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Tree-Huggers Versus Human-Lovers: Anthropomorphism and Dehumanization Predict Valuing Nature Over Outgroups

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Abstract

Previous examinations of the scope of moral concern have focused on aggregate attributions of moral worth. However, because trade-offs exist in valuing different kinds of entities, tabulating total amounts of moral expansiveness may conceal significant individual differences in the relative proportions of moral valuation ascribed to various entities. We hypothesized that some individuals (“tree-huggers”) would ascribe greater moral worth to animals and ecosystems than to humans from marginalized or stigmatized groups, while others (“human-lovers”) would ascribe greater moral worth to outgroup members than to the natural world. Additionally, because moral valuation is often treated as being zero-sum, we hypothesized that there would be no difference in aggregate levels of moral concern between tree-huggers and human-lovers. Finally, because attributions of mental capacities substantially contribute to moral valuation, we predicted that tree-huggers and human-lovers would show different patterns of mind attribution for animals versus humans. Three studies ($N = 985$) yielded evidence in support of our hypotheses. First, over one-third of participants valued nature over outgroups. Second, extending moral value to animals and nature was not indicative of more expansive moral concern overall; instead, tree-huggers and human-lovers were identical in their aggregate ascriptions of moral worth. Third, tree-huggers had relatively amplified tendencies to attribute mental capacities to animals and relatively reduced tendencies to attribute mental capacities to outgroup members—thus having elevated rates of both anthropomorphism and dehumanization. These findings necessitate a reconceptualization of both the extension of moral worth and the attribution of minds.

Keywords: Moral circles; Moral worth; Anthropomorphism; Dehumanization; Mind attribution; Zero-sum bias

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1. Introduction

Once, long ago, we cared only for ourselves and our families. We eventually began to show moral concern for friends and neighbors. Gradually, our circle of moral concern swelled until it encompassed a diverse swath of humankind, including strangers and foreigners. In modern times, our moral circle has ballooned so much that it has begun to contain the entirety of humanity as well as other highly sentient creatures. Our newly capacious moral circle is on its way to subsuming the entire conscious universe and perhaps even nonsentient entities.

This tale of the expanding moral circle has gained considerable traction in recent decades (e.g., Bloom, 2004; Pinker, 2011; Singer, 1981). Compelling historical, anthropological, and psychological evidence supports the idea that the extension of moral worth often proceeds by stretching outward from the self toward increasingly dissimilar entities and ontologically distant objects. Such patterns of moral valuation can be metaphorically demarcated by “circles” demarcating boundaries of moral concern, which can accumulate new concentric “rings” in a predictable and perhaps universally applicable fashion. This schema has productively served as the bedrock for research on ascriptions of moral rights and obligations (e.g., Bastian, Costello, Loughnan, & Hodson, 2012; Bratanova, Loughnan, & Gatersleben, 2012; Crimston, Bain, Hornsey, & Bastian, 2016, 2018a; Laham, 2009; Neldner, Crimston, Wilks, Redshaw, & Nielsen, 2018; Reed & Aquino, 2003; Waytz, Iyer, Young, Haidt, & Graham, 2019; also see Crimston, Hornsey, Bain, & Bastian, 2018b; Graham, Waytz, Meindl, Iyer, & Young, 2017). However, despite the considerable explanatory power provided by the concept of the moral circle, we argue that previous characterizations of the anatomy of moral concern have been incomplete.

We hypothesize that the scope of moral concern is not always easily characterized as consisting of accretions of concentric rings. Instead, circles of moral concern may often be non-concentric, particularly at the margins of moral concern. In this paper, we explore the possibility that some people are “human-lovers” (who, as predicted by the model of the expanding moral circle, value human outgroup members to a greater extent than animals and the natural world), while other people are “tree-huggers” (who defy the model of the expanding moral circle by morally prioritizing animals and the natural world above human outgroup members). We additionally examine how differences in the attribution of mental capacities can partially explain tendencies to extend greater moral worth to animals and ecosystems than to marginalized or stigmatized persons.

1.1. *The finitude of moral concern*

The typical representation of moral expansiveness posits that humans have the capacity for a seemingly limitless reservoir of moral value. This is consistent with macro-level examinations that argue that moral circles are clearly expanding across historical time (e.g., Pinker, 2011). Despite a common notion that these historical trends should be recapitulated in ontogeny, such that individuals’ moral circles grow during the lifespan, this has not been borne out by recent research.

During the course of childhood, the moral circle does not expand to increasingly include more dissimilar entities. In forced-choice tasks where participants are made to choose between saving humans and saving animals, relative value for animals gradually *decreases* between childhood and adulthood (Wilks, Caviola, Kahane, & Bloom, 2021). In non-forced-choice tasks, overall moral expansiveness does not vary across child development. Rather, the patterning of moral valuation changes—such that certain entities (e.g., stigmatized individuals) become valued more highly with increasing age and other entities (e.g., cats) become devalued with increasing age, and levels of moral concern become more graded (Neldner et al., 2018). This finding suggests that there may be a “conservation” of moral concern, such that changes in moral value are frequently characterized by a reallocation of moral priorities rather than an expansion of overall moral valuation.

Pragmatically, of course, certain contexts necessarily preclude moral concern from being distributed in a non-zero-sum fashion. Many moral conflicts take the form of dilemmatic trade-offs in which certain entities must be prioritized, such as when humans and animals compete for the same resources (Opotow, 1993) or when human pleasures must be restricted to curtail environmental destruction. Thus, although some have claimed that valuing non-human nature in no way precludes valuing humanity (e.g., Vucetich, Bruskotter, & Nelson, 2015), this is plausible only in a constrained range of situations. Realistically, moral expansion will frequently entail scarcity and certain losses if resources cannot expand to meet the needs of a growing number of morally worthy recipients (Bastian & Crimston, 2016; Crosby & Lubin, 1990). Having an extremely large circle of moral concern (including rocks, stem cells, and the like) could actually lead to morally regressive resolutions of dilemmas (Bloom, 2004).

However, even in contexts that have the potential to be non-zero-sum, there is reason to expect that people will continue to perceive moral value as a limited resource. A pervasive bias to believe that most situations are zero-sum has been documented in disparate other domains (Bazerman, 1983; Meegan, 2010; Norton & Sommers, 2011; Pilditch, Fenton, & Lagnado, 2019) and may be a general feature of social reasoning (Różycka-Tran, Boski, & Wojciszke, 2015). Given that moral cognition often recruits aspects of general-purpose cognition (Miller & Cushman, 2018), a zero-sum bias can also be expected to emerge in the moral domain.

Supportive evidence for this claim comes from findings that enlarging the breadth of moral concern is often associated with sacrificing the depth of moral concern. Even though political conservatives have more constricted moral circles than political liberals, liberals and conservatives differ primarily in the targets of their moral concern rather than in their aggregate levels of moral concern. Specifically, when asked to allocate “moral units” among a range of entities, conservatives allocate relatively more to humans and liberals allocate relatively more to nonhumans, but both political parties expend similar amounts of moral units—regardless of whether these units are presented as finite or infinite (Waytz et al., 2019). This pattern is replicated in actual charitable donations, with liberals spreading contributions across many charities and conservatives donating to relatively few organizations, but with similar amounts of money being donated across the political spectrum (Farmer, Kidwell, & Hardesty, 2020). This evidence indicates that expanding moral concern to certain entities does not typically involve simple addition, but rather involves a restructuring of how moral concern is allocated.

Thus, moral concern is frequently treated as a limited resource, even when it need not be, such that people are biased to believe that ascriptions of moral value must be distributed in a zero-sum fashion regardless of situational constraints. If people perceive themselves to possess a finite “quota” of moral value, such that they reallocate a relatively fixed amount of moral concern when certain entities gain or lose moral standing (Neldner et al., 2018), the model of the expanding moral circle provides an incomplete picture of how moral change could occur. Of direct relevance here, measuring total amounts of moral concern may fail to account for critical variation in how different people allocate moral value to different entities. A full picture of the scope of moral concern may require a more fine-grained partitioning.

1.2. *Measuring moral worth*

There is a reliable overall tendency for people to assign greater moral value to outgroup members and stigmatized individuals than to nonhuman animals and other constituents of the natural world (Crimston et al., 2016). However, research to date has only tackled aggregate examinations of attributions of moral worth. Here, we take a more granular approach by studying individual differences in patterns of moral valuation across specific ontological categories.

Theoretical and empirical characterizations of the moral circle have presumed that concerns for different kinds of entities are tightly aligned. For example, greater concerns for animals and nature should be associated with greater concerns for marginalized and stigmatized humans (see Amiot & Bastian, 2015). Several recent studies have corroborated this prediction. In particular, “speciesist” notions that nonhuman animals are intrinsically less valuable than humans are aligned with tendencies to devalue outgroups, meaning that people who are less prejudiced toward humans also tend to be less prejudiced toward nonhuman animals (Caviola, Everett, & Faber, 2019; Dhont, Hodson, Costello, & MacInnis, 2014). Additionally, experimentally inducing people to think about animals as similar to humans increases moral concern for both animals and outgroup members (Bastian et al., 2012; also see Costello & Hodson, 2010). In sum, there is compelling evidence that moral valuation of animals and outgroups will often be positively related. More concretely, if Jill cares about saving rhinoceroses more than Jack, we can confidently wager that Jill will also care about the rights of immigrants more than Jack.

However, this coarse-grained level of comparison may conceal fine-grained differences in patterns of relative intraindividual valuation. That is, even if Jill has a more expansive moral circle than Jack, Jill may care relatively more about preserving vulnerable animal species than protecting the rights of vulnerable humans, while Jack may care relatively more about the latter. In many real-world cases in which people must choose whether to prioritize one aim over another (e.g., which charity to donate to or which political candidate to support), Jack could plausibly end up supporting humanitarian agendas more often than Jill, despite having a smaller overall moral circle. Therefore, we argue that a complete understanding of moral valuation requires an understanding of *granular* variation in the ascription of moral worth, which may be orthogonal to *coarse* variation (see Fig. 1 for a schematic). To our knowledge, this has never been systematically investigated.

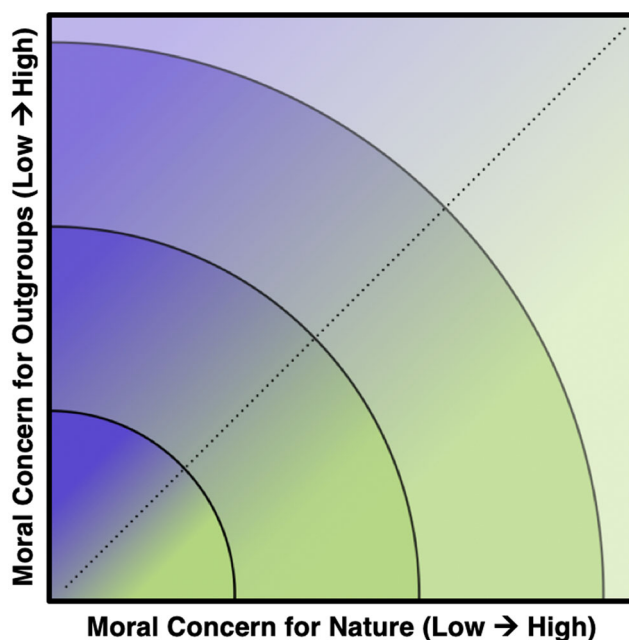


Fig. 1. Moral concern is often characterized in aggregate terms, moving from restricted to expansive (along the dotted line from lower-left to upper-right). However, at any level of moral expansiveness, it is conceivable that people could care more for human outgroups than for nature (represented by purple; upper-left) or relatively more for nature than for outgroups (represented by green; lower-right).

The elegant metaphor of a moral circle contains a latent assumption that individual differences will exist only at the level of aggregate patterns of valuation. If entities presumed to stably occupy “inner rungs” of the moral circle will be valued relatively more than entities presumed to stably occupy “outer rungs,” then relative patterns of valuation will not differ across people (e.g., humans will always be valued more than nonhumans). Challenging this presupposition, there are anecdotal exceptions to the generalization that moral concern spreads through reliable accretions of concentric moral circles. As an extreme example, proponents of the Voluntary Human Extinction Movement advocate the preservation of the biosphere at the cost of the persistence of the human species, such that the value placed on a typically distant rung of the moral circle overpowers the value placed on rungs that are typically classified as being more central. A tension between valuing nature and valuing humans also resurfaces in everyday conflicts. People working in the field of conservation—such as John Robinson, who urged the displacement of several thousand indigenous people living in Nagarhole National Park to protect approximately 40 tigers (Guha & Martinez-Alier, 1997)—are often reproached for caring more about animal welfare than social justice (see Heise, 2016). In hypothetical sacrificial dilemmas in which either a pet or a stranger can be saved from being hit by an oncoming vehicle, many people say they would save their pet (Topolski, Weaver, Martin, & McCoy, 2013), although this tendency declines significantly for others’

pets (Amiot, Sukhanova, & Bastian, 2020; Topolski et al., 2013) and is not as pronounced for other animal species (Petrinovich, O'Neill, & Jorgensen, 1993). Thus, even though many people care much more about humans than about nonhuman creatures and natural habitats, as evidenced by the devastating loss of biodiversity caused by people acting to benefit humanity through agriculture and other activities (Newbold et al., 2015), this is not a universal tendency. These exceptions necessitate a rethinking of the notion that people uniformly possess moral circles that neatly expand outward from the self.

1.3. *Moral worth relies on mind attribution*

Moral valuation generally entails personhood (e.g., Jaworska, 2007). Attributions of personhood are tightly entwined with attributions of mental capacities, and philosophical theories and folk intuitions converge in considering an entity to be worthy of moral concern to the extent that it has certain key psychological faculties, such as the ability to reason or the ability to suffer (e.g., Jack & Robbins, 2012; Sytsma & Machery, 2012; also see Goodwin, 2015; Gray, Young, & Waytz, 2012). Because mental capacities are hidden features that must be imperfectly inferred, there is often variation in the degree to which particular entities are attributed with various sensory, emotional, and rational abilities—and thus with moral worth (Waytz, Gray, Epley, & Wegner, 2010). Sometimes, mental capacities are over-attributed. Most frequently, this takes the form of ascribing human-like minds to nonhuman entities—a process that can be referred to as *anthropomorphism*. In other cases, mental capacities are under-attributed. Most frequently, this takes the form of failures to ascribe minds to humans—a process that can be referred to as *dehumanization*.¹

Anthropomorphism elevates moral concern. Guiding people to think about how animals are like humans increases their perceptions of animals' moral standing (Bastian et al., 2012) and their intentions to act prosocially toward these animals (Butterfield, Hill, & Lord, 2012). Moreover, experimentally manipulating perceptions of humanlike capacities in the natural world increases willingness to engage in conservation behaviors (Tam, Lee, & Chao, 2013). Although humanness is often operationalized in ways that extend beyond attributions of mental capacities, evidence suggests that these results are partially explained by increases in mind attribution (Bastian et al., 2012).

Dehumanization has the reverse effect; it strips away value and pushes people outside the boundaries of moral concern (Goff, Eberhardt, Williams, & Jackson, 2008; Loughnan et al., 2010; also see Haslam, 2006; Smith, 2011). Reduced perceptions of qualities related to human nature (i.e., qualities that are characteristic of humans, such as emotional responsiveness) decrease moral valuation, although this is not true of reduced perceptions of qualities related to human uniqueness (i.e., qualities that separate humans from other species, such as

¹ The terms “anthropomorphism” and “dehumanization” have diverse uses and do not always refer to attributions of mental capacities (Over, 2021). Given our focus, we generally restrict our usage of these terms to the process of mind attribution. Furthermore, dehumanization has been subdivided into a number of distinct processes, including animalistic dehumanization and mechanistic dehumanization (Haslam, 2006). Here, we do not distinguish between these different forms but instead focus on overall reductions in attributions of mental capacities.

civility) (Bastian, Laham, Wilson, Haslam, & Koval, 2011). Some research has suggested that dehumanization increases propensities to torture outgroup transgressors (Viki, Osgood, & Phillips, 2013) or to act cruelly more generally (see Bandura, 1999). However, other research has indicated that reduced perceptions of others' mental states do not increase morally motivated forms of violence but rather increase violence that entails using others as means to an end (Rai, Valdesolo, & Graham, 2017). Therefore, while there are nuances in the causes and effects of dehumanizing others, and there is not always a clear link between dehumanization and harmdoing (see Over, 2021), prejudice and maltreatment are generally heightened for groups that fail to elicit typical patterns of social cognition (Harris & Fiske, 2006).

In part because of their contrasting effects, dehumanization is often characterized as the opposite of anthropomorphism (e.g., Brandt & Reyna, 2011; Kwan & Fiske, 2008; Waytz, Epley, & Cacioppo, 2010). Indirect support of the claim that these phenomena are direct counterparts comes from research suggesting that the two processes have inverse causes (Waytz, Gray, et al., 2010). For example, social connectedness increases dehumanization (Waytz & Epley, 2012), while loneliness increases anthropomorphism (Epley, Akalis, Waytz, & Cacioppo, 2008). However, to our knowledge, previous empirical research has never investigated anthropomorphism and dehumanization concurrently. In the present research, we aimed to simultaneously measure tendencies for anthropomorphization and dehumanization and to examine how ascriptions of moral worth are related to each of these forms of mind attribution.

1.4. Overview of studies

Our hypotheses were threefold. First, we predicted that some individuals would ascribe greater moral value to nature than to outgroups, thus violating a key assumption that the figurative moral circle involves a set of universally applicable concentric rings. We did not seek to obtain a reliable estimate of the proportion of these individuals in the general population. Our samples are not representative of humanity at large, and we expect that cultural influences exert substantial effects on the extent to which individuals value nature more than outgroups. Instead, we aimed to determine whether such individuals exist *at all*, and whether (at least within online and university samples in the United States) they represent a subpopulation that is worthy of future investigation.

Second, contingent upon our first hypothesis being confirmed, we predicted that people who value nature more than outgroups (termed "tree-huggers") would have similar aggregate levels of moral expansiveness as people who value outgroups more than nature (termed "human-lovers"). That is, if moral value is treated as being zero-sum, and if moral circles do not entail concentric rings of moral concern, tree-huggers and human-lovers should differ in their respective patterning of allocating moral value across different entities without reliably differing in their overall allocations of moral value.

Third, we predicted that tree-huggers would have different patterns of mind attribution than human-lovers. Specifically, we expected tree-huggers to ascribe relatively more mind to animals as compared to human-lovers, and to ascribe relatively less mind to outgroups as compared to human-lovers (since they value animals relatively more than outgroups).

Somewhat paradoxically, this suggests that tree-huggers should be higher in tendencies toward anthropomorphism *and* in tendencies toward dehumanization.

Study 1 provides an initial test of these hypotheses. Study 2 serves as a replication, with improvements to our measures. Study 3 provides convergent validity by utilizing additional measures of moral worth. Hypotheses, methods, data collection procedures, exclusion criteria, and analyses for all studies were preregistered on the Open Science Framework (see <https://osf.io/g7z34>, <https://osf.io/zmesn>, and <https://osf.io/t8hpf>); however, several of the analyses we present here were added based on suggestions from the editor and reviewers. We report all measures and data exclusions either in the main text or in the Supplementary Materials. Our sample sizes in Studies 1 and 2 were powered to allow for approximately 10 times more participants than items in our scales as per a typical rule of thumb for factor analyses. We doubled our sample size in Study 3 to ensure high power.

2. Study 1

2.1. Method

2.1.1. Participants

Residents of the United States ($N = 199$; 106 female; 162 White; $M_{\text{age}} = 36.32$; $SD_{\text{age}} = 9.99$) were recruited via Amazon Mechanical Turk. An additional 51 participants were tested but excluded from analyses for providing incomplete data ($n = 3$) or for missing one or more preregistered attention checks that were distributed throughout the study ($n = 48$; see Supplementary Materials for details).

2.1.2. Materials and procedure

Participants were presented with a modified version of the Moral Expansiveness Scale (MES; Crimston et al., 2016), for which they assigned varying levels of moral worth to 10 entities representing people from groups that are frequently marginalized or stigmatized in American culture (e.g., an Arab; a schizophrenic individual)², and 10 entities representing animals or ecosystems (e.g., a parrot; a redwood forest); see Table 1 for a full list. Participants also rated the moral worth of three entities representing close others (a family member, a close friend, and a partner/spouse) and three entities representing artificial intelligence (a supercomputer, an intelligent robot, and a self-driving car), which served as control items meant to anchor judgments. Participants were instructed to place each entity into one of four graded categories: inner circle of moral concern, outer circle of moral concern, fringes of moral concern, or outside the moral boundary, each of which was given a detailed definition (see Crimston et al., 2016).

² Throughout the paper, we frequently refer to these individuals as outgroup members. However, we acknowledge that this is not necessarily accurate for the entirety of our samples, as some participants may have belonged to one or more of these marginalized groups. Because we think it is likely that these numbers were small, and because even people with stigmatized identities sometimes harbor biases against the socially marginalized groups to which they belong (Jost, Banaji, & Nosek, 2004), we did not seek to exclude these participants from analyses.

Table 1
Factor loadings (above 0.32) for the Moral Expansiveness Scale items, across all three studies

	Study 1		Study 2		Study 3	
	Factor 1: nature	Factor 2: outgroups	Factor 1: nature	Factor 2: outgroups	Factor 1: nature	Factor 2: out- groups
Monkey	0.86		0.71		0.76	
Dolphin	0.91		0.76		0.75	
Parrot	0.86		0.73		0.74	
Polar bear	0.95		0.76		0.83	
Lizard	0.81		0.71		0.75	
National park	0.68		0.93		0.85	
Coral reef	0.77		0.90		0.85	
Redwood forest	0.79		0.97		0.88	
Rainforest	0.78		1.00		0.88	
River	0.80		0.83		0.82	
Member of opposing political party		0.77		0.82		0.80
Somebody with different religious beliefs		0.79		0.91		0.81
Transgender individual		0.71		0.74		0.72
Scientologist		0.73		0.78		0.69
Arab		0.81		0.84		0.83
Uneducated individual		0.75		0.85		0.83
Drug addict		0.77		0.74		0.81
Schizophrenic individual		0.80		0.80		0.77
Undocumented immigrant		0.83		N/A		N/A
Ku Klux Klan member		0.59		N/A		N/A
Native American		N/A		0.72		0.72
Polygamist		N/A		0.73		0.67

Although there are many existing measures of anthropomorphism and dehumanization, they all focus either on one process or the other rather than using similar questions to investigate mind attribution for both humans and nonhumans. Additionally, many widely used measures do not focus specifically on mind attribution, but rather investigate other aspects of humanness or animality. Because no previous scale has measured individual differences in attributions of psychological capacities in a way that simultaneously taps both anthropomorphism and dehumanization, thus allowing for psychometric factors to be equated across both

forms of mind attribution, we developed an original scale for this purpose (see Tables S1–S3 and Appendix A).

Our novel Measure of Mind Attribution (MoMA) assessed attributions of various psychological capacities to 10 humans who are frequently victims of denigration in American culture and 10 animals (e.g., “A Mexican has the ability to empathize with others”; “An elephant can experience pleasure”), as well as to three close others and three artifacts (which served as attention checks). Importantly, with the exception of a self-driving car and a close friend (both anchor targets in the MES), none of the entities that were included in this scale matched those used in the MES. This scale was adapted from the Individual Differences in Anthropomorphism Questionnaire (IDAQ; Waytz, Cacioppo, & Epley, 2010), which asks about attributions of mental capacities in a range of nonhuman entities and objects (e.g., “To what extent do cows have intentions?”; “To what extent does the average insect have a mind of its own?”) but was extended to also measure attributions of mental capacities in a range of marginalized or stigmatized humans. Although some previous work has investigated anthropomorphism of the natural world, including trees (Gebhard, Nevers, & Billmann-Mahecha, 2003) and the entire planet (Sacchi, Riva, & Brambilla, 2013; Tam et al., 2013), we considered it unlikely that participants would reliably attribute mental states to nonsentient entities, and we thus opted to constrain our nonhuman targets on the MoMA to animals.

To assess the concurrent validity of the MoMA, we also administered two previously validated scales. As a standard measure of anthropomorphism, we used the IDAQ, for which participants rated whether a range of nonhuman entities and objects have mental capacities on a 1 (not at all) to 10 (very much) scale (Waytz, Cacioppo, et al., 2010). An anthropomorphism score was computed by averaging across the 15 items on this scale. As a measure of dehumanization, we used the Ascent of Humans Measure of Blatant Dehumanization (Kteily, Bruneau, Waytz, & Cotterill, 2015), which assesses attributions of humanness by presenting participants with five silhouettes of primates, progressing from a chimpanzee-like ape to a bipedal modern human, and asks participants to rate the extent to which an average member of varying ethnic or national groups is “evolved” by using a 0–100 slider scale. Participants were asked to rate an American, European, Japanese, Australian, Chinese, Jew, North Korean, Mexican immigrant, Arab, and Muslim. Because the last four groups are the most commonly dehumanized (as borne out by our data), we subtracted each participant’s rating for each of these groups from their rating for the American, and then averaged these four difference scores to produce a dehumanization score.

Because mind attribution is often a motivated process, such that entities which are regarded positively are more likely to be attributed with mental capacities than entities which are regarded neutrally or negatively (e.g., Kozak, Marsh, & Wegner, 2006), we also administered a measure to control for general, nonmoral positivity toward the entities evaluated in the MES and the MoMA. In this “General Positivity Measure,” participants were asked how positively they regarded each of the 40 target entities across the two tasks, using a seven-point scale ranging from extremely negative to extremely positive. We additionally administered a trait disgust scale, a trait awe scale, and a measure on which participants identified their preferred charitable organizations; however, as these three measures did not directly test our hypotheses, we include details of the methods and findings in the Supplementary Materials.

2.2. Factor structure and scoring of scales

2.2.1. Moral Expansiveness Scale

Responses on our adapted version of the MES (overall $\alpha = 0.96$) were scored such that the assignment of an entity to the inner circle of moral concern received three points, assignment to the outer circle of moral concern received two points, assignment to the fringes of moral concern received one point, and assignment outside the moral boundary received zero points.

A factor analysis of the 20 primary items (excluding close others and artificial intelligence) was conducted to determine whether the valuation of marginalized and stigmatized humans was distinct from the valuation of animals and nature. While both three-factor and two-factor solutions were warranted by different factor selection criteria (see the Supplementary Materials for details), we opted to retain a two-factor solution. The five animals and the five ecosystems all loaded together ($\alpha = 0.96$; loadings ranged from 0.68 to 0.95), and the 10 outgroup members all loaded onto a separate factor ($\alpha = 0.93$; loadings ranged from 0.59 to 0.83; see Table 1). We computed two composite variables indicating the perceived moral worth of outgroups and nature by averaging across the 10 items on each factor.

To obtain a measure of aggregate moral valuation, an overall Moral Expansiveness score was computed for each participant by tabulating the total number of points for all 26 entities (such that the MES score could range from 0 to 78, with higher scores indicating higher levels of moral valuation). The sample had a mean overall moral expansiveness score of 37.52 ($SD = 11.77$). To obtain a measure of granular differences in moral valuation, a Relative Value score was computed by subtracting the points for the 10 marginalized/stigmatized human items from the points for the 10 animal/nature items, thus providing a continuous difference score indicating relative tendencies to value nature over outgroups ($M = -0.09$, $SD = 0.74$).

2.2.2. Measure of mind attribution

Responses on the MoMA (overall $\alpha = 0.88$) were scored by averaging across the 20 items on the scale (excluding attention checks), such that scores could range from 1 to 7. Overall, attributions of mental states were high ($M = 5.82$; $SD = 0.70$). Although the scale had a negative skew, the overall skewness value (-0.40) was not problematic.

A factor analysis of the 20 scale items was conducted to determine whether mind attribution for marginalized and stigmatized humans was distinct from mind attribution for animals. Again, both three-factor and two-factor solutions were warranted by different factor selection criteria (see Supplementary Materials for details), and we again opted to retain a two-factor solution to maximize interpretability. The 10 animals loaded onto one factor ($\alpha = 0.90$; loadings ranged from 0.54 to 0.80) and the 10 marginalized humans loaded onto a separate factor ($\alpha = 0.87$; loadings ranged from 0.38 to 0.83; see Table S1). We computed two composite variables indicating attributions of mental capacities to animals and attributions of mental capacities to outgroups by averaging across the 10 items on each factor. Overall, while mind attribution for outgroups and mind attribution for animals were positively related, $r(197) = .24$, $p = .001$, the correlation between the subscales was modest, indicating that anthropomorphism and dehumanization are not pure inverses.

To determine the concurrent validity of this scale, we compared the average scores on each subscale of the MoMA to previously validated measures of anthropomorphism and dehumanization. In line with our expectations, the IDAQ was highly correlated with the MoMA for animal targets, $r(197) = .50$, $p < .001$, but not for human targets, $r(197) = -.03$, $p = .703$ (the latter relationship was statistically equivalent to zero given a smallest effect size of interest (SESOI) of $r = .23$, $p = .002$). The Ascent of Humans measure was highly correlated with the MoMA for human targets, $r(197) = -.32$, $p < .001$, and much less so for animal targets, $r(197) = -.15$, $p = .040$. There was a significant difference between the first pair of correlations (with the IDAQ), $z = 5.73$, $p < .001$, but only a marginally significant difference between the second pair of correlations (with the Ascent of Humans measure), $z = 1.79$, $p = .074$.

2.3. Primary results

2.3.1. Do some people value nature more than outgroups?

Although the perceived moral worth of marginalized/stigmatized humans was correlated with the perceived moral worth of animals and nature, $r(197) = .39$, $p < .001$, people tended to value one of these groups more than the other. Participants were categorized as tree-huggers or human-lovers (or as having equal value for both sets of entities) according to whether the sum of their points for the 10 animal/nature items was greater than or less than (or equal to) the sum of their points for the 10 marginalized/stigmatized human items.³ Affirming our first hypothesis that some people would value nature more than outgroups, 91 participants were categorized as tree-huggers, while 96 participants were categorized as human-lovers, and 12 participants valued both entity types equally. Tree-huggers valued nature ($M = 1.66$, $SD = 0.61$) significantly more than outgroups ($M = 1.11$, $SD = 0.56$), $t(90) = 12.46$, $p < .001$, $d = 1.31$, and human-lovers valued outgroups ($M = 1.75$, $SD = 0.55$) significantly more than nature ($M = 1.05$, $SD = 0.58$), $t(95) = 15.03$, $p < .001$, $d = 1.53$. A visualization of tree-huggers' and human-lovers' moral valuation of the different entities is presented in Fig. 2.

2.3.2. Is moral worth attributed in a zero-sum manner?

Consistent with our second hypothesis, tree-huggers and the human-lovers did not differ in overall levels of moral expansiveness, $t(181.5) = 0.03$, $p = .976$, $d = 0.00$. An equivalence test with a SESOI of $d = 0.48$ ⁴ confirmed the absence of a meaningful effect, such that the two groups can be said to be statistically equivalent, $t(181.5) = 3.25$, $p < .001$ (see Fig. 3). Thus, despite tree-huggers valuing nature highly—significantly more than human-lovers, $t(183.1) = 7.01$, $p < .001$, $d = 1.03$ —they did not value all entities highly, but rather valued outgroups significantly less than human-lovers, $t(184.1) = -7.96$, $p < .001$, $d = 1.16$. This evidence

³ We did not consider participants' valuation for close others or artificial intelligence when creating these groupings. However, it is worth noting that both human-lovers and tree-huggers had very similar scores for these two entity types, indicating that tree-huggers ascribe a great deal of moral value to certain humans and do not ascribe value to all nonhuman entities.

⁴ Here and elsewhere, the SESOI was determined by a post-hoc power analysis determining the smallest effect size that was detectable with 90% power (see Lakens, Scheel, & Isager, 2018).

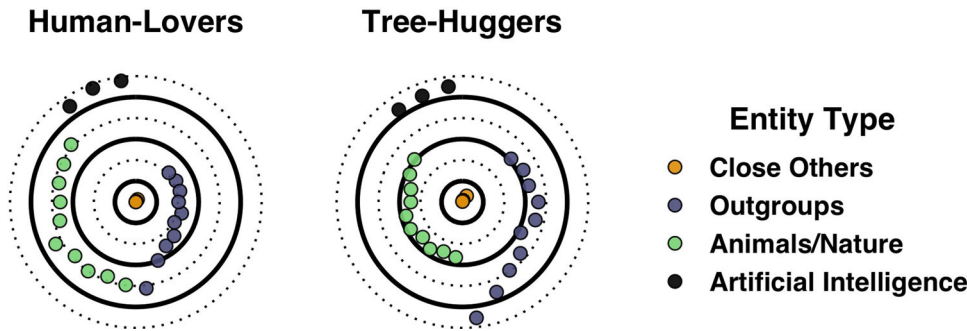


Fig. 2. A schematic indicating the placement of each entity within the moral circles in the Moral Expansiveness Scale (MES) task in Study 1. Values closest to the center are highest. Solid circles indicate the boundaries dividing each level of moral concern (inner circle of moral concern: 3–2.5; outer circle of moral concern: 2.5–1.5; fringes of moral concern: 1.5–0.5; outside the moral boundary: 0.5–0); dotted circles indicate integer values.

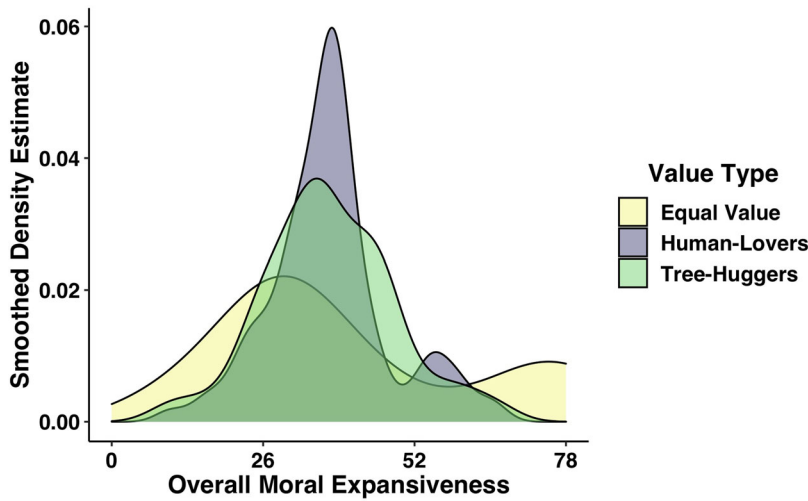


Fig. 3. Kernel density estimation plot indicating the relative frequencies of each level of moral expansiveness, split across tree-huggers, human-lovers, and participants with equal value.

supports the view that moral valuation involves hydraulic trade-offs, in which valuing one category of entities entails devaluing another category of entities in a zero-sum fashion.

To determine the extent to which measuring granular patterns of moral valuation offers distinct insights from measuring aggregate levels of moral evaluation, we examined whether the Relative Value score was orthogonal to the overall Moral Expansiveness score. As expected, participants' relative valuation of nature and outgroups was not indicative of the size of their aggregate moral circles, $r(197) = .06, p = .376$.

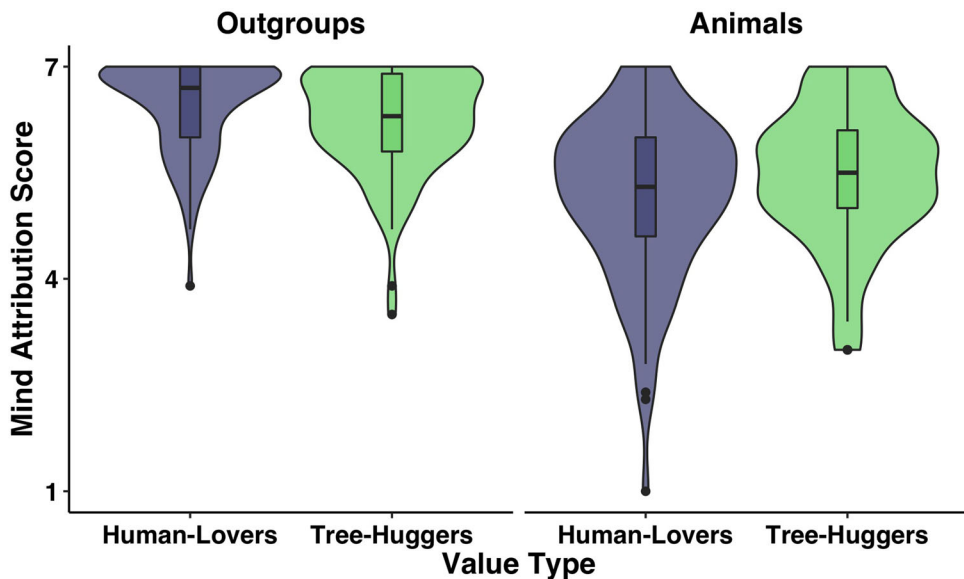


Fig. 4. Violin plots (with embedded boxplots) representing probability densities for ratings of mind in Study 1, split by entity type (outgroups and animals) and value type (human-lovers and tree-huggers), demonstrating that tree-huggers have relatively lower mind attribution for outgroup members and relatively higher mind attribution for animals.

2.3.3. Do anthropomorphism and dehumanization predict valuing nature more than outgroups?

Composite scores on the MoMA were positively correlated with composite MES scores, $r(197) = .24$, $p < .001$, replicating previous findings that mind attribution and moral concern tend to align (e.g., Crimston et al., 2016; Gray, Gray, & Wegner, 2007). However, in line with our third hypothesis, tree-huggers had relatively elevated tendencies toward both anthropomorphism and dehumanization, such that they attributed more similar mental abilities to outgroup members and animals than did human-lovers (see Fig. 4). A linear regression (excluding participants who valued outgroups and nature equally) confirmed that there was a significant interaction between entity type (outgroups vs. animals) and value type (human-lovers and tree-huggers), $b = -0.52$ ($SE = 0.18$), $p = .005$. Subsequent simple contrasts indicated that tree-huggers were higher than human-lovers in attributions of mind to animals, $b = 0.30$ ($SE = 0.13$), $p = .024$, and marginally lower than human-lovers in attributions of mind to outgroup members, $b = -0.23$ ($SE = 0.13$), $p = .086$.

In order to look at the data in a slightly different way, we explored whether different forms of mind attribution predict tendencies to value nature more than outgroups. A linear regression was conducted in which the Relative Value score was regressed onto the MoMA scores for outgroups and animals. This yielded a significant model, $F(2, 196) = 3.93$, $p = .021$, $R^2 = .04$. Higher attributions of mind to animals positively predicted higher valuation of nature over outgroups, $b = 0.11$ ($SE = 0.05$), $p = .026$, whereas higher attributions of mind to outgroup

members negatively predicted higher valuation of nature over outgroups, $b = -0.17$ ($SE = 0.08$), $p = .031$.

When controlling for General Positivity toward nature and toward outgroups, higher attributions of mind to animals no longer predicted higher valuation of nature over outgroups, $b = 0.04$ ($SE = 0.05$), $p = .380$, but higher attributions of mind to outgroup members continued to negatively predict higher valuation of outgroups over nature, $b = -0.16$ ($SE = 0.08$), $p = .040$. Overall positivity toward nature, $b = 0.28$ ($SE = 0.06$), $p < .001$, and overall positivity toward outgroups, $b = -0.14$ ($SE = 0.05$), $p = .006$, were each highly predictive of valuing nature over outgroups, in opposing directions.

When instead controlling for demographic variables—gender, age, income level, religiosity, and political conservatism—attributions of mind to animals continued to positively predict a higher valuation of nature over outgroups, $b = 0.11$ ($SE = 0.05$), $p = .041$, and attributions of mind to outgroup members continued to negatively predict a higher valuation of nature over outgroups, though this became marginal, $b = -0.15$ ($SE = 0.08$), $p = .076$. Additionally, increased age positively predicted valuing nature over outgroups, $b = 0.01$ ($SE = 0.01$), $p = .029$. There was also a trend toward participants identifying as male having a lower relative value of nature over outgroups than participants identifying as female, $b = -0.18$ ($SE = 0.11$), $p = .097$. Income level, religiosity, and political conservatism were not predictive of the Relative Value score, $ps > .40$.

Finally, a regression analysis predicting the Relative Value score from the IDAQ and Ascent of Humans scores was significant, $F(2, 196) = 4.38$, $p = .014$, $R^2 = .04$. Using these previously validated measures, tendencies to anthropomorphize predicted higher valuation of nature over outgroups, $b = 0.13$ ($SE = 0.04$), $p = .004$, but tendencies to dehumanize did not significantly predict Relative Value scores, $b = 0.002$ ($SE = 0.003$), $p = .542$.

2.4. Discussion

Study 1 confirmed that some people harbor less moral concern for outgroup members than for animals and ecosystems. These individuals, who we classify here as tree-huggers, were not rare anomalies but instead comprised 46% of our sample. Of course, our online sample of participants from the United States is not representative of humanity at large. Even though demographic characteristics such as religiosity and conservatism did not differentiate tree-huggers from human-lovers, these results should not be extrapolated to indicate that nearly half of people value nature over outgroup members. On the contrary, we would predict substantial variation in the proportion of tree-huggers across societies. Instead, these findings serve as an “existence proof” that some people’s attributions of moral worth defy the typical characterization of the moral circle, which suggests that humanity will be pervasively valued more than nonhumans. Furthermore, our finding that tree-huggers did not have higher overall levels of moral expansiveness than human-lovers contradicts an additional characterization of the moral circle: The assumption that people who value nature highly should be more morally expansive than people who do not value nature highly. This study, therefore, confirmed that patterns of fine-grained intraindividual differences in relative moral valuation are worthy of experimental investigation.

Using a novel scale, the MoMA, we found that valuing animals and nature relatively more than marginalized/stigmatized humans was predicted by higher tendencies to anthropomorphize (i.e., relatively higher attributions of mental capacities to animals) *and* by higher tendencies to dehumanize (i.e., relatively lower attributions of mental capacities to outgroups).⁵ However, these relationships were relatively weak. Additionally, our novel measure of anthropomorphism was no longer predictive when controlling for overall positivity toward animals and ecosystems, and a previously validated measure of dehumanization was not predictive of relative patterns of valuation, indicating a need for replication. The primary aim of Study 2 was to conduct this replication, with important refinements made to our measures.

3. Study 2

Study 2 directly replicated Study 1, with three notable changes. First, two items on our modified MES were replaced in an attempt to further improve the internal consistency of this measure. Second, because responses on the MoMA clustered near the top of the scale in Study 1, we expanded the range by using a nine-point slider scale in Study 2 and made a number of changes to the wording of the specific items to further reduce ceiling-level responding. Third, because the General Positivity measure was perhaps too strong of a covariate, given that it measured positivity and antipathy toward the same 40 entities that were featured in the MES and in the MoMA, we instead included different covariates that tapped a more general affinity for nature or “biophilia” (see Kellert & Wilson, 1993) and a more general dislike of humans or “misanthropy” (see Rosenberg, 1956).

3.1. Method

3.1.1. Participants

Residents of the United States ($N = 224$; 107 female, one nonbinary; 162 White; $M_{\text{age}} = 36.57$; $SD_{\text{age}} = 11.02$) were recruited via Amazon Mechanical Turk. An additional 28 participants were tested but excluded from analyses for providing incomplete data ($n = 1$) or for missing one or more preregistered attention checks ($n = 27$; see Supplementary Materials for details).

3.1.2. Materials and procedure

The MES and MoMA were again included as the primary foci of Study 2, with the alterations noted above. The IDAQ and Ascent of Humans measures, along with the Charity measure (see Supplementary Materials), were also retained to further test the validity of our findings. In place of the General Positivity measure, we included Perkins’s (2010) 15-item measure of Biophilia (e.g., “I feel a personal sense of interconnectedness with the rest of nature”) as well as Rosenberg’s (1956) five-item measure of Misanthropy (e.g., “If you don’t

⁵ Tendencies to value nature more than outgroups were also positively predicted by both trait disgust and trait awe; see Supplementary Materials for details.

watch yourself, people will take advantage of you"). For both of these measures, participants expressed their agreement on a seven-point Likert scale.

3.2. Factor structure and scoring of scales

3.2.1. Moral expansiveness scale

Responses were scored as in Study 1. A factor analysis of the 20 primary items, constrained to a two-factor solution, replicated the pattern of factor loadings from Study 1 (see Table 1), with all nature items loading together ($\alpha = 0.96$; loadings ranged from 0.71 to 1.00) and all marginalized human items loading together ($\alpha = 0.94$; loadings ranged from 0.72 to 0.91).

To obtain an aggregate measure of moral valuation, an overall Moral Expansiveness score was again computed for each participant by summing the total number of points for all 26 entities ($M = 39.45$, $SD = 12.63$). To obtain a granular measure of moral valuation, a Relative Value score was again computed by subtracting the points for the 10 marginalized human items from the points for the 10 animal/nature items, thus providing a continuous difference score indicating relative tendencies to value nature over outgroups ($M = -0.23$, $SD = 0.82$).

3.2.2. Measure of mind attribution

Responses on the MoMA were scored as in Study 1 but with scores ranging from 1 to 9. Overall, attributions of mental states were high ($M = 7.42$; $SD = 1.16$). Although the data had a negative skew, the overall skewness value (-0.81) was not problematic. A factor analysis of the 20 scale items of interest, constrained to a two-factor solution, found that the 10 marginalized and stigmatized humans loaded onto one factor ($\alpha = 0.84$; loadings ranged from 0.34 to 0.75), while the 10 animals loaded onto a second factor ($\alpha = 0.91$; loadings ranged from 0.56 to 0.80; see Table S2). As in Study 1, while mind attribution for outgroup members and animals were related, $r(222) = .30$, $p < .001$, the correlation was far from perfect, again indicating that anthropomorphism and dehumanization are not polar opposites.

The MoMA demonstrated strong concurrent validity. The IDAQ was highly correlated with the MoMA for animal targets, $r(222) = .62$, $p < .001$, but not for human targets, $r(222) = -.07$, $p = .296$ (the latter relationship was statistically equivalent to zero given a SESOI of $r = .22$, $p = .011$). The Ascent of Humans measure was correlated with the MoMA for human targets, $r(222) = -.36$, $p < .001$, but not for animal targets, $r(222) = -.10$, $p = .138$ (the latter relationship was statistically equivalent to zero given a SESOI of $r = .22$, $p = .032$). Each of these pairs of correlations was significantly different from one another, $z_s > 2.9$, $ps < .005$. Therefore, the double dissociation suggested by the Study 1 results was fully apparent in the Study 2 dataset.

3.3. Primary results

3.3.1. Do some people value nature more than outgroups?

The perceived moral worth of outgroup members was again correlated with the perceived moral worth of animals and nature, $r(222) = .37$, $p < .001$, but as in Study 1, participants tended to value one of these groups more than the other. Confirming our first hypothesis that moral value is not always extended in accordance with a universally applicable series

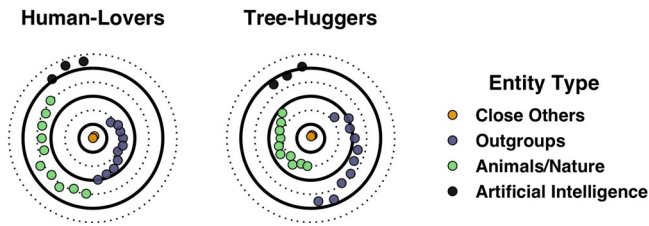


Fig. 5. A schematic indicating the placement of each entity within the moral circles in the MES task in Study 2. Values closest to the center are highest. Solid circles indicate the boundaries dividing each level of moral concern (inner circle of moral concern: 3–2.5; outer circle of moral concern: 2.5–1.5; fringes of moral concern: 1.5–0.5; outside moral boundary: 0.5–0); dotted circles indicate integer values.

of concentric rings, 75 participants in our sample were categorized as tree-huggers (as they assigned more moral worth to the animal/nature items than to the marginalized/stigmatized human items on the MES). A total of 122 participants were categorized as human-lovers, and 27 participants valued both groups equally. Tree-huggers valued nature ($M = 1.87$, $SD = 0.61$) significantly more than outgroups ($M = 1.24$, $SD = 0.63$), $t(74) = 10.97$, $p < .001$, $d = 1.27$, and human-lovers valued outgroups ($M = 1.86$, $SD = 0.61$) significantly more than nature ($M = 1.05$, $SD = 0.61$), $t(121) = 17.08$, $p < .001$, $d = 1.55$. A visualization of tree-huggers' and human-lovers' moral valuation of the different entities is presented in Fig. 5.

3.3.2. Is moral worth attributed in a zero-sum manner?

Consistent with Study 1 and in support of our second hypothesis, the tree-huggers and the human-lovers did not significantly differ in their overall levels of moral expansiveness, $t(147.2) = -1.57$, $p = .119$, $d = 0.23$. However, as there was a slight trend for tree-huggers to have higher MES scores, the difference between the two groups cannot be confidently said to be statistically equivalent to zero; an equivalence test with a SESOI of $d = 0.47$ was only marginally significant, $t(147.2) = 1.61$, $p = .055$ (see Fig. 6). Overall, despite tree-huggers valuing nature highly—significantly more than human-lovers, $t(158.4) = 9.28$, $p < .001$, $d = 1.36$ —they did not value all entities highly but valued outgroups significantly less than human-lovers, $t(153.7) = -6.79$, $p < .001$, $d = 1.00$. As in Study 1, the Relative Value score was not significantly correlated with the overall Moral Expansiveness score, $r(222) = .08$, $p = .217$, indicating that there is a perceived trade-off between valuing nature and valuing humans.

3.3.3. Do anthropomorphism and dehumanization predict valuing nature more than outgroups?

Composite scores on the MoMA were positively correlated with composite MES scores, $r(222) = .34$, $p < .001$. However, in support of our third hypothesis that relative patterns of moral valuation would entail relative differences in mind attribution, tree-huggers again had relatively elevated tendencies to attribute mental capacities to animals and relatively diminished tendencies to attribute mental capacities to outgroup members (see Fig. 7). A linear

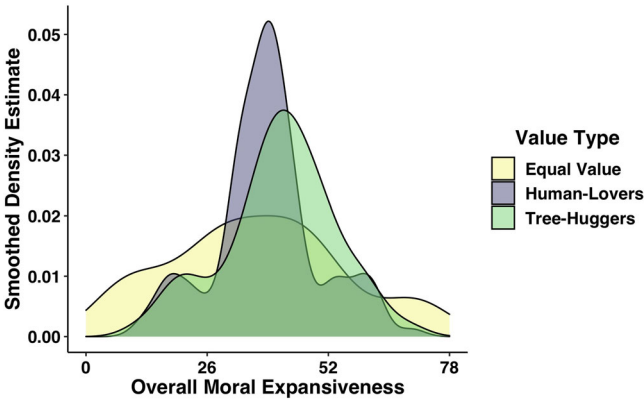


Fig. 6. Kernel density estimation plot indicating the relative frequencies of each level of moral expansiveness, split across tree-huggers, human-lovers, and participants with equal value.

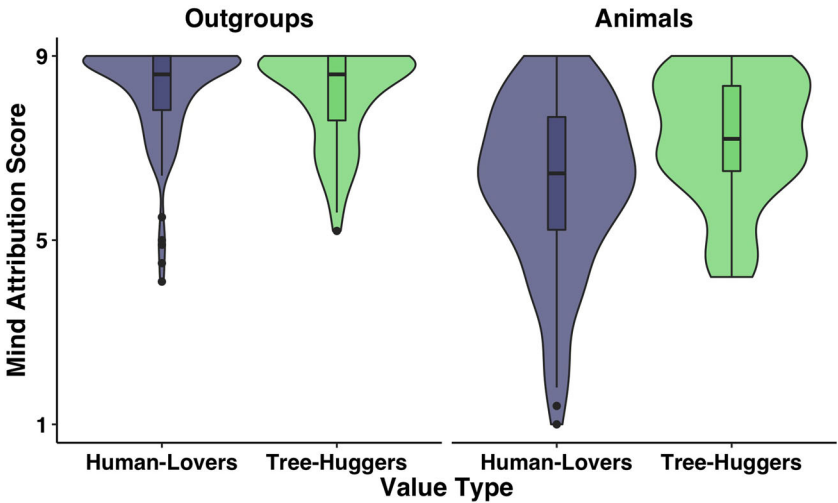


Fig. 7. Violin plots (with embedded boxplots) representing probability densities for ratings of mind in Study 2, split by entity type (outgroups and animals) and value type (human-lovers and tree-huggers), demonstrating that tree-huggers have relatively lower mind attribution for outgroup members and relatively higher mind attribution for animals.

regression (excluding participants who valued outgroups and nature equally) confirmed that there was a significant interaction between entity type (outgroups vs. animals) and value type (human-lovers and tree-huggers), $b = -1.10$ ($SE = 0.29$), $p < .001$. Subsequent simple contrasts indicated that tree-huggers were higher than human-lovers in their attributions of mind to animals, $b = 0.98$ ($SE = 0.20$), $p < .001$, although they were not significantly lower than human-lovers in their attributions of mind to outgroup members, $b = -0.13$ ($SE = 0.20$), $p = .540$.

To determine whether different forms of mind attribution predicted tendencies to value nature over outgroups, we again conducted a linear regression predicting the Relative Value score from the MoMA score for outgroups and animals. Consistent with Study 1, this yielded a significant model, $F(2, 221) = 17.39$, $p < .001$, $R^2 = .14$. Higher attributions of mind to animals positively predicted higher valuation of nature over outgroups, $b = 0.17$ ($SE = 0.03$), $p < .001$, whereas higher attributions of mind to outgroup members negatively predicted higher valuation of nature over outgroups, $b = -0.17$ ($SE = 0.05$), $p = .002$. Furthermore, these relationships held even when controlling for Biophilia and Misanthropy; attributions of mind to animals: $b = 0.14$ ($SE = 0.03$), $p < .001$; attributions of mind to outgroup members: $b = -0.12$ ($SE = 0.05$), $p = .012$. Both Biophilia, $b = 0.12$ ($SE = 0.04$), $p < .001$, and Misanthropy, $b = 0.22$ ($SE = 0.04$), $p < .001$, were additionally predictive of valuing nature over outgroups in this analysis.

When separately controlling for demographic variables—gender, age, income level, religiosity, and political conservatism—higher attributions of mind to animals continued to predict higher valuation of nature over outgroups, $b = 0.16$ ($SE = 0.03$), $p < .001$, and higher attributions of mind to outgroup members continued to negatively predict higher valuation of nature over outgroups, $b = -0.20$ ($SE = 0.05$), $p < .001$. Again, participants identifying as male had a marginally lower tendency to value nature over outgroups than participants identifying as female, $b = -0.20$ ($SE = 0.11$), $p = .070$. Unlike in Study 1, religiosity negatively predicted valuing nature over outgroups, $b = -0.09$ ($SE = 0.03$), $p = .002$. Age, income level, and political conservatism were not predictive of the Relative Value score, $ps > .25$.

A regression analysis predicting the Relative Value score from scores on the IDAQ and the Ascent of Humans measure was also significant, $F(2, 221) = 12.58$, $p < .001$, $R^2 = .10$. Using these previously validated measures, tendencies to anthropomorphize predicted higher valuation of nature over outgroups, $b = 0.18$ ($SE = 0.04$), $p < .001$, as did tendencies to dehumanize, $b = 0.01$ ($SE = 0.003$), $p = .008$.

3.4. Discussion

Study 2 successfully replicated Study 1, and it yielded even stronger evidence for our third hypothesis regarding the relationship between mind attribution and ascriptions of moral worth. Specifically, anthropomorphism and dehumanization each independently predicted tendencies to value nature over outgroups, both when assessed on the MoMA and when assessed with previously validated measures. This pattern of results held true even when controlling for other relevant variables (biophilia and misanthropy). Therefore, we can more confidently assert that people who value nature more than outgroups are likely to perceive more similar mental abilities in marginalized/stigmatized humans and in non-human animals as compared to people who value outgroups more than nature. In order to further increase the generalizability of these findings and to ensure that our results are not constrained to one particular measure of moral valuation, we conducted a third study.

4. Study 3

The MES is framed to allow for unconstrained ascriptions of moral value. In Studies 1 and 2, most participants did not evenly distribute entities across the four predetermined circles of moral concern. Yet, our finding that tree-huggers and human-lovers have equivalent levels of total moral expansiveness—suggesting that valuing nature over outgroups leads to a *redistribution* rather than an *expansion* of overall moral concern—could be a methodological artifact of using the MES to classify these two groups. In order to rule out this possibility, Study 3 employed three independent methods for categorizing participants as tree-huggers or human-lovers. First, we again utilized the adapted Moral Expansiveness measure. Second, we constructed a novel scale to measure participants' self-reported tendencies to favor environmentalism and humanitarianism. Third, we categorized participants as tree-huggers or human-lovers based on their preferred charitable organizations.

4.1. Method

4.1.1. Participants

Residents of the United States ($N = 562$; 336 female, two nonbinary; 419 White; $M_{\text{age}} = 29.84$; $SD_{\text{age}} = 11.51$) were recruited via Prolific ($n = 398$) and through an undergraduate subject pool from a large university in the northeastern United States ($n = 164$). An additional 133 participants were tested but excluded from analyses for providing incomplete data ($n = 24$; for 14 participants, this was due to a glitch in the survey administration) or for missing one or more preregistered attention checks ($n = 109$; see Supplementary Materials for details).

4.1.2. Materials and procedure

We removed the IDAQ and the Ascent of Humans measures, and we administered one new measure in this study—our novel Tree-Hugger versus Human-Lover scale (see Tables S4–S5 and Appendix B). Otherwise, the measures remained the same as in Study 2. However, rather than treating the Charity measure as an auxiliary dependent variable, as in the previous studies, we used it as an additional means of categorizing participants as tree-huggers or human-lovers. In this task, participants were asked to choose their top three charities from a list of six organizations, three of which were human-centered (Doctors without Borders, the American Civil Liberties Union, and Feed the Children) and three of which were nature-centered (the Nature Conservancy, the World Wildlife Fund, and the Rainforest Alliance). Additionally, the MoMA was changed slightly; three items were altered in an attempt to increase the internal consistency of the scale (see Table S3).

4.2. Factor structure and scoring of scales

4.2.1. Moral expansiveness scale

Responses were scored as in Studies 1 and 2. A factor analysis of the 20 primary items, constrained to a two-factor solution, replicated the factor loadings from Study 1 (see Table 1), with all nature items loading onto one factor ($\alpha = 0.95$; loadings ranged from 0.74 to 0.88) and all 10 human items loading onto a second factor ($\alpha = 0.93$; loadings ranged from 0.67

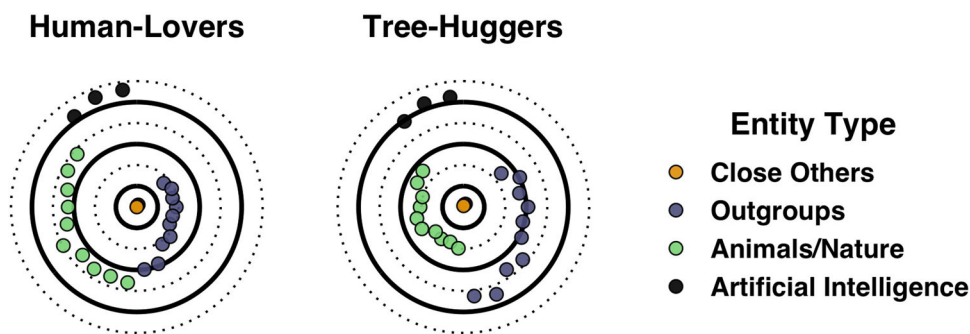


Fig. 8. A schematic indicating the placement of each entity within the moral circles in the MES task in Study 3. Values closest to the center are highest. Solid circles indicate the boundaries dividing each level of moral concern (inner circle of moral concern: 3–2.5; outer circle of moral concern: 2.5–1.5; fringes of moral concern: 1.5–0.5; outside moral boundary: 0.5–0); dotted circles indicate integer values.

to 0.83). A visualization of participants’ moral valuation of the different entities across tree-huggers and human-lovers on the Moral Expansiveness measure is presented in Fig. 8.

An overall Moral Expansiveness score was computed for each participant by aggregating the total number of points for all 26 entities ($M = 42.63$, $SD = 10.92$). A Relative Value score for this measure was computed by subtracting the points for the 10 marginalized human items from the points for the 10 animal/nature items, providing a continuous difference score indicating relative tendencies to value nature over outgroups ($M = -0.12$, $SD = 0.78$).

4.2.2. *Tree-Hugger versus Human-Lover scale*

Four items on this scale were excluded to produce an acceptable factor-analytic solution (see Supplementary Materials for details; see Tables S4 and S5 for factor loadings). Half of the items on this final 16-item scale loaded onto a factor measuring tendencies toward being a human-lover ($\alpha = 0.86$; loadings ranged from 0.47 to 0.84), while the remaining eight items loaded onto a factor measuring tendencies toward being a tree-hugger ($\alpha = 0.83$; loadings ranged from 0.45 to 0.78).

A Relative Value score for this measure was computed by subtracting the average rating on the eight items from the Human-Lover subscale from the average rating on the eight items from the Tree-Hugger subscale, thus providing a continuous difference score indicating relative tendencies to value nature over outgroups ($M = -0.39$, $SD = 1.53$).

4.2.3. *Charity measure*

A Relative Value score for this measure was computed by subtracting the total number of human-centered charities that were selected from the total number of nature-centered charities that were selected, out of a total of three required choices. This yielded a difference score with integers ranging from -3 to 3 ($M = -0.52$, $SD = 1.67$).

4.2.4. Measure of mind attribution

Scores on the MoMA were high ($M = 7.65$; $SD = 0.96$), but the skewness value (-0.71) was not problematic. A factor analysis of the 20 primary scale items, constrained to a two-factor solution, confirmed that mind attribution for marginalized/stigmatized humans ($\alpha = 0.89$; loadings ranged from 0.55 to 0.79) was distinct from mind attribution for animals ($\alpha = 0.91$; loadings ranged from 0.67 to 0.78; see Table S3). Mind attribution for outgroup members and mind attribution for animals were again positively but imperfectly related, $r(560) = .34$, $p < .001$.

4.3. Primary results

4.3.1. Do some people value nature more than outgroups?

The perceived moral worth of marginalized, stigmatized humans was again correlated with the perceived moral worth of animals and nature on both the Moral Expansiveness measure, $r(560) = .30$, $p < .001$, and the Tree-Hugger versus Human-Lover scale, $r(560) = .44$, $p < .001$, but as in the previous two studies, participants tended to value one of these groups more than the other.⁶

According to the Moral Expansiveness measure, 218 participants in our sample were categorized as tree-huggers, while 276 participants were categorized as human-lovers, and 68 participants valued both groups equally. Tree-huggers (as categorized by the Moral Expansiveness measure) valued nature ($M = 1.95$, $SD = 0.54$) significantly more than outgroups ($M = 1.33$, $SD = 0.58$), $t(217) = 18.76$, $p < .001$, $d = 1.27$, and human-lovers valued outgroups ($M = 1.95$, $SD = 0.59$) significantly more than nature ($M = 1.21$, $SD = 0.55$), $t(275) = 26.87$, $p < .001$, $d = 1.62$.

According to the Tree-Hugger versus Human-Lover scale, 185 participants in our sample were categorized as tree-huggers, while 352 participants were categorized as human-lovers, and 25 participants valued both groups equally. Tree-huggers (as categorized by the Tree-Hugger versus Human-Lover scale) had significantly higher ratings on the Tree-Hugger subscale ($M = 6.95$, $SD = 1.14$) than on the Human-Lover subscale ($M = 5.72$, $SD = 1.51$), $t(184) = 14.78$, $p < .001$, $d = 1.09$, and human-lovers had significantly higher ratings on the Human-Lover subscale ($M = 7.25$, $SD = 1.22$) than on the Tree-Hugger subscale ($M = 5.98$, $SD = 1.40$), $t(351) = 24.77$, $p < .001$, $d = 1.32$.

According to the Charity measure, 175 participants in our sample were categorized as tree-huggers, while 387 participants were categorized as human-lovers (equal valuation was impossible given the constraints of this task). Tree-huggers (as categorized by the Charity measure) reported stronger inclinations to donate to nature-related charities ($M = 2.30$, $SD = 0.46$) than to outgroup-related charities ($M = 0.70$, $SD = 0.46$), $t(174) = 23.01$, $p < .001$, $d = 1.74$, and human-lovers reported stronger inclinations to donate to outgroup-related charities ($M = 2.24$, $SD = 0.43$) than to nature-related charities ($M = 0.76$, $SD = 0.43$), $t(386) = 34.05$, $p < .001$, $d = 1.73$.

⁶ Because the Charity measure involved a forced choice, a perfect negative correlation was necessitated, precluding this analysis from being performed for this task.

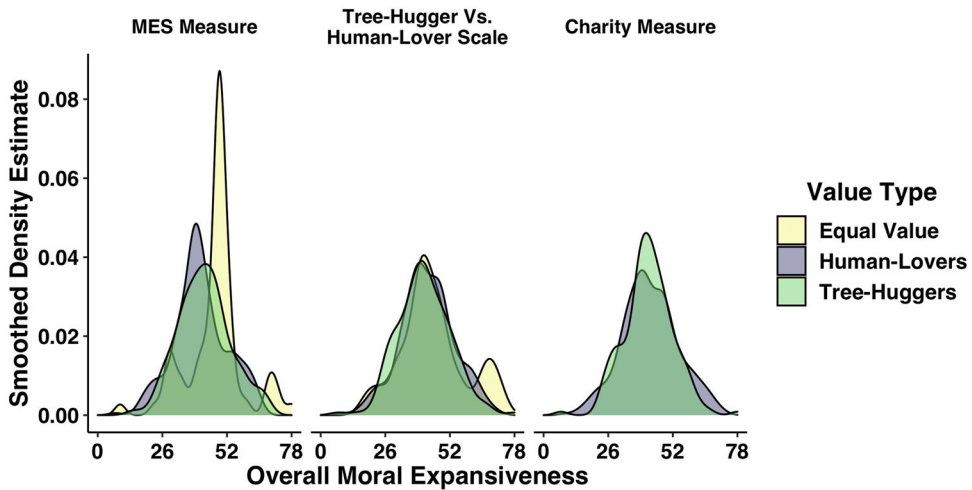


Fig. 9. Kernel density estimation plot indicating the relative frequencies of each level of moral expansiveness, split across tree-huggers, human-lovers, and participants with equal value, as categorized according to each of the three tasks in Study 3.

Thus, we obtained support for our first hypothesis across three disparate ways of measuring moral value for outgroups and nature. In general, these three measures yielded convergent results; the continuous Relative Value scores were correlated for each of three possible combinations, $r_s > .43$, $p_s < .001$.

4.3.2. Is moral worth attributed in a zero-sum manner?

Tree-huggers and human-lovers did not significantly differ in their overall levels of moral expansiveness, regardless of which task was used to classify these groups: Moral Expansiveness measure: $t(469.3) = -1.54$, $p = .124$, $d = 0.14$; Tree-Hugger versus Human-Lover scale: $t(383.5) = 1.26$, $p = .210$, $d = 0.11$; Charity measure: $t(382.9) = 0.59$, $p = .557$, $d = 0.05$ (see Fig. 9). In each of these three cases, the difference between the two groups was statistically equivalent to zero; equivalence tests with SESOIs of $d = 0.30$, $d = 0.28$, and $d = 0.28$, respectively, were all significant, $p_s < .05$.

Thus, our second hypothesis was again supported. Despite tree-huggers valuing nature highly—significantly more than human-lovers did (Moral Expansiveness measure: $t(468.5) = 14.84$, $p < .001$, $d = 1.34$; Tree-Hugger versus Human-Lover scale: $t(445.5) = 8.59$, $p < .001$, $d = 0.73$; Charity measure: $t(315.0) = 37.56$, $p < .001$, $d = 3.52$)—they did not value all entities highly but valued outgroups significantly less than human-lovers did (Moral Expansiveness measure: $t(468.6) = -11.85$, $p < .001$, $d = 1.07$; Tree-Hugger versus Human-Lover scale: $t(313.6) = -11.89$, $p < .001$, $d = 1.15$; Charity measure: $t(315.0) = -37.56$, $p < .001$, $d = 3.52$).

Again, the overall Moral Expansiveness score (as computed for the MES) was uncorrelated with the Relative Value score, regardless of whether this latter score was computed for the

MES, $r(560) = .02$, $p = .586$, for the Tree-Hugger versus Human-Lover scale, $r(560) = -.03$, $p = .484$, or for the Charity measure, $r(560) = .00$, $p = .980$.

4.3.3. *Do anthropomorphism and dehumanization predict valuing nature more than outgroups?*

Composite scores on the MoMA were again positively correlated with composite MES scores, $r(560) = .30$, $p < .001$. However, as in Studies 1 and 2, conducting a more fine-grained analysis of the data provided support for our third hypothesis. Tree-huggers tended to have relatively higher propensities toward both anthropomorphism and dehumanization, and as such they attributed more similar mental capacities to outgroup members and animals than did human-lovers. This was true across all three methods of categorizing participants as tree-huggers and human-lovers (see Fig. 10). Linear regressions (excluding participants who valued outgroups and nature equally) confirmed that there was a significant interaction between entity type (outgroups vs. animals) and value type (human-lovers and tree-huggers) for each of the three measures, MES measure: $b = -0.60$ ($SE = 0.15$), $p < .001$; Tree-Hugger versus Human-Lover scale: $b = -0.54$ ($SE = 0.15$), $p < .001$; Charity measure: $b = -0.43$ ($SE = 0.15$), $p = .004$. Simple contrasts indicated that tree-huggers were higher than human-lovers in attributions of mind to animals on the MES measure: $b = 0.43$ ($SE = 0.11$), $p < .001$, although this tendency was not significant for the Tree-Hugger versus Human-Lover scale: $b = 0.13$ ($SE = 0.11$), $p = .232$, or the Charity measure: $b = 0.13$ ($SE = 0.11$), $p = .223$. Tree-huggers were lower than human-lovers in attributions of mind to outgroup members for the Tree-Hugger versus Human-Lover scale: $b = -0.41$ ($SE = 0.11$), $p < .001$, and for the Charity measure: $b = -0.30$ ($SE = 0.11$), $p = .005$, and they were marginally lower on the MES measure: $b = -0.18$ ($SE = 0.11$), $p = .096$.

To determine whether different forms of mind attribution predicted tendencies to value nature more than outgroups, a series of three linear regressions were conducted, one for each of the three Relative Value scores. For each, the Relative Value score was regressed onto the MoMA scores for outgroups and animals. Additional regression analyses were conducted to control for Biophilia and Misanthropy and to control for demographic variables (gender, age, income level, religiosity, and political conservatism).

The model using the Moral Expansiveness measure to generate the Relative Value score was significant, $F(2, 559) = 14.39$, $p < .001$, $R^2 = .05$. Higher attributions of mind to animals positively predicted higher valuation of nature over outgroups, $b = 0.10$ ($SE = 0.02$), $p < .001$, whereas higher attributions of mind to outgroup members negatively predicted higher valuation of nature over outgroups, $b = -0.18$ ($SE = 0.04$), $p < .001$. Furthermore, these relationships held even when controlling for Biophilia and Misanthropy; attributions of mind to animals: $b = 0.06$ ($SE = 0.02$), $p = .020$; attributions of mind to outgroup members: $b = -0.16$ ($SE = 0.04$), $p < .001$. These relationships also continued to hold when controlling for demographic variables; attributions of mind to animals: $b = 0.09$ ($SE = 0.02$), $p < .001$; attributions of mind to outgroup members: $b = -0.18$ ($SE = 0.04$), $p < .001$.

The model using the Tree-Hugger versus Human-Lover scale to generate the Relative Value score was significant, $F(2, 559) = 31.25$, $p < .001$, $R^2 = .10$. Higher attributions of mind to animals positively predicted higher endorsement of environmentalism over humanitarianism,

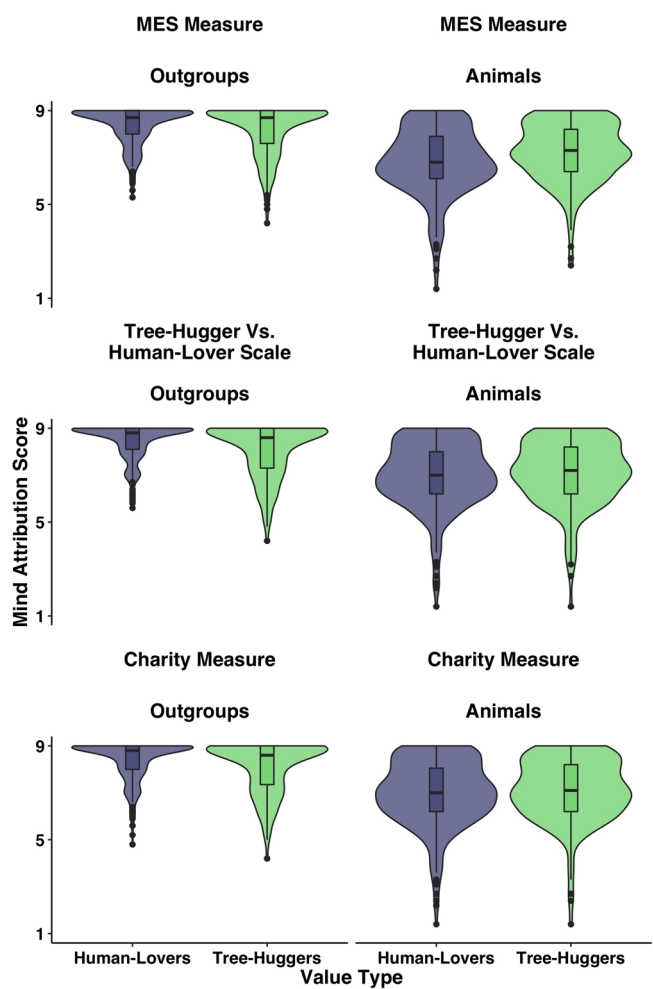


Fig. 10. Violin plots (with embedded boxplots) representing probability densities for ratings of mind in Study 3, split by entity type (outgroups and animals) and value type (human-lovers and tree-huggers) for each of the three measures of moral valuation.

$b = 0.16$ ($SE = 0.05$), $p < .001$, whereas higher attributions of mind to outgroup members negatively predicted higher endorsement of environmentalism over humanitarianism, $b = -0.56$ ($SE = 0.07$), $p < .001$. When controlling for Biophilia and Misanthropy, attributions of mind to outgroup members continued to be a significant negative predictor, $b = -0.48$ ($SE = 0.07$), $p < .001$. However, attributions of mind to animals was no longer a significant predictor, $b = 0.06$ ($SE = 0.05$), $p = .209$. Both predictors remained significant when controlling for demographic variables; attributions of mind to animals: $b = 0.20$ ($SE = 0.05$), $p < .001$; attributions of mind to outgroup members: $b = -0.47$ ($SE = 0.07$), $p < .001$.

The model using the Charity measure to generate the Relative Value score was significant, $F(2, 559) = 12.28$, $p < .001$, $R^2 = .04$. Higher attributions of mind to animals positively predicted higher tendencies to favor environmentalist charities over humanitarian charities, $b = 0.18$ ($SE = 0.05$), $p < .001$, whereas higher attributions of mind to outgroup members negatively predicted higher tendencies to favor environmentalist charities over humanitarian charities, $b = -0.36$ ($SE = 0.08$), $p < .001$. When controlling for Biophilia and Misanthropy, attributions of mind to outgroup members continued to be a significant negative predictor, $b = -0.29$ ($SE = 0.08$), $p < .001$. However, attributions of mind to animals was no longer a significant predictor, $b = 0.07$ ($SE = 0.05$), $p = .163$. Both predictors remained significant when controlling for demographic variables; attributions of mind to animals: $b = 0.19$ ($SE = 0.05$), $p < .001$; attributions of mind to outgroup members: $b = -0.31$ ($SE = 0.08$), $p < .001$.

4.4. Discussion

Study 3 again provided support for each of our hypotheses, with consistent findings across three separate measures of valuing nature relative to outgroups. First, a substantial number of U.S. residents expressed a greater moral concern for nature than for outgroups. Second, these tree-huggers had similar levels of aggregate moral value as did human-lovers. Third, tree-huggers had elevated tendencies for dehumanization *and* anthropomorphism, although anthropomorphism was a more tenuous predictor of relative moral value than dehumanization.

5. General discussion

People are notoriously deficient in their tendencies to attribute moral worth to outgroup members (Opotow, 1990), animals (Opotow, 1993), and the natural world (Opotow & Weiss, 2000). Each of these failures to ascribe moral value is typically chalked up to a uniformly narrow scope of moral concern. However, it is possible that certain forms of moral anemia are coupled with other forms of moral abundance. In order for these patterns of moral valuation to be properly understood, there is a need to characterize the anatomy of moral circles in a way that measures ascriptions of moral worth in both coarse and granular fashions. Although a focus on individual differences in *total* moral valuation has led to many productive insights about ascriptions of moral worth (e.g., Crimston et al., 2016), it has concealed an orthogonal distinction between different forms of *relative* moral valuation.

Across three studies, we have shown that—contrary to much theorizing about the moral circle expanding outward from the self in a reliable fashion—not all people value humanitarianism over environmentalism. Instead, at least within the United States, it is not uncommon for people to value environmentalism over humanitarianism. Across three studies, we repeatedly found that these different patterns of relative moral worth were predicted in part by different patterns of mind attribution. As compared to people who morally prioritized outgroup members over nature, people who morally prioritized nature over outgroup members attributed relatively more mental capacities to animals and relatively fewer mental capacities to marginalized/stigmatized humans.

5.1. Challenges to previous research on attributions of mental capacities

Rather than mind attribution having a unitary manifestation across humans and nonhumans, our results indicated that some individuals have elevated tendencies toward both anthropomorphism and dehumanization. Attributing rich mental capacities to animals (i.e., anthropomorphism) was not a simple inverse of failing to attribute mental capacities to outgroup members (i.e., dehumanization), and only a moderate correlation existed between the two subscales measuring each of these tendencies in our new scale, the MoMA. We also uncovered a double dissociation: Scores on an existing measure of dehumanization (Kteily et al., 2015) strongly correlated with attributions of mind to outgroup members on the MoMA but not with attributions of mind to animals. Conversely, scores on an existing measure of anthropomorphism (Waytz, Cacioppo, et al., 2010) strongly correlated with attributions of mind to animals on the MoMA but not with attributions of mind to outgroup members. Therefore, despite widespread theoretical claims that anthropomorphism and dehumanization are opposite ends of a single continuum, and that the dispositional and motivational factors increasing anthropomorphism should reduce dehumanization and vice versa (Brandt & Reyna, 2011; Epley, Waytz, & Cacioppo, 2007; Kwan & Fiske, 2008; Waytz, Epley, et al., 2010; Waytz, Gray, et al., 2010), this was not borne out by our data. Instead, it appears that attributing minds to humans and nonhumans are not isomorphic processes. This finding has broad implications for social cognition and intergroup relations, suggesting (for instance) that fostering anthropomorphism may not be a productive way to combat the dehumanization of marginalized groups.

Prior research has found that mental capacities exist along different dimensions, such as agency and experience (Gray et al., 2007) or physiological, social-emotional, and perceptual-cognitive abilities (Weisman, Dweck, & Markman, 2017). In the present research, factor analyses on the MoMA indicated that the boundary between humans and nonhumans subsumed these distinctions, suggesting that species membership may be a more salient divide than different kinds of mental states (also see Piazza, Landy, & Goodwin, 2014). Future studies should continue to investigate this possibility, and we hope that the MoMA serves as a useful instrument for research on folk attributions of mental capacities.

While our research identified a significant role for mind attribution in accounting for the distinction between human-lovers and tree-huggers, the predictive role of anthropomorphism and dehumanization was modest. Another important contributor to granular differences in moral valuation was the degree of affinity (or negativity) felt toward outgroups and toward nature, as shown by our finding that participants' relative moral valuation of outgroups and nature was strongly predicted by our General Positivity measure in Study 1 and by measures of Biophilia and Misanthropy in Studies 2 and 3. This was to be expected, given that positive nonmoral traits, such as aesthetic beauty, are often aligned with attributions of moral value (Gunnthorsdottir, 2001). Further research should explore additional sources of variance predicting differences in the relative valuation of nature and outgroups. For example, early life experiences (such as time spent in the wilderness and the ethnic diversity of one's childhood neighborhood) are likely to be predictors of being a tree-hugger or a human-lover, respectively.

5.2. *Apportionment of moral worth may be zero-sum*

Previous research that has compared allocations of moral worth to outgroups and to the natural world has shown that these tendencies often align. In particular, people who devalue animals are also more likely to be racist, sexist, and homophobic (Caviola et al., 2019; Dhont et al., 2014), and thus failures to value the natural world are often associated with failures to value all of humanity. We replicated this previous research by uncovering a positive correlation of moderate strength between moral value for members of human outgroups and moral value for animals and nature. However, by digging deeper and comparing the relative degree to which people value outgroups and nature, we identified a hydraulic relationship between these two forms of value, such that people who morally prioritize outgroups tend to have the same amount of overall moral concern as people who morally prioritize nature. Thus, in contrast to previous research focusing on tendencies for some people to be more morally expansive than others, we found evidence in support of an overarching tendency for moral value to be allocated in a zero-sum manner.

These two conclusions—that moral valuation of outgroups and nature are positively associated and that there is a trade-off between valuing outgroups and valuing nature—may at first appear contradictory. However, we believe that there is a straightforward way in which these findings can be reconciled. The positive correlation between valuing outgroups and nature can be explained by the robust finding that some people have greater aggregate moral expansiveness than others (Crimston et al., 2016). Vast dispositional variations in general tendencies to bestow moral value can explain why valuing one kind of entity is frequently predictive of valuing many other kinds of entities. However, at any given level of moral expansiveness, moral misers and extreme altruists alike will vary in the relative amounts of moral value that they assign to various categories. To the extent that people are predisposed to conceptualize moral worth as zero-sum, increasing or decreasing moral valuation of a particular type of entity can be expected to lead to a reallocation of moral value to other entities in a compensatory fashion.

Our data indicate that people typically ascribe moral value in a zero-sum fashion, even in non-zero-sum contexts. By utilizing the MES to measure moral value, we explicitly provided participants with the option to ascribe maximum moral worth to all entities, such that the expression of moral valuation was unbounded. Despite this, very few people included all entities in their inner circles of moral concern. Even more notably, given the focus of the present research, both tree-huggers and human-lovers ascribed a similarly moderate amount of moral worth across entities. It is unlikely that this latter finding can be explained by demand characteristics or other methodological artifacts, given that participants in Study 3 were separately categorized as human-lovers or tree-huggers by three independent measures (the MES, the Human-Lover versus Tree-Hugger scale, and the Charity measure), and each of these categorizations yielded evidence of identical levels of aggregate moral valuation on the MES.

These results carry far-reaching implications for other prominent issues in moral psychology. For example, debates about the normative desirability of empathy (e.g., Bloom, 2016; Zaki, 2019) ultimately hinge on the empirical question of whether empathy is a limited resource that is distributed inequitably or a boundless resource that can be cultivated and

distributed plentifully (see Graham et al., 2017). Specifically, because empathy is most strongly experienced toward ingroup members (Bloom, 2016; Cikara, Bruneau, & Saxe, 2011), its potential to contribute to moral expansiveness relies on its capacity to increase moral concern for dissimilar others in a non-zero-sum fashion, such that it can be cultivated for distant others while simultaneously continuing to be directed toward close others to a relatively greater degree. Thus, evidence that people treat moral concern as zero-sum may serve to promote greater skepticism about empathy as a force for social progress.

Importantly, however, the finding that moral value is allocated in a zero-sum manner does not necessarily imply that people possess inherently limited moral capacities. Rather, perhaps because there are many cases in which moral concern is in fact constrained by concrete limitations of finite resources, people may continue to possess a mindset that moral concern is limited even when they enter situations that allow for more unbounded expressions of moral value. This suggests the intriguing possibility that moral concern could be expanded in a non-limited way simply by changing people's mindsets (see Laham, 2009).

Although a pervasive mindset that moral worth is zero-sum can help to explain the mean similarity in the amount of moral concern displayed by human-lovers and by tree-huggers, it does not account for the considerable individual differences in levels of aggregate moral expansiveness that existed within each of these groups. This variation necessitates further exploration. For example, it is possible that some people who are tree-huggers have a large scope of moral concern due to elevated levels of anthropomorphism but relatively blunted levels of dehumanization, while some people who are human-lovers have a large scope of moral concern due to very low levels of dehumanization and moderate levels of anthropomorphism. Alternatively, a number of other variables—including the self-importance of moral identity (Reed & Aquino, 2003; Smith, Aquino, Koleva, & Graham, 2014), proclivities to identify with diverse others (Crimston et al., 2016, 2018a; McFarland, Brown, & Webb, 2013), and demographic factors that promote well-being (Brethel-Haurwitz & Marsh, 2014)—may help to explain individual differences in overall moral expansiveness in tree-huggers, in human-lovers, or in both of these groups. Future research should aim to discern whether reliable differences exist between tree-huggers who have highly expansive (or highly restricted) moral circles and human-lovers who have highly expansive (or highly restricted) moral circles. It will also be beneficial to explore whether aggregate, rather than granular, patterns of moral valuation are more relevant for understanding people at extreme ends of these continua.

5.3. Concluding remarks

The demarcation of boundaries of moral concern has profound implications for the treatment of all lifeforms (Opotow, 1990; Singer, 1981). Furthermore, understanding the processes underlying attributions of moral worth may provide a foundation for understanding moral cognition more broadly (Beal, 2020). Here, in a violation of standard depictions of the expansion of moral concern (see Crimston et al., 2018b), we found that some individuals ascribe substantial moral value to ontologically distant entities and lesser moral value to ontologically more similar entities. Specifically, while some of us extend moral value in the way predicted by typical schematics of the moral circle, with all of humanity being afforded moral worth

before nonhuman animals and other parts of nature, some of us afford greater moral worth to animals and ecosystems than to marginalized and stigmatized humans. Neither pattern of extending moral worth results in greater overall moral expansiveness.

Finding ways to expand the scope of moral concern in a way that does not lead to conflicts between tree-huggers and human-lovers is a crucial area for future research. This is particularly true for combating pressing issues such as climate change. Although climate change is often depicted as an environmentalist issue, given its tremendous impact on animals and ecosystems, it is also a social justice issue, given that it disproportionately impacts vulnerable humans from low-status groups (Swim & Bloodhart, 2018). Perhaps by emphasizing the ways in which environmentalism and humanitarianism can go hand-in-hand, people will cease to view moral value as zero-sum and begin to expand their moral concern for both outgroups and nature.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Supporting information

Appendix A

Measure of mind attribution

Different people, animals, and other things in the world can be distinguished from one another by how complex their feelings, thoughts, and abilities are. We would like to know how you think about the different kinds of minds listed below. Please rate the extent to which you disagree or agree with each of the following statements. *Note: Statements were randomized for participants.*

1. A panda has many feelings.
2. A tree frog can feel tired.
3. A turtle is capable of experiencing pleasure.
4. A shark is able to do things on purpose.
5. A bee is capable of planned actions
6. A penguin is self-aware.
7. A chimpanzee is highly conscious.
8. A whale can form many memories.
9. An elephant can feel depressed.
10. A vulture has free will.
11. A North Korean has an elaborate emotional life.
12. A gay man has the ability to articulate complex ideas.
13. A chain smoker is able to reason through difficult logic problems.
14. An undocumented immigrant can have a spiritual experience.
15. A Mexican has a powerful imagination.
16. An atheist has a sophisticated appreciation of beauty.
17. A prostitute can easily understand what others are feeling.
18. A physically disabled individual can experience extreme grief.
19. A Muslim can persevere to reach goals.
20. A homeless individual has the ability to conceptualize abstract ideas.
21. Your close friend has feelings. [*Attention check*]
22. Your cousin is able to make decisions. [*Attention check*]
23. Your neighbor has the ability to form thoughts. [*Attention check*]
24. A self-driving car can experience intense pain. [*Attention check*]
25. A rock has complex goals. [*Attention check*]
26. A chair has consciousness. [*Attention check*]

Appendix B

Tree-Huggers versus Human-Lovers Scale

Please indicate your level of agreement with each statement below. *Note: Statements were randomized for participants; [R] indicates an item that was reverse-scored.*

1. It is always crucial to protect people who are members of marginalized groups.
2. One of the most important moral issues of our time is the fair treatment of ethnic minorities.
3. I prefer to donate to charities that are aimed at ensuring social justice.
4. Diversity should be honored and upheld at all costs.
5. Overall, I don't care very much about people who live in faraway places. [R]
6. When faced with tough decisions, sometimes we have to sacrifice the rights of minorities. [R]
7. I would hesitate to change my lifestyle in order to raise the quality of life for people I don't know. [R]
8. To be truly honest, I think some groups of people don't deserve much moral concern. [R]
9. It is always crucial to protect endangered animals and their habitats.
10. One of the most important moral issues of our time is the conservation of ecosystems.
11. I prefer to donate to charities that are aimed at helping the environment.
12. Overall, I don't care very much about animals that live in faraway places. [R]
13. I would rather spend money on my family than on helping suffering animals. [R]
14. When faced with tough decisions, sometimes we have to sacrifice the rights of animals. [R]
15. I would hesitate to change my lifestyle in order to enhance the quality of wilderness I've never visited. [R]
16. To be truly honest, I think some animal species don't deserve much moral concern. [R]