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How Do Children Value Animals? A Developmental Review

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Abstract

From a young age, children are deeply curious about animals. Stable patterns exist in the types of attitudes children display towards different kinds of animals: they love pets, value animals that are beautiful, and fear snakes and spiders (Borgi & Cirulli, 2015, <https://doi.org/10.2752/089279315X14129350721939>). Until recently, we've known little about what children think about the moral standing of animals, particularly relative to other entities, including humans. In this review, we synthesize the literature examining children's perceptions of the moral worth of animals. We present factors about the animal, and factors about the judge (the child), shown to impact children's evaluations of animal moral worth. Based on current evidence, we make the claim that children grant animals a high moral standing early on in childhood, but that this decreases during late childhood, throughout adolescence, and into adulthood. We provide some suggestions for the cognitive and cultural mechanisms that might drive these differences, and make recommendations for the field going forward.

Keywords

human-animal relations, moral circle, moral concern, child development, moral attitudes, value judgements, animals



Non-Technical Summary

Background

Understanding the moral value we place on animals is critical to understanding our relationships with them. Recent years have seen a growing interest in this research topic. One question of particular interest has been the development of these attitudes—how do children think about and value animals across development?

Why was this study done?

Despite the interest in understanding children's moral judgements about animals, the field lacks a cohesive review of the relevant methods and findings, the key takeaways and implications of these findings, and the areas for future research. That was the aim of this review.

What did the researchers do and find?

After reviewing more than 70 papers, we detail the methods used to study how children value animals, and identify a number of factors that shape these judgements. These include factors about the animal (sentience, mental life, intelligence, beauty, and risk/disgust) and factors about the child (age, gender/sex, pet ownership, diet, cultural environment). We lay out the implications of these findings for human relationships with animals, and also make suggestions for future research.

What do these findings mean?

These findings offer us a cohesive understanding of factors that shape the way that children value animals. This helps to characterize our relationship with and treatment of animals in society, and understand how our attitudes are developed and maintained.

Human relationships with animals are dynamic. We care deeply for our pets, inviting them into our homes and investing substantial resources into their care. Yet we abhor mosquitoes, spiders, and rats, rapidly ridding them from our homes with sprays and deterrents. And we farm and eat cows, pigs, and chickens, subjecting them to living conditions that negatively impact their health and wellbeing. While we know that human adults typically place the moral standing of nonhuman animals (herein referred to as animals) beneath that of humans (Crimston et al., 2016; McGuire et al., 2022), we are only just beginning to understand children's attitudes in this domain. Recent research suggests that children typically grant much more moral status to animals than adults do.

In this review, we seek to synthesize current evidence on how children morally value animals relative to other entities¹. Drawing on research in developmental psychology,

1) We include a list of additional relevant papers beyond the scope of this review in the [Supplementary Materials](#).

anthrozoology, and anthropology, we describe the methods researchers employ to ask children what they think about animals, and review the evidence on how children's perceptions of animals shift as they age. We list key factors shown to impact how children value animals in childhood. Finally, we make recommendations for how the field can further advance our knowledge regarding how and why children's valuations shift over time, and discuss what this might mean for our future coexistence with animals.

Understanding how children value animals has important implications. First, tracking when these attitudes emerge in children, and how they shift alongside key developmental milestones, can help inform our understanding of the mechanisms that shape our moral concern—both for animals and for others more generally. Second, it can help us to understand how these attitudes may (or may not) shape behaviors—such as care expressed towards animals (Hawkins & Williams, 2016) and elective meat consumption (Hussar & Harris, 2018). Finally, this knowledge can be informative for educational and conservation initiatives which seek to understand when evidence-based interventions might be most effective in fostering more positive relations between children and animals (e.g., Bryant & Dillard, 2020; Randler et al., 2012).

Moral Concern and the Moral Circle

What does it mean to think an animal has moral worth? The concept of moral worth is multifaceted, with multiple definitions put forward in psychological literature. Moral worth has been defined as the belief that an organism or entity has inherent value, and is entitled to safety from harm (Crimston et al., 2016). It can also extend to a personal feeling of moral concern: a responsibility to protect, invest or defend that entity's wellbeing (Crimston et al., 2016). In relation to animals, children might be considered as exhibiting moral concern towards an animal if they act prosocially towards it—feeding it if it is hungry, washing it if it is dirty, or protecting it from harm (Hawkins & Williams, 2016).

The field of psychology has recently turned to the philosophical concept of 'moral circles' to help map who we do and do not think of as worthy of moral concern. Moral circles consist of the figurative 'moral boundaries' we place around certain groups of people and animals, which mark the relative levels of responsibility we feel for their wellbeing and care. For example, Crimston et al. (2016) mapped American and Australian adults' circles, asking them to indicate how much they felt personally responsible for the wellbeing of several different members of society. They found that family, friends and ingroup members were granted the highest moral standing, comprising an inner circle, while most animals and outgroup members were placed within secondary or outer boundaries of concern. Finally, villains and plants were typically cast out beyond the reaches of personal concern. Philosopher Peter Singer claims our moral circles are expanding: in general, societies today grant more moral concern to a greater number of entities than ever before (Singer, 1981).

But how do our circles change across childhood? Neldner and colleagues (2018) were the first to track how children's moral circles change in development. The authors presented 4–10 year-old children with pictures of 24 entities, representing different categories of humans, animals, and plants. They asked children to sort these cards into three circles that represented how much they cared about them: a lot, a little bit, or not at all. They found that, while children's overall level of concern across all entities remained the same, children's preferences for *whom* they cared about shifted across age. Specifically, as children aged they focused their moral concern towards humans and away from animals. At 4–5 years, children granted many animals high moral worth, often placing them within their inner circle of concern. However, older children included more human entities within their inner circles, and placed more animal species in their outer circles of concern. This suggests that while young children might value animal entities highly, children's circles of concern become more human-centric as they age. In further support, several studies have now revealed that children appear more willing to grant moral status to animals than adults are (McGuire et al., 2022; Wilks et al., 2021). This suggests that there is something unique about children's attitudes towards, and perhaps relationships with, animals—as we will explore in this review.

It is also worth asking what exactly is being captured in children's judgements of moral concern. A recent study asked children to report how much they liked, knew about, or cared about animals (as well as other entities), finding that they displayed different patterns of prioritization across animals according to these three constructs (Neldner et al., 2022). This suggests children's appraisals of the moral worth of animals go beyond simple preferences based on liking or disliking (see 'Age' section).

Measuring Children's Moral Attitudes Towards Animals

Reflecting the multifaceted concept of moral concern, researchers have used an array of measures to capture children's moral attitudes towards animals. We describe the most common measures used below (refer to Table 1 for study summaries).

Table 1
Children's Moral Attitudes and Valuations of Animals: A Review of Developmental Literature

Authors	Age Range	Sample Size	Sample Country	Measure Type	Focal IV ^a	DVs	Identified Age Differences? ^b	Identified Gender Differences? ^b	Identified Country Differences? ^b
Bjerkle et al., 1998	9–15 years	562 children	Norway	Questionnaire	N/A	Liking; Urban vs rural; Interests in wildlife; Pet ownership	Yes	Yes	N/A
Borgi et al., 2014	3–6 years; adults	82 children; 58 adults	United Kingdom	Questionnaire; Experimental	Infantile features (yes or no); Species; Pet ownership	Cuteness; Attention	N/A	No	N/A
Borgi & Cirulli, 2015	3–6 years	282 children	Italy	Card-sorting	Species	Liking	N/A	Yes	N/A
Collado et al., 2022	8–12 years	359 children	Spain	Vignette	Attractiveness; Intervention or Control	Harm (degrees of okayness)	N/A	N/A	N/A
Collado & Sorrel, 2019	4–12 years	482 children	Spain	Vignette	Behavior type; Nature exposure; Urban vs rural	Harm (degrees of okayness)	Yes	N/A	N/A
Drissner et al., 2017	12 years	228 children	Costa Rica, Germany, Ukraine	Questionnaire	Country	Fear; Disgust	N/A	N/A	Yes
Fonseca et al., 2011	8–10 years	43 children	Portugal	Questionnaire; Intervention	Intervention or Control; Pre or post-test	Sentience, Welfare needs, Animal use acceptability	N/A	No	N/A
Hawkins & Williams, 2016	6–13 years	1217 children	United Kingdom	Questionnaire	Species	Pet ownership	Yes	No	N/A
Henseler Kozachenko & Piazza, 2021	6–10 years; adults	241 children; 152 adults	United Kingdom	Questionnaire; Dilemma	Pain; Intelligence; Harmfulness; Similarity; Aesthetics; Ability; Utility; Eating habits	Provide medicine (yes or no)	Yes	No	N/A

Authors	Age Range	Sample Size	Sample Country	Measure Type	Focal IV ^a	DVs	Identified Age Differences ^{a,b}	Identified Gender Differences ^{a,b}	Identified Country Differences ^{a,b}
Hussar & Harris, 2018	7–12 years	60 children	United States	Vignette	Animal category	Harm (degrees of okayness)	No	No	N/A
Kahn et al., 2008	6–7, 9–10, 12–13, 15–16 years	120 children	United States	Questionnaire	N/A	Fear; Caring; Welfare needs; Anthropocentric or biocentric orientation	Yes	N/A	N/A
Kellert, 1985	6–16 years	267 children; adults	United States	Questionnaire	N/A	Knowledge; Liking	Yes	Yes	N/A
Lee & Kang, 2012	6 years	44 children	South Korea	Card-sorting	Physical features	Moral character (good or bad)	N/A	N/A	N/A
McGuire et al., 2022	9–11 years; adults	119 children; 360 adults	United Kingdom	Questionnaire; Card-sorting	Entity	Entity categorization (food, pet or object); Animal use acceptability	No	N/A	N/A
Neldner et al., 2018	4–9 years	151 children	Australia	Card-sorting	Entity	Caring	Yes	Yes	N/A
Neldner et al., 2022	4–9 years	281 children	Australia	Card-sorting	Entity	Caring, Liking, or Knowledge	Yes	Yes	N/A
Nicoll et al., 2008	13–14 years	154 children	United States	Questionnaire; Intervention	Intervention type	Attitudes; Pet interactions; Pet ownership	N/A	No	N/A
Olivos-Jara et al., 2020	5 years	94 children	Spain	Questionnaire	Entity	Emotional attributions	N/A	N/A	N/A
Phillips & McCulloch, 2005	16–30 years old	425 young adults	Asia, Europe ^c	Questionnaire	Entity; Country	Mental capacities; Animal use acceptability	N/A	Yes	Yes
Prokop & Tunnichiffe, 2010	10–15 years	1297 children	Slovakia	Questionnaire	Pet ownership; Species (popular, unpopular)	Attitudes; Knowledge	N/A	Yes	N/A

Authors	Age Range	Sample Size	Sample Country	Measure Type	Focal IVs ^a	DVs	Identified Age Differences ^{a,b}	Identified Gender Differences ^{a,b}	Identified Country Differences ^{a,b}
Randler et al., 2012	11–13 years	319 children	Germany	Questionnaire; Intervention	Intervention or Control; Pre or post-test	Disgust; Fear	N/A	Yes	N/A
Salazar et al., 2022	9–12 years	1772 children	India	Questionnaire	Pre or post-test	Attitudes; Empathy	Yes	N/A	N/A
Sommer et al., 2019	4–10 years	126 children	Australia	Questionnaire; Experimental	Mental capacities; Moral standing	Harm (degrees of okayness)	Yes	N/A	N/A
Vidović et al., 1999	10–15 years	826 children	Croatia	Questionnaire	N/A	Pet ownership; Empathy; Prosocial orientation; Pet attachment	N/A	Yes	N/A
Wells & Hepper, 1995	11–15 years	650 children	United Kingdom	Questionnaire	Pet ownership; Species	Uses (degree of okayness)	Yes	Yes	N/A
Wilks et al., 2021	5–9 years	Children; adults	United States	Questionnaire; Dilemma	Species; Sentience; Intelligence; Exposure	Save: yes or no	No	No	N/A
Zhang et al., 2014	9–10 years	1119 children	China	Questionnaire	Nature contact; Urbanization; Species	Biophilia, Biophobia, Conservation attitudes	N/A	Yes	N/A

Note. This table includes all reviewed papers that included at least one measure of children’s attitudes towards animals. Please refer to our supplementary materials for an expanded table including additional relevant references.

^aFocal IVs are independent variables tested excepting Age, Gender or Country, which are listed in other columns. These columns indicate whether Age, Gender or Country differences were found in each of the studies. ‘Yes’ means that significant differences were found between levels/categories of these variables. No means that no significant differences were found between categories. N/A means not applicable as this variable was not measured in the current study. ^bThis study recruited students in the United Kingdom who were nationals from: Czech Republic, China, France, Germany, Italy, Japan, Korea, Latin America, Poland, Slovakia, Spain, Switzerland, Taiwan, Thailand, Turkey, United Kingdom, and the United States.

Interviews

Early research into children's attitudes toward animals was primarily interview-based. Researchers would ask open-ended questions (e.g., 'what would you do if you found a spider in the dining room of your house?'; Bjerke et al., 1998; Kellert, 1985). Children's answers would then be coded by researchers according to the perceived underlying motivation driving their answer (i.e., avoidance, protection, etc.). Kellert (1985) identified nine values that human adults and children commonly use to describe their relations with animals. These included moralistic values, which focus on a concern for the wellbeing of animals, naturalistic values, which focus on an affection for wildlife and the outdoors, and negativistic attitudes, which cover an avoidance of animals due to fear or dislike, among others. These early studies helped demonstrate the scope and complexity of the concepts that children, and adults, associate with animals.

Ratings

Recently, researchers have employed standardized Likert scales in order to quantify children's moral attitudes in a more systematic way. Children are asked a question (e.g., "If someone kicked this animal, how much pain would it feel?") and asked to respond on an ordinal scale (e.g., *no pain, a little pain, some pain, quite a bit of pain or a lot of pain*; Henseler Kozachenko & Piazza, 2021). In some cases, researchers employ vignettes that tell children about hypothetical scenarios where a transgression is performed against an entity, usually a person or animal. Children are then asked to rate this hypothetical (e.g., "How wrong was it for the person to hit the dog?", ranging from *definitely not okay* to *definitely okay*; Collado et al., 2022; Hussar & Harris, 2018; Sommer et al., 2019). These rankings give insight into how children think about the capacities of and transgressions towards certain entities (i.e., which are acceptable or unacceptable) and enable rough comparisons between them.

Sorting Tasks

In sorting tasks researchers present children with representations (e.g., pictures) of entities to be ranked or sorted. These tasks are open-ended, where children select as many animals as they wish and sort them into categories freely. For example, children sorted pet, food, high sentience and low sentience animals according to how much they cared about them (a lot, a little or not at all; Neldner et al., 2018). Similarly, McGuire et al. (2022) gave children pictures of animals, objects and food items, which children could sort into "pet", "food", or "other" categories. These tasks give insight into how children categorize animals along certain dimensions.

Prioritization Tasks

In prioritization tasks, children are presented with ethical dilemmas with two (or more) possible outcomes and asked to make a decision about which is the best outcome. For example, [Wilks et al \(2021\)](#) presented 5- to 9-year-old US-based children with dilemmas that involved two sinking boats housing various numbers of people, dogs, or pigs. Children were asked to decide which boat they wanted to save across a number of hypotheticals (e.g., “Would you save one person or 10 pigs?”; and could choose “can’t decide” if they felt the decision was too difficult). Similarly, [Henseler Kozachenko and Piazza \(2021\)](#) presented children with a moral dilemma in which all 19 animal entities became seriously ill. Children then had to choose the order in which they would administer medicine to the sick animals. These tasks impose an “upper limit” on moral concern (where not all entities can be given the top moral standing), which compels children to appraise the moral worth of entities *relative* to one other.

Factors Impacting Moral Concern

Across these measures, researchers have identified factors which appear to shape who children do (and do not) grant moral status to. To date, much of this work has focused on factors about the entity being judged (e.g., perceived sentience, perceived beauty etc.) and relatively less has focused on factors about the judge (e.g., age, political orientation, etc.). This is despite research demonstrating that factors about the judge account for at least as much variance as factors about the entity (see [Jaeger & Wilks, 2021](#)). In the next section, we review factors about the entity (in this case the animal) and factors about the judge (the child) that shape children’s moral concern toward different animals.

Factors About the Animal

Sentience

Sentience is a broad and difficult concept to capture. However, it may be defined as an entity’s ability to feel physical pain and negative emotions ([Wilks et al., 2021](#)). There is mixed evidence on whether children incorporate sentience into their moral judgements about animals. A number of studies have found that children think physical transgressions (e.g., hitting) performed against humans or animals are worse than those performed against robots ([Sommer et al., 2019](#)) or plants ([Collado & Sorrel, 2019](#)). And in another study, children judged physical moral transgressions against an animal as more morally wrong than hurting another child ([Hussar & Harris, 2018](#)). Importantly, when asked why it was more wrong, children most commonly referred to the vulnerability of the animal as the reason (38%), suggesting a link between perceived sentience and capacity to suffer. However, children also reported that it was more morally wrong to harm some animals over others: hurting pets was rated as more wrong than hurting

wild animals, which was again more wrong than harming farm animals. This suggests children perceive a moral hierarchy regarding which animals it is most damaging to harm (McGuire et al., 2022).

However, in other studies children do not factor sentience into their judgments of moral concern. When asked to rate animals on sentient dimensions such as feeling pain, children's evaluations had no impact on the order in which children chose to give medicine to the animals (Henseler Kozachenko & Piazza, 2021). In another study, when choosing to save dogs, pigs, or people, children's perceptions of sentience of the animals was unrelated to their tendency to prioritize humans over animals (though perceived intelligence was predictive; Wilks et al., 2021). These findings suggest that children do not consistently use sentience as a metric for evaluating moral worth. Rather, children may grant moral concern to entities for reasons outside of perceived sentience. However, it may also be a function of using varying methods to capture a difficult and abstract concept. Focused research exploring the link between sentience and moral concern is still needed.

Mental Life

Children might also evaluate the richness of an organism's mental life. That might include its capacity to think, feel emotions, or act with intention (Weisman et al., 2021). When asked to assign mental, bodily and emotional attributes to a range of human and animal entities, 6- to 12-year-old children from 5 countries (America, China, Ghana, Thailand, Vanuatu) consistently answered according to a mind-body distinction, suggesting they form a concept of mind early on that is separate from bodily sensation (Weisman et al., 2021). Children in the UK (Hawkins & Williams, 2016) showed consistent patterns when ranking which animals might have richer versus lesser capacities to feel happiness, sadness and fear, with dogs, chimpanzees and humans having higher ratings than frogs, cows, and goldfish. Notably, those children who also owned pets had elevated perceptions of mental life compared to those children who did not have pets. The directional influence here is unclear: it may be that direct experience with animals elevates children's perceptions of animals' mental life. By contrast, children (or their families) that see animals as having greater mental capacities may be more likely to choose to have pets.

Intelligence²

Several studies have found that the perceived intelligence of an animal (e.g.; how smart or clever they are) is predictive of its moral standing. For example, both Henseler Kozachenko and Piazza (2021) and Wilks et al. (2021) found that intelligent beings

2) While intelligence is arguably a narrow component of mental life, we think it is important to distinguish perceptions of broad mental life from intelligence when considering their roles in shaping moral value.

were granted more moral worth: being more likely to receive medicine and be saved from a sinking ship, respectively. Importantly, this finding persists for both children and adults' moral judgements—thus perceived intelligence appears to reliably predict moral worth. However, there is a large amount of conceptual overlap between intelligence and other similar concepts, such as mental life and sentience. To our knowledge, no empirical research has systematically explored the differences and similarities between these concepts and how they apply to moral concern. We consider this an important area of future study.

Anthropomorphism and Perceived Similarity

Anthropomorphism is common in children's storybooks and movies, where animal characters have emotions, thoughts, and speech like humans do. There appears to be a relationship between anthropomorphism and moral concern: research shows that children who use anthropomorphic language to describe animals tend to grant them higher moral standing (Gebhard et al., 2003). Further, Henseler Kozachenko and Piazza (2021) found that children aged 6- to 10-years, as well as adults, rated animals they perceived as more similar to themselves as having more moral standing. However, there is some evidence that this tendency is culturally variable: some studies find that anthropomorphism is more common in children from urban areas than those living in rural areas or Native American communities (Medin et al., 2010).

Physical Appearance

Beauty and Attractiveness — One factor that consistently influences children's ratings of animal moral worth is physical appearance. If an animal is perceived as attractive or beautiful, it is more likely to be ascribed moral worth, compared to when it is conceived of as unattractive or ugly (Borgi & Cirulli, 2015; Henseler Kozachenko & Piazza, 2021). Features deemed attractive appear to include colour variation, infantile features such as large, wide-set eyes, and large body size (Borgi et al., 2014; Henseler Kozachenko & Piazza, 2021). For example, butterflies are often granted higher levels of moral standing than other invertebrates, which may be due to their vibrant colors (Borgi & Cirulli, 2015; Collado et al., 2022). And when pictures of dogs and cats are manipulated to show more infantile features, they are rated as more "cute" by children and are looked at for longer (Borgi et al., 2014).

Children will also judge moral transgressions as more morally wrong when they are made towards attractive animals. Collado et al. (2022) gave children pictures of animals and asked them to rate how attractive they found them. They subsequently heard about moral transgressions committed against the animal. Children judged it more immoral to harm attractive than unattractive animals. Importantly, moral transgressions against attractive animals were judged as equally morally wrong to a harmful action made against another human child.

Glocker et al. (2009) propose that the underlying mechanism driving such preferences are likely of an evolutionary nature. Infantile features signal that an animal is not a threat, but rather vulnerable and needing protection. In adults, there is evidence that these features activate our caretaking or nurturant neurological pathways (Glocker et al., 2009).

Risk and Disgust — Whether or not an animal is perceived to be dangerous or disgusting appears to have an impact on its perceived moral standing. Children consistently report feeling negative emotions, such as fear, surprise and disgust, towards insects, crustaceans and reptiles (Borgi & Cirulli, 2015; Olivos-Jara et al., 2020). Children also grant lower moral standing to these animals than to mammals and birds (Henseler Kozachenko & Piazza, 2021). This occurs despite children having good knowledge of the biological characteristics of invertebrates (Prokop & Tunnichliffe, 2010), with one study finding that children had greater knowledge even than adults (Kellert, 1985).

Children from multiple countries report a dislike of reptiles and insects, suggesting this aversion might be evolutionarily adaptive (Bjerke et al., 1998; Drissner et al., 2017; Salazar et al., 2022). Experiencing strong affective responses to such animals likely evolved to ensure humans avoided animals potentially harmful to us (such as venomous snakes and insects that carry disease; Henseler Kozachenko & Piazza, 2021). Six-year-olds pay more attention to physical features in animals that signal threat, such as claws or sharp teeth, labelling animals with such features as “bad” (Lee & Kang, 2012). Children also grant lower moral status to those animals they perceive as harmful (Henseler Kozachenko & Piazza, 2021). Notably, Henseler Kozachenko and Piazza found that this effect was stronger in 6- to 8- year olds than 8- to 10- year olds, suggesting that younger children might place more weight on the potential threat of an animal when making moral judgements than older children (Henseler Kozachenko & Piazza, 2021). However, one study examining how children thought about bats revealed that while they were fearful of bats, they also reported caring about them, and afforded them moral rights such as the freedom to be wild (Kahn et al., 2008). This suggests children can grant moral standing despite fearful attitudes, at least for some species.

Factors About the Child

Age

Age is an important factor that shapes moral concern towards animals. Children are repeatedly shown to grant more moral worth to animals than adults do (McGuire et al., 2022; Neldner et al., 2018; Wilks et al., 2021). However, we also find evidence that children’s attitudes change across development.

Early Childhood (3–6 Years) — Young children grant high levels of moral standing to animals. When asked to evaluate how much they cared about a range of entities,

young children aged 4–5 years consistently report caring ‘a lot’ about a range of animals (Neldner et al., 2018; Neldner et al., 2022). Young children use the perceived aesthetics and benevolence (lack of threat) of the animal to guide their decision-making when granting animals moral status, with animals perceived as beautiful, harmless, and friendly granted the most moral concern (Henseler Kozachenko & Piazza, 2021). They seem less inclined to use sentience, utility, or intelligence to guide their moral evaluations of animals at this stage of development (Henseler Kozachenko & Piazza, 2021). Instead, affective mechanisms such as joy, curiosity, and fear appear to drive children’s attitudes towards and relations with animals at this stage (Kellert, 1985; Lee & Kang, 2012).

Middle Childhood (7–11 Years) – In middle childhood, children’s valuation of animals overall, and in comparison with human entities, decreases significantly (Neldner et al., 2018). This is not due to a restricting of older children’s overall moral concern, but rather a ‘re-orienting’ of this concern towards more human entities, at the exclusion of most animal entities (except pets). This occurs even though they still report high levels of liking for animals at this stage (Neldner et al., 2022). This might occur as children become increasingly attuned to social norms valuing human entities as they go through school and consume more media (Kellert, 1985; Neldner et al., 2018). Despite this, children’s knowledge of animals has shown to increase rapidly from 10 to 13 years of age, and children show improvements in being able to process human-animal relations based on abstract relations rather than self-related ones during this period (Kellert, 1985).

Reflecting this, in middle childhood children consider multiple attributes when deciding which animals to grant moral concern to. Eight to 10-year-olds granted more moral standing to animals they thought were beautiful, intelligent and similar to humans. They also considered potential utility in their decisions: animals deemed more edible were afforded more moral standing (Henseler Kozachenko & Piazza, 2021). However, children aged 9–11 years old were less likely to categorize farm animals like pigs as ‘food’ compared to adolescents and adults (McGuire et al., 2022). This trajectory suggests children learn to value animals according to human utility through social learning and cultural mechanisms (McGuire et al., 2022).

Adolescence (12–18 Years) – In adolescence, children tend to report the least interest in animals and nature. A decline in reported interest in animals and a wish to conserve nature has been found from 9–15 years of age (Bjerke et al., 1998; Keith et al., 2021). Some researchers term this the ‘adolescent dip’ (Keith et al., 2021). Although little work has measured the moral concern of adolescents (McGuire et al., 2022), it is likely that the moral standing of animals also falls in this developmental phase. However, adolescents also show greater capacities for reasoning about the complex interrelations animals have with their ecosystems and with humans (Kellert, 1985; Myers et al., 2004). Further, a subset of adolescents routinely engage in strong acts of environmental activism, such as

Fridays for Future campaigns that call for global climate change action (Wallis & Loy, 2021). More research is needed to see whether individual differences in moral attitudes towards nature widen in adolescence, and identify mechanisms that might predict when and why some adolescents still display strong affiliations with nature.

While trends of decreasing moral concern for animals have been found in several studies (Henseler Kozachenko & Piazza, 2021; Neldner et al., 2018; Neldner et al., 2022), others report consistent results across ages. For example, Wilks et al. (2021) found children as young as 5 and as old as 9 granted similar moral worth to dogs and pigs (vs. people) in prioritization. The differing patterns seen across studies may reflect methodological differences. For example, Neldner et al. (2018) asked children to rate the moral worth of each animal, thus a certain level of moral concern could be extended to all entities. By contrast, Wilks et al. (2021) had children make tradeoffs between lives, forcing a relative judgement (though the children could choose “can’t decide”). The ‘mortal’ weight of this manipulation might have led children to be more protective of animal life in their evaluations. It will be the task of future research to ascertain how much methodology impacts children’s moral judgements about animals.

Gender/Sex – Females typically ascribe higher moral worth to a range of animals than males (Herzog, 2007; Kellert, 1985; Neldner et al., 2018). This finding persists across multiple measures and methods (e.g., reported liking vs. moral concern; Borgi & Cirulli, 2015; Kellert, 1985; Neldner et al., 2018). It occurs even though boys are less likely to show a strong disgust or fear response towards animals colloquially known as “creepy crawlies” (like spiders, scorpions, and snakes; Borgi & Cirulli, 2015; Prokop & Tunncliffe, 2010). However, when asked to evaluate how immoral acts of physical harm against animals were, boys and girls judged the acts equally wrong (Hussar & Harris, 2018).

In one study, female high school students also reported a stronger connection to nature than male students, and felt a greater sense of responsibility for caring for it (Keith et al., 2021). They also report a greater willingness to engage in conservation behaviours such as donating to charities, suggesting that these gender differences persist across childhood and into adolescence. However, it is currently unknown whether such differences reflect innate preferences or socialization pressures—females are often encouraged to appear more nurturant and caring of others, which might influence their responding on such tasks (Keith et al., 2021). More research is needed to uncover the mechanisms driving gender differences across the lifespan.

Pet Ownership – Children who have experience living amongst, and caring for pets, often grant a range of animals greater moral standing. Wilks and colleagues (2021) found that children who owned pets were less likely to prioritize humans over dogs or pigs within a trade-off dilemma, suggesting pet ownership might reduce speciesist preferences. Remarkably, children in Slovakia who owned pets also showed more positive

attitudes towards popular (e.g. rabbits) and unpopular (e.g. potato beetle) local animals (Prokop & Tunnicliffe, 2010), suggesting that the positive effects of pet ownership may generalize to many animals. Children who own pets, as well as those who report strong affection for their pets, consistently score higher on tests of empathy than their non-pet-owner counterparts (Vidović et al., 1999). It is possible that caring for pets helps build empathy through providing opportunities for children to practice nurturance, responsibility and affection (Vidović et al., 1999). However, it is also possible that children (and families) who care more about animals are more likely to own pets. Finally, Henseler Kozachenko and Piazza (2021) found that pet ownership did not influence how children evaluated a range of an animal lives in their medicine allocation task, indicating that the effect may not persist in all cases.

Meat Consumption — The choice to eat (or abstain from) meat might also shape, or be influenced by, children's moral judgements about animals. While substantial work is underway exploring these links in adults (Piazza et al., 2015), research with children is more limited. McGuire and colleagues (2022) found that, compared to adults, 9–11 year old children grant more moral concern to food animals, and are less likely to categorize farmed animals as food. In a recent study, high school students were most likely to abstain from eating meat over a three-month period if they had been presented with an educational appeal using an animal welfare focus, rather than a health focus (Bryant & Dillard, 2020). This suggests concern for animal wellbeing might motivate changes in adolescents' food choices. However, other work shows that children do grant less moral status to food animals than companion animals (Henseler Kozachenko & Piazza, 2021; Neldner et al., 2018; Wilks et al., 2021). Finally, Hussar and Harris (2018) find that vegetarian and non-vegetarian children aged 7 to 12 make similar moral judgements about moral transgressions against animals (with children generally seeing harm to animals as equally bad or worse as transgressions performed against humans). This collection of work highlights that, as in adults, the relationship between moral concern for animals and an individual's eating habits is dynamic and complex—possibly reflecting similar mechanisms of protective rationalization (Piazza et al., 2015). Given the applied importance of these questions, we consider this a critical area for future research.

Cultural Environment — Many researchers acknowledge that a child's cultural environment shapes their moral attitudes towards animals (Medin et al., 2010; Phillips & McCulloch, 2005; Wilks et al., 2021). A child's cultural environment will influence their belief and value systems, and change the ways in which they experience and interact with nature (Medin et al., 2010). Despite this, most of the research examining children's attitudes towards animals has sampled children from Westernized countries—reflective of a larger sampling bias in development psychology research more broadly (see Henrich et al., 2010 for a review of how psychological, motivational and behavioral factors vary

across Westernized and other countries). We see this as particularly problematic for research in this domain, as it means that the work is being conducted in areas away from where most of the world's biodiversity is now concentrated (Kellert, 1985; see Table 1). Indeed, the majority of research examining children's moral concern for animals has taken place in the United Kingdom, United States, or Australia (Collado et al., 2022; Henseler Kozachenko & Piazza, 2021; Hussar & Harris, 2018; Neldner et al., 2018; Wilks et al., 2021). The field is, thus, clearly limited by a lack of representation from countries outside the Global West, and a dearth of cross-cultural research.

However, a small number of studies are attempting to break this trend. One cross-cultural study examined young adults' (aged 16–30 years-old) moral attitudes in several European and Asian countries. The authors found that young adults from Asian cultures reported lower levels of moral concern for animal suffering, but revered animal life at similar levels to young adults from European cultures (Phillips & McCulloch, 2005). Another study examined 9- and 10-year-olds living in China, finding that children who had higher ratings towards a range of animals were more willing to engage in conservation practices (Zhang et al., 2014). Finally, Salazar and colleagues (2022) found that children in India felt stronger connections to their family than to nature or wildlife, that positive emotions were mostly associated with harmless local animals (such as peacocks), and negative emotions to potentially dangerous animals (such as elephants). These studies hint at the vital role cultural upbringing and socialization likely plays in the formation and maintenance of children's moral valuations of animals.

Similarly, most children tested live in urban environments. Some research finds differences in children's perceptions of animals depending on whether they live in urban or rural environments. Children living in rural areas have higher factual knowledge about animals (Kellert, 1985), and report less concern about animal use for sport or entertainment than children living in urban areas (Wells & Hepper, 1995). Living in an urban location is also associated with lower reported connections with nature for children (Zhang et al., 2014). Finally, a small number of studies have shown that children raised on farms (and those with pets) have greater biological understanding and use less anthropocentric reasoning than those raised in urban environments (or who don't have pets; Longbottom & Slaughter, 2016; Medin et al., 2010).

We consider it crucial that future research prioritizes sampling from a diverse range of cultural environs, including small-scale subsistence communities and remote populations. Only with broader sampling can we begin to identify the underlying mechanisms driving variation and similarity in children's valuation of animals across different contexts.

Shifting Perceptions

Are there factors which shift children towards granting greater moral status to animals? A substantial amount of research finds that children's attitudes towards animals become more positive after a child has interacted physically with a companion animal (Fonseca et al., 2011; Nicoll et al., 2008). Even attitudes towards unpopular animals can be shifted through such interventions. For example, using a pre-post design, Randler et al. (2012) found that 11- to 13-year-olds reported more positive attitudes towards typically disliked animals (a wood louse, a snail, and a mouse) after having the opportunity to closely observe and interact with them. Importantly, reported disgust and fear were significantly reduced. Similarly, after Spanish school children attended information sessions where they learned about the biology and behaviour of moths, ants and bats, they judged harmful actions made towards these animals as more morally wrong (Collado et al., 2022). However, most of these studies test post-intervention attitudes only weeks after the activity has occurred, meaning their longer-term impacts remain unknown.

More intervention-based research is sorely needed, ideally with comprehensive, longer-term follow ups. For instance, very few interventions have targeted young children between 3 and 6 years of age. However, given that younger and older children appear to ascribe moral worth based on different factors, interventions that might suit older children, such as those emphasizing the intelligent behavior of animals, may not be successful with younger children. Rather, those that focus on developing a positive emotional connection might work best (Kellert, 1985). Therefore, future research must ensure interventions are age-relevant and evidence-based in regards to the factors impacting children's prioritization of animals within each stage of development.

Moving the Field Forward

When synthesizing across the findings listed in this review, it appears that younger children are more willing to include a range of animals within their circles of concern than older children. Further, the specific dimensions that appear to predict their evaluations of moral worth vary from those used by adults. However, many open research questions remain. We still do not know the cognitive and social mechanisms that underpin these moral attitudes, nor which factors drive the apparent shift in attitudes between childhood and adulthood. For this, both cross-sectional and longitudinal work is needed. We also lack the research to determine how these attitudes may reflect children's behavior towards animals in real-world contexts. Finally, as demonstrated in this review, the results appear to vary as a function of the types of measures used and participants sampled—the latter point being particularly problematic given the systematic oversampling of WEIRD populations in developmental psychology (Henrich et al., 2010). Given the breadth and complexity in the concept of moral concern, the field would benefit from

large-scale systematic exploration of these factors to identify what types of moral concern are applied when, and to whom. We suggest the primary focus for the next decade of human-animal relations research focus on uncovering these underlying mechanisms, and sampling broadly from diverse populations of children, to gain a picture of how various cultural values and viewpoints shape these attitudes. By employing mixed-methods approaches, incorporating interviews, experimental paradigms and observational assessments, studies will gain more insight into the complexity behind children's moral attitudes and behaviors towards animals in a range of contexts (Salazar et al., 2022).

Despite the clear need for more research, the field has made substantial progress in understanding the development of our attitudes towards animals. The authors of this piece consider these findings tentatively optimistic. Children, especially younger children, appear to hold caring and compassionate attitudes towards animals, and value them much more similarly to humans than their adult counterparts. This is also reflected in young people's moral attitudes towards nature and the environment more broadly; with the huge push from young people in the climate movement as just one example (Wallis & Loy, 2021). Understanding how we can best help preserve the concern that young people show towards animals into adulthood is a pertinent question for the future (Keith et al., 2021; Olivos-Jara et al., 2020). We consider it critical for facilitating positive and effective change in societal attitudes towards (and treatment of) non-human animals going forward—a trend which we are already seeing reflected in the general expansion of society's moral circle (Singer, 1981).

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Supplementary Materials

The supplementary materials in Neldner and Wilks (2022) include additional references relevant to understanding how children value animals in development. These are organized according to the sections of the main review they are most relevant to and are also recapitulated within an extended table summary of papers.

Index of Supplementary Materials

Neldner, K., & Wilks, M. (2022). *Supplementary materials to "How do children value animals? A developmental review"* [Additional Materials]. PsychOpen GOLD.

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