, R., & Baker, W. E. (2000). Modernization, cultural change, and the persistence of traditional values. *American Sociological Review, 65,* 19–51. https://doi.org/10.2307/2657288

Is LEGO the most popular toy? – Brick Bucks. (2021). https://brickbucks.net/is-lego-the-most-popular-toy/

Jaquet, F. (2019). A Debunking Argument Against Speciesism. *Synthese*, *198*, 1011–1027. https://doi.org/10.1007/s11229-019-02080-5

Kass, R. E., & Raftery, A. E. (1995). Bayes Factors. *Journal of the American Statistical Association*, *90*, 773–795. https://doi.org/10.2307/2291091

Killen, M., Mulvey, K. L., Richardson, C., Jampol, N., & Woodward, A. (2011). The accidental transgressor: Morally-relevant theory of mind. *Cognition*, *119*, 197–215. https://doi.org/10.1016/j.cognition.2011.01.006

Ly, A., Etz, A., Marsman, M., & Wagenmakers, E.-J. (2019). Replication Bayes factors from evidence updating. *Behavior Research Methods*, *51*, 2498–2508. https://doi.org/10.3758/s13428-018-1092-x

Małecki, W., Sorokowski, P., Pawłowski, B., & Cieński, M. (2020). *Human Minds and Animal Stories: How Narratives Make Us Care About Othe*. Routledge.

Marshall, J., Gollwitzer, A., Mermin-Bunnell, K., Shinomiya, M., Retelsdorf, J., & Bloom, P. (2022). How development and culture shape intuitions about prosocial obligations. *Journal of Experimental Psychology: General, 151,* 1866–1882. https://doi.org/10.1037/xge0001136

McAuliffe, K., Blake, P. R., Steinbeis, N., & Warneken, F. (2017). The developmental foundations of human fairness. *Nature Human Behaviour*, *1*, 1–9. https://doi.org/10.1038/s41562-016-0042

McGuire, L., Palmer, S., & Faber, N. (2022a). *Loving some animals, eating others: Species categorisation in childhood, young adulthood and adulthood*. PsyArXiv. https://doi.org/10.31234/osf.io/fte9m

McGuire, L., Fry, E., Palmer, S.B., & Faber, N.S. (2022b). Age-related differences in reasoning about the acceptability of eating animals. *Social Development.* Advanced online. https://doi.org/10.1111/sode.12655

Miklósi, Á., & Topál, J. (2004). Review Comparative social cognition: What can dogs teach us? *Animal Behaviour, 67,* 995–1004. https://doi.org/10.1016/j.anbehav.2003.10.008

Misiak, M., Butovskaya, M., & Sorokowski, P. (2018). Ecology shapes moral judgments towards food-wasting behavior: Evidence from the Yali of West Papua, the Ngorongoro Maasai, and Poles. *Appetite*, *125*, 124–130. https://doi.org/10.1016/j.appet.2017.12.031

Muthukrishna, M., Bell, A. V., Henrich, J., Curtin, C. M., Gedranovich, A., McInerney, J., & Thue, B. (2020). Beyond Western, Educated, Industrial, Rich, and Democratic (WEIRD) Psychology: Measuring and Mapping Scales of Cultural and Psychological

Distance. *Psychological Science, 31,* 678–701. https://doi.org/10.1177/0956797620916782

Neldner, K., Crimston, C., Wilks, M., Redshaw, J., & Nielsen, M. (2018). The developmental origins of moral concern: An examination of moral boundary decision making throughout childhood. *PloS One*, *13*, e0197819. https://doi.org/10.1371/journal.pone.0197819

Neldner, K., & Wilks, M. (2022). How do children value animals? A developmental review. *Psychology of Human-Animal Intergroup Relations, 1,*e9907. https://doi.org/10.5964/phair.9907

Neldner, K., Wilks, M., Crimston, C. R., Jaymes, R. W. M., & Nielsen, M. (2023). I may not like you, but I still care: Children differentiate moral concern from other constructs. *Developmental Psychology, 59,* 549–566. https://doi.org/10.1037/dev0001485

Nielsen, M., Haun, D., Kärtner, J., & Legare, C. H. (2017). The persistent sampling bias in developmental psychology: A call to action. *Journal of Experimental Child Psychology*, *162*, 31–38. https://doi.org/10.1016/j.jecp.2017.04.017

Nielsen, M., & Haun, D. (2016). Why developmental psychology is incomplete without comparative and cross-cultural perspectives. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *371*, 20150071. https://doi.org/10.1098/rstb.2015.0071

Piazza, J., Landy, J. F., & Goodwin, G. P. (2014). Cruel nature: Harmfulness as an important, overlooked dimension in judgments of moral standing. *Cognition*, *131*, 108–124. https://doi.org/10.1016/j.cognition.2013.12.013

Piazza, J., Simpson, V., & McGuire, L. (2023). Why children moralise harm to animals but not meat. *Trends in cognitive sciences, 27,* 685–688. https://doi.org/10.1016/j.tics.2023.05.004

Prokop, Zvaríková, M., Zvarík, M., & Fedor, P. (2021). The effect of animal bipedal posture on perceived cuteness, fear and willingness to protect them. *Frontiers in Ecology and Evolution*, *9*, 681241.

Reinecke, M. G, Wilks, M., & Bloom, P. (2021). Developmental changes in perceived moral standing of robots. Proceedings of the Annual Meeting of the Cognitive Science Society, 43. Retrieved from https://escholarship.org/uc/item/8f32d068

Rottman, J., Crimston, C.R., & Syropoulos, S. (2021). Tree-Huggers Versus Human-Lovers: Anthropomorphism and Dehumanization Predict Valuing Nature Over Outgroups. *Cognitive Science, 45,* e12967. https://doi.org/10.1111/cogs.12967

Rutland, A., Killen, M., & Abrams, D. (2010). A New Social-Cognitive Developmental Perspective on Prejudice: The Interplay Between Morality and Group Identity. *Perspectives on Psychological Science, 5,* 279–291. https://doi.org/10.1177/1745691610369468

Rustemovich, A. R. (2017). *Exploration of animals exploitation in food, clothes, entertainment and testing industries, its impact on economy and ecology*. https://doi.org/10.20861/2410-2873-2017-32-003

Saarni, C. (2010). The Plasticity of Emotional Development. *Emotion Review*, *2*, 300–303. https://doi.org/10.1177/1754073909357969

Scanes, C. G., & Chengzhong, P. (2018). Chapter 11—Animals and Religion, Belief Systems, Symbolism and Myth. In C. G. Scanes & S. R. Toukhsati (Eds.), *Animals and Human Society* (pp. 257–280). Academic Press. https://doi.org/10.1016/B978-0-12-805247-1.00017-4

Schein, C. (2020). The importance of context in moral judgments. *Perspectives on Psychological Science*, *15*, 207–215. https://doi.org/10.1177/1745691620904083

Shaw, A., Montinari, N., Piovesan, M., Olson, K. R., Gino, F., & Norton, M. I. (2014). Children develop a veil of fairness. *Journal of Experimental Psychology: General*, *143*, 363–375. https://doi.org/10.1037/a0031247

Sorokowski, P., Marczak, M., Misiak, M., & Białek, M. (2020). Trolley Dilemma in Papua. Yali horticulturalists refuse to pull the lever. *Psychonomic Bulletin & Review*, *27*, 398–403. https://doi.org/10.3758/s13423-019-01700-y

Turpin, M. H., Walker, A. C., Fugelsang, J. A., Sorokowski, P., Igor, G., & Białek, M. (2021). The search for predictable moral partners: Predictability and moral (character) preferences. *Journal of Experimental Social Psychology*, *97*, 104196.

Verhagen, J., & Wagenmakers, E.-J. (2014). Bayesian tests to quantify the result of a replication attempt. *Journal of Experimental Psychology: General*, *143*, 1457–1475. https://doi.org/10.1037/a0036731

Uz, I. (2015). The index of cultural tightness and looseness among 68 countries. *Journal of Cross-Cultural Psychology*, *46*, 319–335. https://doi.org/10.1177/0022022114563611

Wilks, M., Caviola, L., Kahane, G., & Bloom, P. (2021). Children Prioritize Humans Over Animals Less Than Adults Do. *Psychological Science*, *32*, 27–38. https://doi.org/10.1177/0956797620960398

Supplementary Materials

Study 1c: Adults (Including "Can't Decide" Option)

Method

Participants

Consistent with the power analyses from Study 1a, we aimed to collect 200 participants for this study via the Prolific platform among Polish participants to ensure that we were sufficiently powered. Two hundred-one participants filled out the survey. Following our preregistered exclusion criteria, 16 participants were excluded because they failed to pass one or more of our attention checks (1 human *vs.* 10 plates, 1 human *vs.* 10 humans) or were incomplete. The final sample included 185 participants (66 women, 119 men), whose ages ranged from 18 to 52 years ($M = 22.65$, $SD = 6.03$).

Sensitivity Power Analysis

For the linear regression with six predictors, this sample size results in 80% power to detect an effect size of $f^2 = .076$ with an alpha of .05. For the *F*-test with two groups and 1 numerator *df* (comparing Polish adults and children), we obtain 80% power to detect an effect size of 0.149 given our total sample size of 356 (185 adults + 171 children).

Measures and Procedure

The measures were identical to Study 1a. The procedure was the same, except that the study was conducted as an online survey using written rather than verbal instructions and displaying photos of the figurines used in the children's study.

Results for Study 1a (including the child who chose the "can't decide" option) and 1c

Bias Score

Children were more likely to save animals over humans than adults. Figure 1 visualizes the answer pattern for the individual moral dilemmas. For example, 65% of adults said they would save one human over one dog, 26% said they were undecided, and 8% said

they would rather save one dog than one human. For children, on the other hand, only 57% said they would save one human over one dog, only 1% were undecided (the difference in 'undecided' responses will be discussed more in the following sections), and 42% would save one dog over one human. This pattern is also reflected when looking at saving humans vs. chimpanzees. Here 74% of adults said they would save one human over one chimpanzee, 22% were undecided, and 5% would rather save one chimpanzee than one human. On the other hand, 73% of children said they would save one human over one chimpanzee, none were undecided, and 27% said they would save one chimpanzee over one human.

Figure 2 depicts children's mean human-over-dog bias score was 2.14 (SD = 6.39), and children's mean human-over-chimpanzee bias score was 4.49 (SD = 6.46). The higher this score, the stronger the tendency to morally prioritize humans over animals. A score of zero indicates the tendency to value both types of beings the same. The mean humans-over-dogs bias score for adults was 6.16 (SD = 7.18), and the mean humans-over-chimpanzee bias score was 7.20 (SD = 6.10). For adults and children, the bias scores were significantly above zero for both species (children dog: $t(170) = 4.39$, $p < .001$, $d = 0.34$; children chimpanzee: $t(170) = 9.01$, $p < .001$, $d = 0.69$; adults dog: $t(184) = 11.66$, $p < .001$, $d = 0.86$; adults chimpanzee: $t(184) = 16.01$, $p < .001$, $d = 1.18$).

We conducted a 2*2 ANOVA with the factors species (dogs vs. chimpanzees) and group (adults vs. children) using the human-over-animals bias score as a dependent variable (Figure 2). The analysis revealed a significant main effect of species and group. As predicted in our preregistration, children prioritized humans over animals less than adults, $F(1, 354) = 31.70$, $p < .001$, partial $\eta^2 = .08$. In addition, participants had a stronger tendency to prioritize humans over chimpanzees than over dogs, $F(1, 354) = 23.33$, $p < .001$, partial $\eta^2 = .06$. There was no interaction between the group (adults vs. children) and species (dogs vs. chimpanzees) factors, $F(1, 354) = 3.19$, $p = .075$, partial $\eta^2 = .00$. In other words, there is no evidence that

adults and children differ in the relative moral weight they assign to dogs compared to chimpanzees, but they do differ in the moral weight they assign to animals (i.e., dogs and chimpanzees) compared to humans. We further find a positive relationship between physical and emotional pain for adults (humans: $r(183) = .34$, $p < .001$; chimpanzees: $r(183) = .29$, $p < .001$; dogs: $r(183) = .15$, $p = .038$; the relationships for children are reported in the man text).

Figure S1

Responses for the Individual Moral Dilemmas (Studies 1a and 1c)

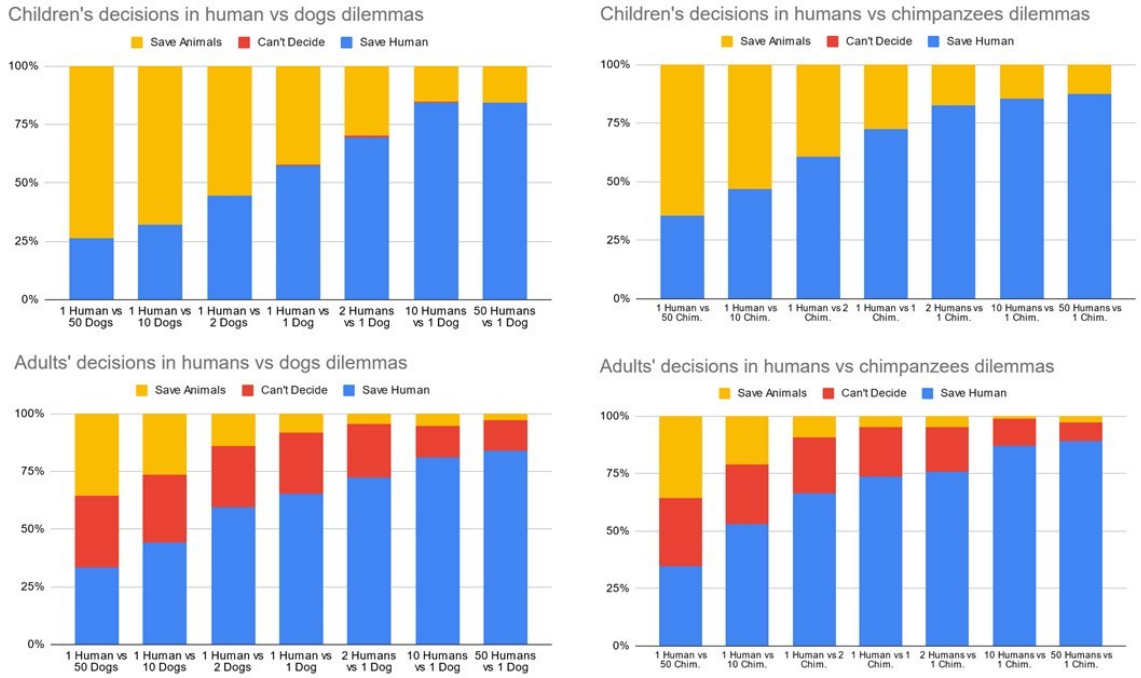
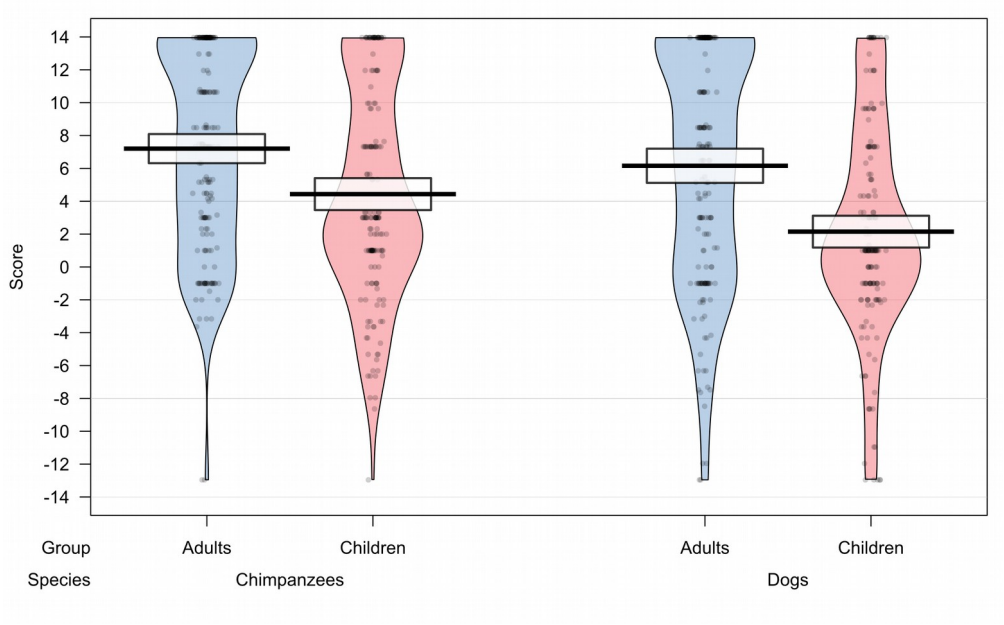


Figure S2

Pirateplot Summarizing the Overall Bias Scores (Studies 1a and 1c)



Note. Black lines indicate means, and white areas indicate confidence intervals.

Following Wilks and Caviola et al. (2021), we conducted a mixed linear regression with bias score as a dependent variable and species, age, gender, perceived intelligence, perceived sentience, and animal exposure as predictors. Table 1 shows the *standardized coefficients* for the different predictors for adults. Gender was associated with the tendency to prioritize humans over animals. Males were more likely to save humans over animals in comparison to females. In addition, a stronger perception of humans as more intelligent compared to the respective animals resulted in a higher tendency to prioritize humans over animals. In line with our predictions, we found no age-related changes among children. This also holds when testing age-related changes directly without controlling for the other variables in the regression (for humans vs. chimpanzees: r = .083, $t(169)$ = 1.09, p = .276, for humans vs. dogs, r = -.27, $t(169)$ = -0.348, p = .728). For adults, we also found a p-value suggestive of a lower tendency to prioritize humans over animals with increasing age for

chimpanzees, r = -.156, $t(183)$ = -2.14, p = .034, but not for dogs, r = -.02, $t(183)$ = -0.33, p = .744.

Table S1

Standardized Beta Coefficients with 95% CI From a Multiple Regression Predicting Speciesism from Different Explanatory Variables. To make the comparisons easier, on the left are results from this study, on the right from Study 1c on children.

Predictor	Adults (Study 1c)	Children (Study 1a)
Species	0.24 [0.12, 0.35]	0.36 [0.17, 0.54]
Age	-0.04 [-0.16, 0.07]	0.03 [-0.09, 0.15]
Gender	-0.22 [-0.34, -0.10]	-0.08 [-0.20, 0.04]
Perceived Intelligence	0.24 [0.13, 0.34]	0.02 [-0.09, 0.13]
Perceived Sentience	0.10 [0.01, 0.19]	-0.01 [-0.12, 0.11]
Exposure to Animal	-0.01[-0.08, 0.06]	-0.04 [-0.14, 0.06]

Although adults and children could indicate that they were undecided, children did so far less often than adults (see red bars in Figure 1). Indeed, only one child indicated to be undecided, whereas adults indicated to be undecided 22% of the time.

Providing Benefits to Different Species

Table 2 summarizes the snack allocation of adults and children. The chi-square test indicates that adults assign the snacks differently often to different species, $X^2(2) = 39.43$, $p < .001$, Cramer's $V = 0.361$, and that the snack allocation differs between the two groups, $X^2(3) = 66.38$, $p < .001$, Cramer's $V = 0.43$.

Table S2

Allocation of the Snack by Adults and Children (Studies 1a and 1c)

	Human	Dog	Chimpanzee	No one
Adults	67 (36%)	70 (38%)	14 (8%)	34 (18%)
Children	27 (16%)	121 (71%)	23 (13%)	0 (0%)

When directly comparing the snack allocation to humans vs. animals—omitting those who gave a snack to no one and collapsing across dogs and chimpanzees—we find evidence that children, compared to adults, are more likely to assign the snack to an animal, $X^2(1) = 30.32$, $p < .001$, Cramer's $V = 0.31$ replicating the pattern we found in the moral dilemmas.

Replication Bayes Factor

Thus far, we have assessed the evidence for the presence of an effect in this study, ignoring the data from Wilks and Caviola et al. (2021). This section will examine whether our results are in line with this previous research using replication Bayes factors (see Supplementary Materials 1). This analysis allows us to directly test whether the effects observed here are more in line with the null hypothesis of no effect or the effect size in the original study (Ly et al., 2019; Verhagen & Wagenmakers, 2014). Our study is closer to a conceptual replication since the paradigm for moral decision-making was changed, and since the maximum number of humans was only 50 rather than 100; therefore, some difference in the estimated effect size is to be expected. However, the replication Bayes factor is still a helpful tool to compare the relative evidence for successful replication in comparison to the null hypothesis.

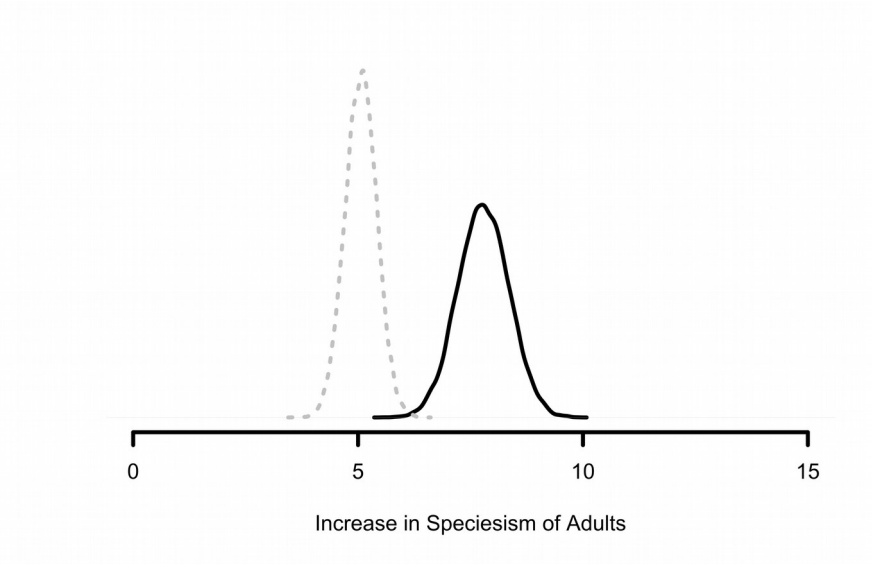
In our context, we will focus the analysis on the main effect of adults vs. children since (1) this was the most focal hypothesis in both studies and (2) the change of species from pigs to chimpanzees does impede a meaningful test for the main effect of species or the interaction. Figure 3 visualizes the posterior distribution for the difference in speciesism in adults and children from Wilks and Caviola et al. (2021) in black[6]. In the next step, we used this posterior distribution as a prior distribution when testing for an effect of children vs.

[6] We used a prior of normal (0,7) on the difference in speciesism between adults and children for Wilks and Caviola et al., (2021); this gives much prior mass to a reasonably large difference between adults and children. In addition, we bounded the prior so that all values are between 29.92 and – 29.92, which is the maximum possible difference between adults and children. For this analysis we specified a mixed-effects ANOVA with main effect of age in brms (Bürkner, 2017).

adults in our study. This results in a replication Bayes factor of 2.3 x 10^7; in other words, overwhelming evidence for successful replication. The posterior after updating this study when using the previous study as prior is shown in grey. We can see that the effect is somewhat smaller. However, it is more in line with successful replication than the null hypothesis of no effect.

Figure S3

Prior and Posterior Distributions for the Replication Bayes Factor Analysis (Studies 1a and 1c)



Note: The posterior distribution for a stronger tendency to prioritize humans over animals in adults than in children after updating the study of Wilks and Caviola et al. (2021) in black and after updating our study when using Wilks and Caviola et al. (2021) as prior in grey. The height of the distribution indicates the density.