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Children and adults across 15 countries believe in human uniqueness of mind: a cross-cultural investigation of cross-species mind perception

Karri Neldner [a,b,1,*], Luke Maurits [a,1], Magie Junker [c,d], Lara Abbas [3], Nayrouz Abbas [3], Arianna Abis [c], Federica Amici [e], Bernardo Arroyo-Garcia [c], Negar Asghari [a], Giovanna Barragán Pardo [3], Zhen Zhang [f], Junior Peña Chumacero [3], Ardain Dzabatou [a], Dustin Eirdosh [a], Susan Hanisch [a], Tom Herrnsdorf [c], Tom Hovehne [3], Alicia Junker [3], Patricia Kanngiesser [g], Felipe Villa Larens [3], Safaa Mahmoud [3], Sandra Masaquiza [3], Iino Masato [3], Risma Illa Maulany [3], Tongtong Meng [f], Kardelen Mutlu [3], Putu Oka Ngakan [3], Ebru Peközer [a], Ljubica Petrović [a], Mirella Christy Rehatalanit [3], Kadek Sonia Piscayanti [h], Sarah Pope-Caldwell [a], Maria Inés Sandoval Sernaque [3], Dennis Shishala [3], Doriana Sportelli [i], Roman Stengelin [a], Thomas Stodulka [j], Blanca Striegler [c], Wanting Sun [f], Jahnavi Sunderarajan [k,c], Sebastian Tempelmann [i], Ferdiansyah Thajib [l], Noemi Thiede [a], Disney Tjizao [a], Linus Useb [a], Lena Woidich [c], Janina Weyrowitz [c], Daniel Haun [a,2], Katja Liebal [c,e,2]

[a] Department of Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology, Germany
[b] School of Psychological Science, The University of Western Australia, Australia
[c] Leipzig Lab, Children and Nature, The University of Leipzig, Germany
[d] School of Psychology, Cardiff University, UK
[e] Institute for Biology, The University of Leipzig, Germany
[f] Institute of Psychology, Chinese Academy of Science, China
[g] School of Psychology (Faculty of Health), University of Plymouth, UK
[h] English Department, Universitas Pendidikan Ganesha, Indonesia
[i] Institute for Research, Development and Evaluation, Pädagogische Hochschule Bern, Switzerland
[j] Department of Social and Cultural Anthropology, University of Münster, Germany
[k] Department of Social Sciences, Flame University, India
[l] Institute for Near Eastern and East Asian Languages and Civilizations, Friedrich-Alexander-Universität, Germany

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ABSTRACT

The way humans relate to other animals is fundamentally shaped by whether we perceive ourselves as unique, with feelings and thoughts not shared by other animals. How beliefs about animals' ability to feel and think develop across cultures remains largely unexplored. We asked children and adolescents (4–17 years, $N = 1025$) and adults ($N = 190$) from 33 urban and rural communities across 15 countries whether animals have thoughts or feelings (judgments of presence), and whether those thoughts or feelings are human-like (judgments of similarity). Bayesian analyses revealed that participants generally ascribed non-human animals the ability for thoughts and feelings. However, they universally denied that animals have human-like thoughts, with these beliefs emerging early in development across all societies and remaining stable across the lifespan. There was more cultural variation found in whether participants attributed human-like feelings to animals. Human mental

* Corresponding author. Department of Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology, Germany.
E-mail address: karri_neldner@eva.mpg.de (K. Neldner).
[1] first authors (shared).
[2] senior authors (shared).
[3] Independent Researcher.

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exceptionalism appears to be a human universal and is restricted to human-like thoughts. Implications for human-animal relationships and ethical considerations for the treatment and conservation of other animals are discussed.

1. Introduction

Are humans unique among animals? Are humans even animals at all? In Western societies, attempts to answer these questions have traditionally focused on the human mind. While Rene Descartes claimed that only humans are "creatures of reason" (Descartes, 1664), Charles Darwin claimed that "there is no fundamental difference between man and the higher animals in their mental faculties" (Darwin, 1871). The Latin name *Homo sapiens* ('wise human'; Linnaeus, 1758) directly relies on the assumption that human ways of thinking are our defining features. In consequence, questions of human exceptionalism rely on whether we believe that non-human animals (herein referred to as animals) have thoughts and feelings similar to our own. Crucially, such concepts of animal thoughts and feelings are not only central determinants of human self-image (Knight, 2020), but they are also a foundation for the ways we relate to other animals: Humans love, eat, torture, fear, and worship animals (Alves, 2012), not least depending on whether they believe these animals share thoughts and feelings similar to our own (Amiot et al., 2017a; Caviola et al., 2019; Gray et al., 2007). In this study, we examine how children, adolescents and adults across 33 communities conceive of animal thoughts and feelings, and the perceived similarity of these to human thoughts and feelings.

1.1. The origins of cross-species mind perception

The ability to reason about the mental states of others is a fundamental aspect of human cognition. Mind attribution, or 'mind reading', allows us to predict how an individual is feeling, what they are thinking, their desires and their beliefs. For this reason, our 'Theory of Mind' is a pivotal mechanism supporting strategic social cognition (McCabe et al., 2000; Sher et al., 2014), social connection (Epley et al., 2007), morality and empathy (Baron-Cohen et al., 2002; Hoffman, 1993), and reflexive thought (Bogdan, 2000). While this ability likely evolved to reason about other human minds and predict human behaviour (Eddy et al., 1993), we also apply it flexibly to reason about the minds of other species (Ladak et al., 2023).

Several theorists have described the socio-cognitive and motivational processes involved in attributing or denying mental experiences to other animals (Dhont et al., 2016; Spence, Urquiza-Haas & Kotrschal, 2015; Waytz et al., 2010b). These include neurocognitive architectures that support perceiving intentionality in others' action (Spence, Urquiza-Haas, & Kotrschal, 2015); social biases that favour ingroups and derogate outgroups (Tajfel and Turner, 1986; Dhont et al., 2016; Loughnan et al., 2009); and social learning mechanisms that shape individuals' values through the adoption of cultural beliefs and narratives (Airenti, 2018; Amiot et al., 2017b). Together, these processes provide the foundation for how humans decide which aspects of mind – sensations, emotions or cognition – they are willing to attribute to other animals.

Adults in the economic Global North attribute basic emotions like anger, fear, and pleasure to animals, considering these emotions universal and essential for animals' survival (Burghardt, 1985; Demoulin et al., 2004; Haslam et al., 2008; Herzog & Galvin, 1997). However, they often deny animals more complex emotions such as guilt, shame, and empathy, viewing these as uniquely human (Barrett, 2011; Demoulin et al., 2004; Gray et al., 2007; Leyens et al., 2000). Similarly, adults in these populations rarely attribute complex cognitive abilities like knowing, imagining, and reasoning to animals (Haslam et al., 2008; Eddy, Gallup & Povinelli, 1993). This suggests that at least in the Global North, humans believe their mental experience is distinct, if not superior to, the rest of the animal kingdom (Caviola et al., 2019; Costello & Hodson, 2014; Opotow, 1990). Outside the Global North context, systematic investigation of animal theories of mind is limited.

1.2. Cultural variation in cross-species mind perception

There is reason to expect not all humans perceive human and animal mental experiences in the same way (Lillard, 1998; Weisman et al., 2021; Žakula, 2024). Dominant religions vary in how much they emphasize a separateness (Western, Abrahamic religions), or a unity (Eastern religions such as Tao, Buddhism and Hinduism) between other animals and humans (Waldau & Patton, 2009; Yamashita, 1996). Many Indigenous cultures believe there is an interdependence and mutuality between humans and other living beings (Descola, 2006, 2013; Guenther, 2024; Ingold, 1994; Taverna Loza et al., 2016), and in many forager societies, some animal species are other-than-human persons (Nadasdy, 2007; Revilla-Minaya, 2019; Rose, 2013). Animals frequently feature in folklore and origin stories across diverse cultures, taking on or symbolizing the emotions and characteristics of humans (Sax, 2001; Schmidt, 2018). The extent to which we believe human and animal mental experience overlaps is embedded in the corresponding cultural context (Žakula, 2024).

Previous research suggests humans divide experiences into two categories: mind and body (Astuti, 2001; Bering & Bjorklund, 2004; Herzog & Galvin, 1997; Gray et al., 2007). Weisman et al. (2021) examined people's judgments of whether humans or animals could experience perceptions, emotions and cognitions in 5 cultures (China, Ghana, Thailand, USA, Vanuatu). They found diversity in how these experiences clustered: in China, USA and Thailand, three clusters separated 'body' (feeling pain, pleasure, tiredness), 'heart' (socio-emotive experiences) and 'mind' experiences (remembering, planning, communicating). However, in Ghana and Vanuatu, 'heart' experiences were distributed across body and mind clusters. All experiences were attributed to humans, but animals were denied mind and heart experiences, suggesting that participants were reluctant to attribute higher-order experiences to animals. To understand what mechanisms support the development of these beliefs, it is important to consider when and how they emerge in childhood.

1.3. Developmental changes in mind perception

From infancy, human children are fascinated by animals (DeLoache et al., 2011), and readily identify and compare human features with those of other animals. Young children in urbanized areas of the Global North demonstrate a human-centered view of biological life: they use perceived human similarity as the benchmark for comparing other animals to humans (Carey, 1985; Carey & Spelke, 1994). Between 4 and 7, they undergo 'conceptual change' in their thinking and start categorizing animals on biological and ecological traits, rather than human resemblance (Coley, 2007). Children growing up in rural areas in the Global North, as well as those from Menominee, Yucatán and Wichi Indigenous communities, do not show human-centered reasoning, but categorize according to biological kind already at 4 years of age (Medin et al., 2010; Ross et al., 2003; Taverna Loza et al., 2016). This suggests that cultural conceptions of biological similarity (or dissimilarity) to animals begin early in life, and are reflective of lived experience.

Between the ages of 4 and 7, children also develop a Theory of Mind, enabling an understanding that others' beliefs, emotions, and thoughts may diverge from their own (Flavell et al., 1993; Wellman, 1992; Wellman & Liu, 2004). This capacity allows greater flexibility in

considering different kinds of minds and experiences (Altun, 2020; Baron-Cohen et al., 2002), and 6–12-year-old children show diversity in the types of thoughts and feelings they assign to different entities, although these tend to exist within mind-body dualities (Bering & Bjorklund, 2004; Weisman et al., 2021; Sommer et al., 2019). However, the exercising of this capacity is culturally malleable– in some cultures inferring the minds of others is rarely emphasized (Lillard, 1998; Ochs & Schieffelin, 1989) and this might explain variation in children's performance on theory-of-mind tasks across communities (Dixson et al., 2018; Mayer & Träuble, 2013).

Together, these findings suggest that younger children may be more likely to attribute human-like mental capacities to other animals than older children. This is because younger children are more likely to show human-centered reasoning, and lack sophisticated capacities for representing other kinds of minds. However, the development of children's intuitions about animals' thoughts and feelings outside the economic Global North remains severely understudied (Amiot & Bastian, 2015). Combined cross-cultural and developmental approaches are needed for understanding both recurrent and variant patterns in when and how humans come to ascribe (or deny) human-like mental states to animals. Such work is critical, as these underlying beliefs directly impact how humans value and treat other animals (Caviola et al., 2019).

1.4. The consequences of cross-species mind perception

Belief in animal mind is arguably the most important cognitive domain influencing the moral status of animals (Sorabji, 1995; Waytz et al., 2010b). Granting animals a mind confers them moral standing and moral rights (Epley et al., 2007; Epley & Waytz, 2009; Gray et al., 2007; Waytz et al., 2010b). It also builds empathy and prosocial action towards them (Nijssen et al., 2024; Sevillano, Aragones, & Schultz, 2007). In contrast, reducing the mental experiences of animals diminishes their perceived value and our felt obligations to them (Hills, 1995; Knight et al., 2004). According to Serpell (2009), humans hold inconsistent beliefs about animals because we desire two things: to have animals as companions and to utilize them for our needs. For example, some adults in South Korea endorse keeping dogs as pets, but say they would oppose a ban on eating dog meat (Podberscek, 2009). Similarly, research has found that individuals who eat meat are more likely to deny complex emotions and cognitions to food animals such as cows, pigs and chickens (Bastian et al., 2012; Bratanova et al., 2011; Wilkins et al., 2015). If these beliefs are motivated by protective mechanisms that reduce our discomfort about harming animals (Loughnan et al., 2010), it is possible that the tendency to separate human minds and animal minds might be culturally pervasive.

1.5. The present research

Here, we investigated whether 1) children and adolescents believe animals have thoughts and feelings (judgments of presence) and 2) whether they believe these thoughts and feelings are human-like (judgments of similarity). We interviewed 1025 children aged 4–17 years from 33 diverse urban and rural communities across 5 continents and 15 countries. Communities were recruited to maximize and represent global variation in geography, subsistence, as well as socio-cultural, political, and religious views. We also examined a total sample of 190 adults from these communities to compare adult conceptions of human exceptionalism to those of children. We employed semi-structured interviews with open-ended questions, as they allow culture-fair comparisons that don't impose conceptual categories, but prioritize children's intuitive beliefs (Fargas-Malet et al., 2010; Wrightsman, 1992).

Based on prior research, we expected that children, adolescents and adults would be more likely to 1) attribute animals with feelings than thoughts, and 2) say that animal feelings were human-like, whereas animal thoughts were not human-like. Given that Theory of Mind (Wellman & Liu, 2004) and mind-body-dualism typically emerge in middle childhood (Weisman et al., 2021), we expected a decrease in the likelihood of attributing thoughts, and especially human-like thoughts, to animals as children aged, regardless of cultural context. Given the paucity of cross-cultural developmental research investigating human-animal attitudes, we made no specific hypotheses regarding how children's responses might differ between specific communities, but planned to examine country-level and urban-rural differences.

2. Materials and methods

2.1. General approach

The data presented here was extracted from the 'Children and Nature (CaN)' project. The CaN project is a large-scale, collaborative project that seeks to track developmental changes in children's, adolescents', and adults' attitudes towards animals across diverse cultures (Thajib et al., 2025). The CaN project conducted semi-structured interviews with children about animals, comprising 24 questions. The interview questions were developed through an iterative process with consultation between anthropologists, developmental psychologists and local collaborators to ensure the questions would be familiar and appropriate in each community. The current study focuses on the 4 interview questions asking about animal thoughts and feelings, and data was extracted from communities where 50% or more of the total data collected was translated and coded (33 communities on 20th September 2023). The following sections detail information related to those questions specifically. For comprehensive descriptions of the methods and materials used for the CaN project, please refer to the supplemental materials. For a review of the challenges and complexities embedded within our partially-remote collaborative approach, please see Thajib et al., 2025.

2.2. Ethical approvals

Ethical approval for the CaN project was obtained from the ethical committee of the Freie Universität Berlin (Proposal number: 017/2020). As we were working with vulnerable groups in some communities, approval from local authorities and cultural boards was obtained where possible. In Zambia research approval was granted from the Chimfunshi Research Advisory Board, and in Namibia we consulted with the National Commission on Research Science and Technology (NCRST #RPIV01112021). As some interviews were conducted at schools in urban and rural Saxony, Germany, additional approval was obtained by Landesamt für Schule und Bildung (LASUB, approved on 8th September 2020).

2.3. Participants

This study includes 1025 children and 190 adults from 33 different rural and urban communities within 15 countries. Our participants lived in urban and rural communities in China ($n = 83$), Colombia ($n = 44$), Republic of the Congo ($n = 48$), Ecuador ($n = 67$), Germany ($n = 68$), India ($n = 51$), Indonesia ($n = 160$), Italy ($n = 84$), Japan ($n = 36$), Namibia ($n = 25$), Peru ($n = 83$), Switzerland ($n = 62$), Syria ($n = 88$), Turkey ($n = 26$), and Zambia ($n = 100$; refer Fig. 1). Table S2 in the supplemental material describes the age and gender breakdown of each community sample. The differentiation between more urban and more rural settings was based on the judgments of our local collaborators, rather than by applying an external measure (e.g., population density), as local perceptions of what is considered an urban settlement within the cultural context largely varied across sites.

2.4. Recruitment

Participants were recruited through local collaborators, who were community members or researchers with longstanding relationships

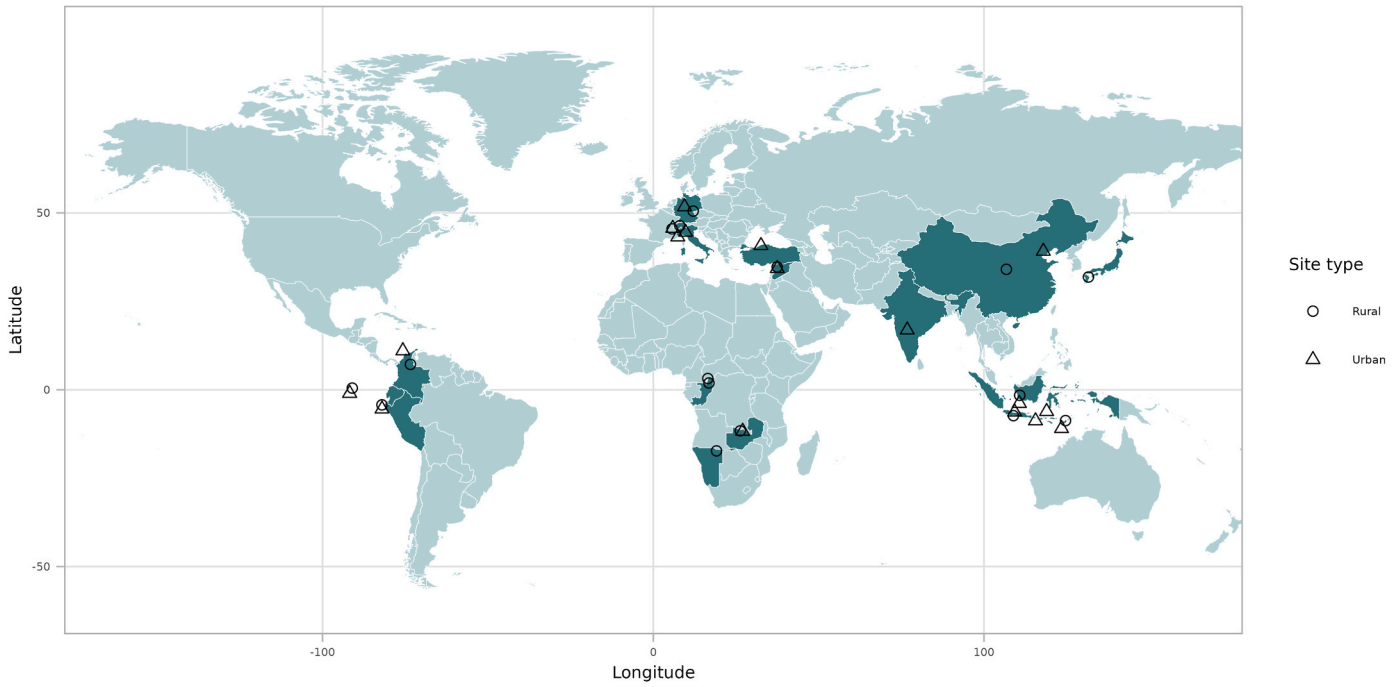

Fig. 1. The global distribution of the 33 communities sampled, representing child and adult participants together. Communities described as urban by local collaborators are represented with triangle points, and communities described as rural by local collaborators are represented with circle points. Countries represented in the sample are coloured in darker green.

with the community. Local collaborators recruited a sample of up to 50 children and adolescents between 4 and 17 years of age, and up to 10 adults 18 years or older, from their corresponding community. This was realized via personal contacts (e.g. Ecuador) or via local schools (e.g., Zambia). Collaborators typically recruited participants through word of mouth and the snowball sampling system. Where culturally appropriate, compensation in the form of sweets or small amounts of money were given (see supplemental materials).

2.5. Consent procedure

Parents gave their informed consent prior to their child's participation in the study. If it was not possible for parents to provide written consent because they could not write or because it was culturally inappropriate to sign a paper, parents gave their consent verbally; if they agreed, their confirmation was video-recorded. Parents received information about the aims, content and data protection measures of the study in their corresponding local language. They were informed that their child could stop the interview at any time without any further explanation. Before the interview started, the procedure was also explained to the children and the local collaborator emphasized that the child could stop at any time without consequence. The interviews were recorded (with audio only, or if parents and the child gave their permission, with video). Interviews were transcribed in the local language and then translated into English or German. If no translator could be found that was proficient in the local language as well as English or German, the interviews were translated into a third language in between (e.g. the Republic of the Congo interviews were first translated into French).

2.6. Study procedure

Participants were first asked about whether animals had thoughts and whether they had feelings. The word 'thoughts' was used because this term is associated with mental processes and cognition. The word 'feelings' was chosen because it encompasses a range of phenomena, from sensations, intuitions and emotions, and would provide greater experiential scope than if we had simply asked about emotions. To ensure the meaning of our questions was consistent across all communities, our local collaborators translated 'thoughts' and 'feelings' into the most appropriate word or phrasing in the respective local language (or that most familiar for children; see Table S1 in the supplemental materials for the questions in each language). Participants were allowed to give as much information as they wanted in response to the questions.

If participants responded with yes to either of these questions, they were followed up with questions about perceived similarity of the thoughts/feelings: "Do animals think/feel like humans or is it different for animals?". This was to gather information about whether the participant considered the mental experience of animals to be similar or dissimilar to that of humans. If they answered no to the initial questions, the interview continued with the next section of the interview (not part of this study).

2.7. Data coding

Participants' spontaneous responses to the questions "Do animals have thoughts/feelings?" were classified into one of three ordinal categories by a trained coding team: No, Partially and Yes (see Table 1). A No code indicated that the participant expressed they did not believe that animals had thoughts/feelings. A Partially code was assigned if the participant considered some animal species to have thoughts/feelings, but others did not, or that animals had some forms of thoughts/feelings, but not others. A Yes code was given any time a participant affirmed that animals had thoughts/feelings. A 'Don't Know' response was available, for when participants stated they did not have an answer for the question. Out of the total sample, 3 % of children/adolescents and 1 % of adults were coded with saying they did not know whether animals had thoughts or feelings (see supplemental materials for exact breakdown).

For the follow-up question of "Do animals think/feel like humans or is it different for animals?", participants' responses were coded into ordinal categories ranging from Different, Partially, and Same. A Different code indicated that the participant saw animals' thoughts/

Table 1
Definitions and Examples for The Ordinal Categories for each Question.

Question	Response	Definition	Example Response (translated to English)
Do animals have thoughts/ feelings?	No	Children state that animals do not experience thoughts or feelings, or lack capacity to do so	"Feelings, probably not" - *5-year-old, urban Turkey* "I don't think animals have thoughts" - *5-year-old, rural Japan*
	Partially	Children specify certain animal species that do have thoughts/ feelings, but contrast them with other animal species that do not have thoughts/ feelings. Or the child makes general comments that some animals have thoughts/feelings while others do not. Or the child specified that animals experience some general thinking/ feeling patterns (e.g., primary emotions) but not others (e.g., secondary emotions)	"I think some have, some don't." - *8-year-old, urban China* "Yes and no." – *17-year-old, urban Japan*
	Yes	Children agree that animals possess capacity for thoughts/ feelings, and might give examples of the types of thoughts/ feelings animals experience.	"Yea! Each animal has its thoughts." – *16-year-old, urban Ecuador* "I am not sure but I feel they do have feelings." – *10-year-old, urban India*
Do animals think/feel like humans or is it different for animals?	Different	Children state that animals have different thoughts/feelings to humans, or that they experience them in a different way to humans. Children might compare and contrast the ways animals and humans experience certain thoughts/feelings.	"Maybe they feel in their own ways, meaning not so similar with how humans feel. – *17-year-old, urban Indonesia (Java)* "I think it is different because, yeah, they don't speak our language, but they understand I think. It's different." – *16-year-old, urban Zambia*
	Partially	Children specify certain animal species that have the same thoughts/feelings, but contrast them with other animal species that have different thoughts/feelings to humans. Or they make general comments that some animals think the same and some think differently. Orthe child stated that some general patterns of thoughts/feelings are experienced the same as humans (e.g., thoughts related to survival) while others are not (e.g., thoughts related to social relationships)	"Animals sometimes think like humans." – *11-year-old, urban India* "Some of their feelings are the same as others, and some are not. - *8-year-old, rural China*
	Same	Children state that animals have the same thoughts/feelings as humans, or that they experience them in the same way as humans. Children might provide examples of thoughts/ feelings that are shared between animals and humans.	"They have feelings like a human." – *16-year-old, urban Indonesia (Makassar)* "He thinks like humans, he knows what people want from him and he acts according to that." – *16-year-old, rural Syria*

feelings to be experienced differently to the ways humans experienced them. The Partially code indicated that the participant considered some animal species to experience thoughts/feelings in the same ways as humans', while others were different. The Same code indicated the participant saw animals' thoughts feelings to be experienced in the same way as humans'.

Coding occurred in MAXQDA (VERBI Software, 2021), a program that allows for qualitative coding on interview transcripts. Eight trained coders each coded a subset of interviews across diverse communities (MJ, BS, NA, EP, LW, JW, LB, LjP). Coders were blind to the study's specific hypotheses at the time of coding, although they were aware of the overall aims of the larger CaN project. Coders went through several training sessions with an experienced coder (MJ) before coding independently. They coded at least three previously coded interviews and received feedback on each of these. If there was insufficient agreement between their coding and the original version of an interview, they coded additional interviews until consistency was reached. Once commencing, if coders were unsure how to code a particular response, they would flag it for discussion with the coding team. The coding team met regularly to make collective decisions on how to treat uncertain responses. Decisions were kept in a protocol and if a similar question arose in the future, it was solved according to the decision made in the protocol.

Inter-rater reliability: All coders were requested to complete inter-rater reliability coding on 20 child and 10 adult interviews. These interviews were randomly selected from all communities and all age groups of children and adults. Interrater reliability between 7 coders was calculated using the intraclass correlation coefficient (ICC) in R, using the two-way random effects model, with absolute agreement and the "single rater" unit. For the questions "do animals have thoughts/feelings", the ICC indicated that agreement between the 7 coders was excellent, kappa = 0.95, $p < .001$, [95 % CIs: 0.93, 0.97]. For the questions "do animals think/feel like humans", the ICC indicated that agreement between the 7 coders was moderate, kappa = 0.65, $p < .001$, [95 % CIs: 0.54, 0.76] (see supplemental materials for details).

2.8. Data availability

The original data and scripts that generated the results and visualizations of this study are available on GitHub at https://github.com/ccp-eva/thoughts-and-feelings. Model summaries and outputs, additional interpretation of results, as well as demographic descriptions of each community, have been deposited in the Open Science Framework (https://osf.io/ahp7w/overview).

2.9. Code availability

The analysis code that generated the results and visualizations and demonstrates the findings of this study is available on GitHub at https://github.com/ccp-eva/thoughts-and-feelings.

3. Results

3.1. Data analysis

To examine children and adolescents' responses across age, we fit two separate models: one for perceived presence of thoughts/feelings ("do animals have thoughts/feelings?") and one for perceived similarity of thoughts/feelings ("do animals think/feel like humans?"). Two similar additional models were fit to the responses from our adult participants. Separate models were used for the adults in expectation of minor changes in response patterns over a wide span of ages, compared to relatively more substantial developmental shifts during childhood and adolescence. All models were fit in a Bayesian framework using the R (R Core Team, 2021) package brms (Bürkner, 2017), which estimates posterior distributions using Hamiltonian MCMC as implemented by Stan (Monnahan et al., 2017).

Models included the following predictor variables: whether the question was about thoughts or feelings, participant's age in years (scaled to have mean 0 and standard deviation 1, included for children/adolescent models only), participants' gender (male/female), whether they belonged to an urban or rural community, plus interaction terms; the urban or rural community variable and the gender variable both interacted with the thoughts or feelings variable, and age interacted with all other variables, including the other interactions. Regularizing priors (normal distributions with mean 0) were placed on all these variables, with tighter priors on interaction terms. Random effects based on the nested grouping variables of community and country were included. The effect of all predictors and their interactions were allowed to vary by country. A reduced number of effects were allowed to vary by community; the urban-rural variable's value was fixed within communities, so our data provides no information about community level variation in its effect. Regularizing exponential priors were placed on all random effect variance terms. Due to the relatively small number of communities sampled within many countries, plus the fact that often communities within-country differed in the urban-rural variable, we placed a tighter prior on the standard deviation of the per-community effects than on that for the country effects.

In all cases, the outcome variable was a categorical variable: "No", "Partially" or "Yes" (for 'presence' questions); "Different", "Partially" or "Same" (for 'similarity' questions). We therefore used ordinal response models, where the probability of each of the three possible responses is determined by how two fixed threshold values or "cut points" divide up the probability of a normal distribution. The variance of this normal distribution is fixed, but the mean is a linear function of the predictors as in other linear regression models (Chib, 2005). In this class of models, predictors with positive effects increase the probability of responding "Yes"/"Same" while simultaneously decreasing the probability of responding "No"/"Different", while predictors with negative effects shift probability in the other direction. The distance between the estimated threshold values reflects the probability of giving the intermediate "Partially" response. Depending on the data, the model may infer a "wide gap" between thresholds, where weak positive effects shift probability away from "No"/"Different" toward "Partially" more than toward "Yes"/"Same", with strong effects required to make "Yes"/"Same" the most probable response. Alternatively, it may infer a "narrow gap" where "Partially" responses are rare and even a weak positive effect is sufficient to switch a participant's most probable response from "No"/"Different" to "Yes"/"Same". We fit separate models (and thus separate thresholds) for the presence and similarity questions data to allow for differing threshold gaps, such that children might switch at a certain age from mostly answering "No" to mostly answering "Yes" for one question, with "Partially" responses being rare, but pass through an intermediate stage of mostly answering "Partially" for the other.

We used the Widely Applicable Information Criterion (WAIC) to compare each full model against two alternative models. We first compared the child-adolescent models (for presence and similarity) against a reduced model with all random effects removed (i.e. assuming there was an absence of variation in effects across countries or cultural groups). We then compared to an alternative model with the effect of question type removed (i.e. considering children's responses to thoughts and feelings questions as if they reflected identical beliefs about both kinds of mental state). For both presence and similarity questions, the full child-adolescent model clearly outperformed both reduced models (WAIC difference exceeding 2 SEs). We conclude that children think about the two mental attributes differently and that responses varied substantially around the world, and report full model results accordingly.

We compared both adult models against reduced models either again with all random effects removed, or with the effect of age removed (i.e. assuming opinions become "fixed" at the start of adulthood). The full models outperformed those without random effects (WAIC difference of 1 SE for presence questions and more than 2 SEs for similarity questions), however models without age did not perform substantially different from the full models (WAIC difference below 1 SE). We conclude that adults' responses showed non-trivial variation across cultural groups but not across age, and report results from the model without age effects accordingly.

3.2. Results

We first describe children, adolescent and adult judgments on the presence of animal thoughts and feelings, followed by their judgments on the perceived similarity of animal thoughts and feelings to those of humans'. We use the notation (10 [7.5, 12.5]) to report posterior mean (10) and 95 % credible intervals ([7.5, 12.5]). Detailed explanation of each models' results, including country- and community-level effects, are available in our https://osf.io/ahp7w/overview.

3.2.1. Presence of animal thoughts and feelings

Child and adolescent responses. We found very strong evidence that children and adolescents, regardless of age, were more likely to attribute feelings to animals than thoughts (see Fig. 2). The 95 % CI for the population-level effect of mental state type entirely excluded zero (0.68 [0.40, 0.96]), and there was no clear interaction between mental state type and age (−0.06 [−0.33, 0.22]). Variation in both these parameters across countries and communities was relatively minor; for every individual community, the 95 % CI for the effect of mental state type excluded zero, and 95 % CI for the interaction with age included zero. Per-community posterior mean effects of type ranged from 0.60 to 0.79. Using the population-level parameter estimates, children of average sampled age (10.8 years) were predicted to answer that animals had thoughts with probability 0.88 ([0.79, 0.95]), while they were predicted to answer that animals had feelings with probability 0.97 ([0.93, 0.99]).

We also found strong evidence that children typically become more likely to attribute mental states to animals as they get older. The 95 % CI for the population level effect of age was entirely positive (0.49 [0.27, 0.69]). There was some non-trivial variation in this effect across countries and communities, and some per-community 95 % CIs included zero, however the posterior probability of a positive effect of age was 0.90 or higher in 29 of our 33 communities (88 % of our sample). Only the Namibian rural ǂAakhoe Hai//om community had a negative posterior mean effect of age (−0.05 [−0.74, 0.54]). Despite the lack of evidence for an interaction between mental state type and age, ceiling effects mean that the probabilities of answering 'Yes' to both thoughts and feelings questions begin to converge at close to 1.0 in many communities as children approach adulthood. The 95 % CIs for the probability of a 17-year-old answering 'Yes' to animals having thoughts were entirely above 0.50 for 25 communities (76 % of sample), and for animals having feelings this was true of 28 communities (85 % of sample). The Namibian rural Hai//om community was the only community whose posterior mean estimate for the probability of answering 'No' was higher than that for answering 'Yes' (0.70 vs 0.21 for thoughts and 0.48

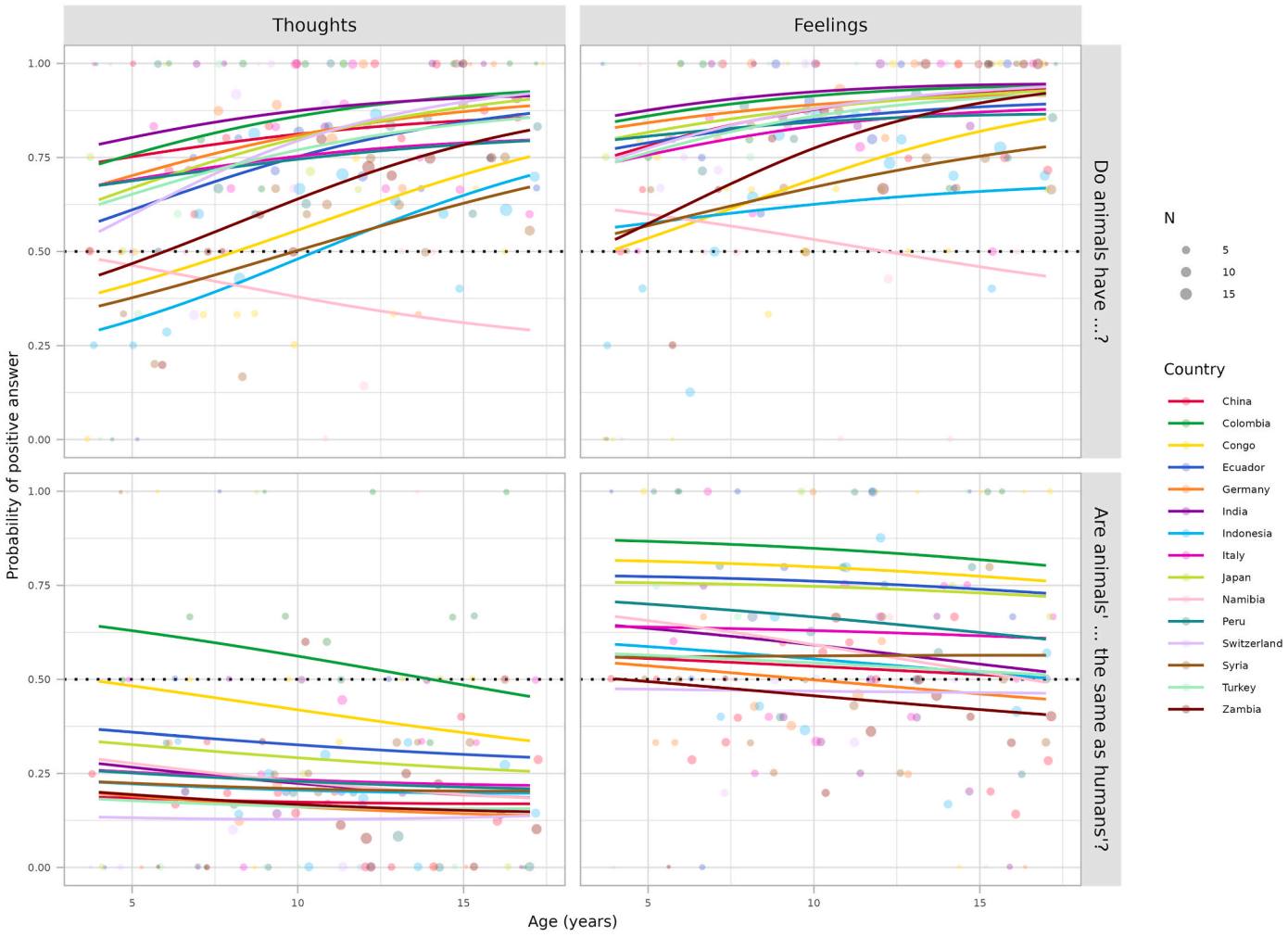

Fig. 2. Model estimations of the likelihood of children and adolescents' responding 'Yes' (top panel) or 'Same' (bottom panel) to the presence of animal thoughts (left panel) and animal feelings (right panel) across age, with communities collapsed within countries. Regression lines indicate the overall age trajectories for each country. The dot points represent raw proportions of participants of a given age in a given country who answered "Yes" and are jittered for ease of presentation, with larger circles indicating larger participant representation.

vs 0.40 for feelings).

In contrast, predicted "Yes" response probabilities for 4-year-olds were lower and varied more substantially across communities than for older children. For the response probabilities of answering 'Yes' to feelings questions, the 95 % CIs for 4-year-olds were entirely above 0.50 in 11 communities, but for most communities 95 % CIs included 0.5 (67 % of the total sample). This means younger children, unlike their older peers, were not clearly more likely to answer "Yes" than to answer "Partially" or "No". Posterior mean estimates of "Yes" probabilities for feelings ranged from 0.18 in a rural Congo community to 0.99 in a rural Colombian community. For the probabilities of answering 'Yes' to thoughts questions, the majority of communities again had 95 % CIs including 0.50, but three communities had 95 % CIs that were entirely above 0.5, and four communities had 95 % CIs entirely below 0.50. Posterior mean estimates of "Yes" probabilities for thoughts ranged from 0.04 in a rural Indonesian community to 0.89 in rural Chinese and Colombian communities.

We found stronger cross-cultural variation in the attributing of thoughts than the attributing of feelings: for mean-age children (10.8 years), posterior mean estimates of the probability of answering 'Yes' to having thoughts varied between 0.24 and 0.99, while probabilities for answering 'Yes' to feelings varied between 0.43 and 0.99. We also found strong evidence of differences in responses between children and adolescents from rural and urban communities; for both mental states the posterior probability that urban participants were more likely than rural participants to attribute animals feelings was 0.97 and to attribute animals thoughts was 0.94. Further, we found moderate evidence that urban children also increased their probability of attributing feelings and thoughts more quickly with age than rural children (posterior probabilities 0.83 for thoughts and 0.80 for feelings).

Adult responses. Based on the reduced adult model excluding age effects, adult attributions of feelings and thoughts were largely identical across all communities (see Fig. 3). Adults were much more likely to attribute animals both feelings and thoughts than any other response: the 95 % CIs for the population level effect of each question type (presence or similarity) did not exclude zero (0.45 [−0.23, 1.13]), with 95 % CIs intervals for the probability of answering "Yes" to both question types being entirely above 0.5 in every community and with posterior mean probabilities of answering "Yes" never being lower than 0.83 for thoughts and 0.94 for feelings. Contradictory to the urban-rural patterns found in children, we found strong evidence that adults in rural communities were more likely to attribute animals' thoughts than adults in urban communities (posterior probability of positive population level effect 0.97), although the magnitude of difference was minor (posterior mean population level probability of 'yes' response 0.89 for urban and 0.98 for rural). No urban-rural pattern was found for adult attributions of animals' feelings (posterior probability of negative population level effect 0.60).

Fig. 3. B) Model estimations of the response probabilities of adults answering 'No', 'Partially' and 'Yes' for the presence of animal thoughts/feelings (panel 1 and 2, respectively) and similarity of animals thoughts and feelings (panel 3 and 4). Adult responses were collapsed across age. Note that in each panel countries are ordered from those with the lowest positive response to those with the highest, so the country order changes with each panel. Some countries are not shown; countries are omitted where no adult interviews were conducted.

3.2.2. Similarity of animal thoughts and feelings (to humans)

Child and adolescent responses. Similar to questions of presence, we also found very strong evidence that children and adolescents, regardless of age, were more likely to describe animal feelings as human-like, than they were to describe animal thoughts as human-like. The 95 % CI for the effect of mental state type entirely excluded zero (1.78 [1.46, 2.11]), and there was no clear interaction between mental state type and age (−0.06 [−0.33, 0.20]). Variation in both these parameters across countries and communities was again relatively minor; for every individual community, the 95 % CI for the effect of mental state type excluded zero, and the 95 % CI for the interaction with age included zero, respectively. Per-community posterior mean effects of mental state type ranged from 1.71 to 1.85. These effects are much larger than those reported for the presence questions and this is reflected in the contrast between the most probable answer that children gave across their answers about thoughts and feelings. Using the population-level parameter estimates, children of mean sampled age (10.8 years) were most likely to answer that animals' thoughts were *not* human-like (0.78 [0.66–0.88]), and more likely to answer that they were *partially* human-like (0.13 [0.08, 0.19]) than that they were human-like (0.09 [0.04, 0.16]; Fig. 4). In contrast, they were mostly likely to answer that animals' feelings *were* human-like (0.65, [0.51, 0.78]), and (slightly) more likely to answer that were partially human-like (0.18 [0.13, 0.23]) than that they were *not* human-like (0.17 [0.08, 0,27]).

Cross-cultural variation in the reluctance to attribute animals human-like thoughts was minimal, with only two communities (rural Congo and rural Colombia) having an estimated probability of mean age children answering that animal thoughts were the "same" as humans being higher than for answering "different". For all other communities (94 % of the sample), the most probable answer was saying that animal thoughts were "different" from human thoughts, and the 95 % CI for the probability of this response was entirely above 0.5 in 23 communities (70 % of sample). Considering human-like feelings, cultural variation was a little more pronounced, with six communities whose estimated probability of answering "different" was higher than that of answering "same", however the difference in probabilities between the two options was typically very small, in every case smaller than the probability of answering "partially". Approximately half our communities (16) had posterior mean probabilities of answering "partially" of 0.2 or higher, which was higher than for any other question. We therefore considerate it an accurate characterization that children around the world thought that animals' feelings were either similar or partially similar to human feelings.

We found some evidence that both gender and urban vs rural community types had an influence on children's tendency to describe animals' thoughts and feelings as human-like. Considering population-level parameters, the posterior probability that rural children were more likely than urban children to describe animal feelings as human-like was 0.84 and for animal thoughts was 0.81. The posterior probability that boys were more likely than girls to describe animal's thoughts as human-like was 0.93, however there was no evidence for a gender influence on judgments about animal's feelings (posterior probability 0.58 that boys

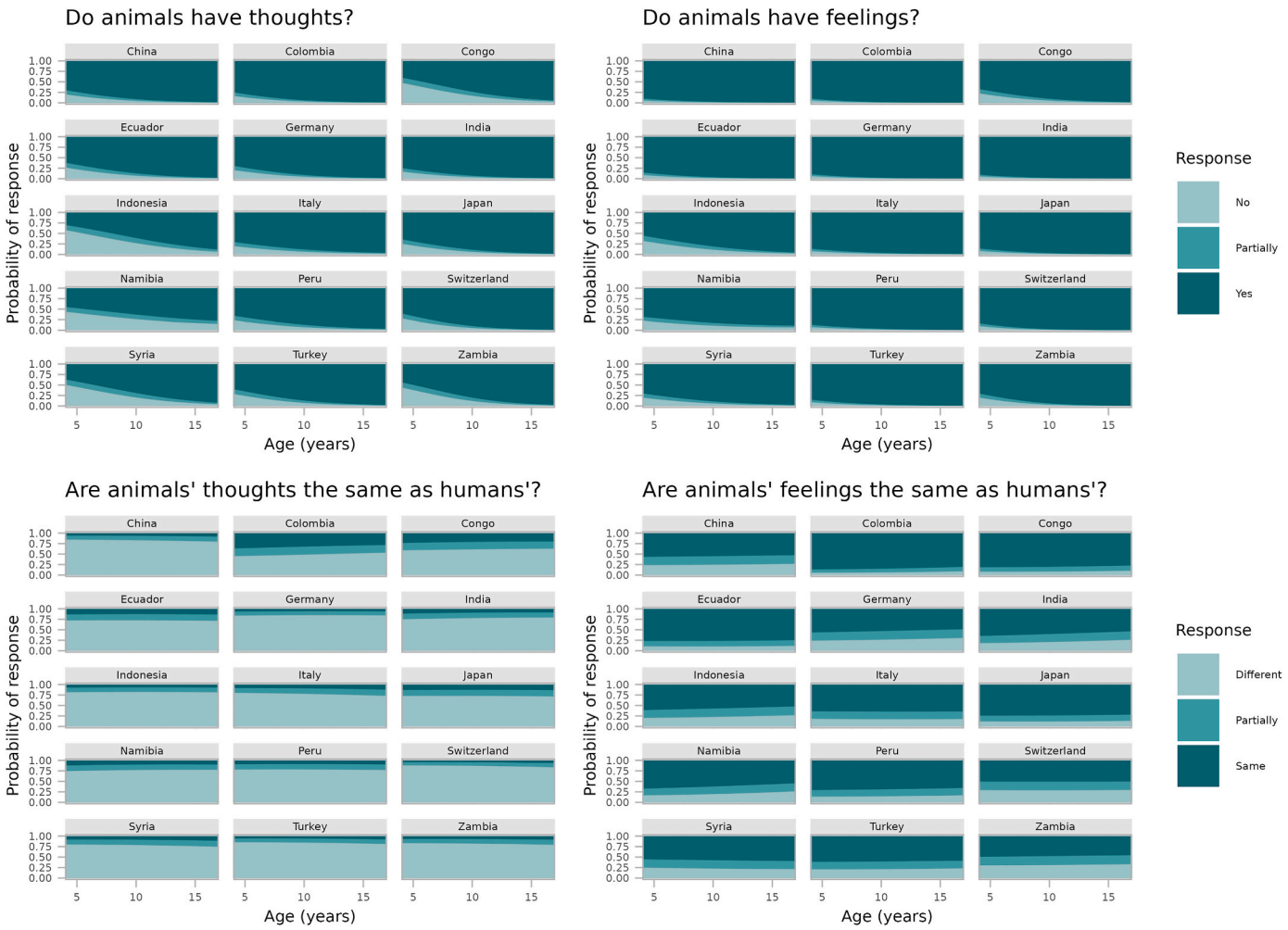

Fig. 4. Model estimations of the likelihood of children & adolescents responding with each ordinal category of 'No', 'Partially' and 'Yes' for presence of animal thoughts (left panel) and animal feelings (right panel) across age, with communities collapsed within countries. Countries are organized alphabetically.

were more likely to do so). However we also found evidence of interactions for all these effects with age, in every case the effects became weaker as children matured (posterior probabilities of weakening effect 0.76 for urban vs rural effect on feelings, 0.88 for urban vs rural effect on thoughts and 0.96 for gender effect on thoughts, refer Fig. S1 in the supplemental for trajectories across urban and rural communities). These interactions were the only apparent developmental trend, with the 95 % CI interval for the overall effect of age centered around zero (−0.01 [−0.17, 0.14]).

Adult responses. In contrast, adults' responses differed across communities and between feelings and thoughts more than their near ubiquitous attributing of the presence of feelings and thoughts (see Fig. 3). The 95 % HPD interval for the population level effect of question type excluded zero (1.03 [0.52, 1.57]), with adults more likely to say that animals' feelings were human-like than their thoughts. We also found strong evidence of an urban-rural contrast for both questions, with rural adults more likely to rate both animals' thoughts (posterior probability of positive population level effect 0.96) and feelings (0.98) as being human-like than urban adults. Despite this effect, adults from both types of community were most likely to assert that animal's thoughts were different from humans (population level posterior mean probabilities of answering "different" 0.57 for rural adults and 0.80 for urban adults). Judgements on the similarity of animals' feelings varied considerably. In rural communities around 1 in 4 adults answered that animals' feelings were "partially" similar to humans' (population level posterior mean probability 0.25). At 11 sites (33 % of the sample), the probability of answering "similar" was estimated to be higher than that of answering "different", compared to 10 communities with the opposite preference (30 % of the sample).

4. Discussion

Whether humans consider themselves unique amongst animals, and how they interact with them, is fundamentally shaped by whether we believe animals have human-like feelings and thoughts. Our study is the first to examine how children, adolescents, and adults from diverse cultures perceive human uniqueness by exploring their beliefs about whether animals have thoughts and feelings, and how human-like these are.

As predicted, we found strong evidence that humans across societies are more likely to attribute feelings to animals than to attribute thoughts. This is consistent with previous research showing that both children and adults grant basic experience, but not complex thought, to other animals (Demoulin et al., 2004; Haslam et al., 2008; Hawkins & Williams, 2016; Menor-Campos et al., 2018). Regarding developmental change, we predicted that older children and adolescents would be less likely to attribute thoughts to animals than younger children, as older children have more flexible theories of mind. To the contrary, we found that children's likelihood of attributing thoughts and feelings to animals increased with age. This is in line with research finding older children are more likely to attribute pain or fear to animals (Hawkins & Wiliams, 2016; Menor-Campos et al., 2018). By the age of 17 years, adolescents in

our study showed near-ceiling endorsement of animal thoughts and feelings. Similarly, our adult cohort almost unanimously attributed thoughts and feelings to animals, suggesting that children's views converge on adults' as they develop. As humans mature, they are more likely to grant animals some mental experience.

However when asked whether animal feelings and thoughts are human-like, there was an early, stable, and consistent pattern: Children, adolescents and adults strongly reject the notion that animal thoughts are similar to human thoughts. This rejection occurred across our sample, independent of age and cultural context. Contrary to our predictions, we found more cross-cultural variation in the tendency to attribute human-like feelings to animals, but marked consistency in the tendency to reject animal thoughts as human-like. It appears humans do not attribute animals the *same* types of thoughts as they attribute to humans. This finding points to a potentially universal boundary between what humans consider uniquely human and what they do not, suggesting an early-emerging and pervasive tendency to emphasize differences between human and animal thought (Costello & Hodson, 2014; Opotow, 1990). The stability of this observed pattern from age four raises questions on whether beliefs of human uniqueness are biologically innate (Baron-Cohen et al., 1995; Bruner, 1990) or socially learned from a very early age (Airenti, 2018; Hawkins & Williams, 2016; Miller & Goodnow, 1995). Our results show that while philosophers might argue, humans in general hold a fundamental intuition: it is our thoughts that make us (uniquely) human.

The majority of our participants live in societies typically underrepresented in psychological research (Nielsen et al., 2017). When examining differences across more urban and more rural communities, we found some curious patterns. Children and adolescents living in urban communities were *more* likely to say that animals have thoughts and feelings than rural children. This is consistent with research showing urban children in the Global North are more likely to attribute mental experience to animals than rural children (Medin et al., 2010; Morrison et al., 2021). However, it is difficult to ascertain the origins of this difference: one possibility is that urban children receive more anthropomorphic messaging in media and education, especially at younger ages, which might facilitate such beliefs (Airenti, 2018; Geerdts, 2016). Alternatively, it could be because children in rural communities are more frequently in contact with dangerous wildlife or the animals they eat, which may foster greater emotional distancing from them (Salazar et al., 2022; Wells & Hepper, 1995). However, we did not find the same pattern in adults: rural adults were more likely than their urban counterparts to say that animals have thoughts, and that their feelings and thoughts are human-like. Past research found that adults who interact with animals frequently, such as those living in rural communities, typically perceive animals as having greater capacity for basic emotions (but did not examine cognitive skills; Urquiza-Haas & Kotrschal, 2022). Our findings are a curious contrast between older children and adults in the same communities and requires further investigation. One way to extend the explanatory power of the current study would be to directly measure adults' and children's daily media exposure and animal interactions alongside their perception of animal minds to understand how these factors might influence these beliefs.

Unlike other communities, children and especially adolescents in the Namibian Hai//om remote forager community showed a slight regression in attributing thoughts and feelings to animals with age. This exceptional trend is surprising, as Hai//om adults did not assign thoughts and feelings to animals any less than adults in other communities. This contrasts with the BaYaka, another remote forager community, where children did not show the same trajectory. A detailed investigation is needed to understand what particularities of Hai//om parenting practices, tradition or lived experience might contribute to this opposing trend. Observations from the community suggest that Hai//om children exhibit moderate mind opacity, suggesting these findings may reflect larger patterns of cultural norm adoption regarding the inability to surmise the minds of others (Widlok, 2023). Future research should integrate self-report measures with ethnographic observations to further inform on children's interactions with animals in these diverse communities.

4.1. Implications for conservation, education and animal welfare

The current study highlights core beliefs humans hold about what separates them from other animals. These beliefs have far-reaching consequences: humans rely on animals for food, labour, clothing, medicine, therapy, and spiritual practices, and in the scope of these interactions, the mental capacities we attribute to animals influence the moral standing we grant them (Caviola et al., 2019; Gray et al., 2007). Individuals that deny animals the capacity for thought or feeling are more likely to justify animal use in contexts such as medical testing, entertainment, or food production (Higgs et al., 2020; Hills, 1995; Knight et al., 2004). Conversely, animal species that are perceived as sentient or similar to humans receive a disproportionately large amount of conservation funding and policy intervention (Martin-Fores, Martin-Lopez & Montes, 2013; Nijssen et al., 2024; Tam, 2013).

Understanding the nature of these intuitions, including their emergence in early childhood, is a necessary first step for developing strategies that might challenge these beliefs. The field of animal cognition is continually advancing our understanding of animals' cognitive and emotional capacities (Bekoff & Pierce, 2009; Broom, 2010; Maust-Mohl et al., 2012) and in some cases challenging folk beliefs (Mameli & Bortolotti, 2006, although see Haslam et al., 2008 for overlaps between animal cognition and folk beliefs). This knowledge could be better harnessed to inform public attitudes and motivate policy advocating for more humane practices within animal husbandry and conservation. Some educational interventions have increased children and young adults' moral concern for animals by focusing on the cognitive capacities animals do possess (rather than focusing on those humans possess; Helton & Helton, 2005; Bastian et al., 2012) and subsequently increased their belief in animal minds (Hawkins et al., 2017). These attitudes, in turn, build a greater sense of moral obligation in children to act compassionately toward animals (Yanco et al., 2021).

However our findings suggest that humans might be *most* responsive to interventions emphasizing the similarity of the *emotional* capacities of animals, rather than their cognitive ones. Highlighting shared emotions can be an effective route to building empathy and increasing moral concern for animals (Burghardt, 1985; Jacobs et al., 2023; Serpell & Paul, 1994; Sevillano, Aragones, & Schultz, 2007) and nature more broadly (Gebhard et al., 2003; Waytz et al., 2010a). Instead, there are mixed results with shared cognitions (Hills, 1995; Leach et al., 2021; Nijssen et al., 2024). We found a reluctance to attribute human-like thoughts to animals in children, adolescents and adults, but much more openness to endorse human-like feelings. Thus, perhaps the easiest 'perspective shift' with the most promise for increasing moral concern and conservation action, is via the affective route (Brosch & Steg, 2021). Importantly, the cross-cultural patterns documented in the present study offer a valuable framework for designing targeted, age-appropriate interventions that are sensitive to local beliefs and contexts (and detailed descriptions of each context is available in the supplemental materials).

4.2. Strengths, limitations and future directions

Our study employed a child-centered, bottom-up approach and was the first to track children's attitude change across a broad age range in diverse cultures. We used this approach to access the authentic folk beliefs children and adolescents hold across development, rather than making theoretical assumptions about how children would respond (Fargas-Malet et al., 2010). An adult coding team then classified children's spontaneous responses into discrete agreement levels (no, partially or yes; different, partially, or same). While this approach supported cross-site comparability and quantitative analysis, we acknowledge that for some of our communities, the relative 'difference' or

'sameness' of human and animal minds may exist on a finer-grained continuum (Dzokoto et al., 2013; Malt, 1995). A future thematic analysis of children's spontaneous responses (Braun & Clarke, 2006) could offer further insight into how different cultural folk theories demarcate the experiential boundaries between humans and other animals.

Due to our remote collaborative approach to data collection, it is possible that sampling biases may exist within our data. For example, it is possible that there was systematic variation in how interviews were delivered across interviewers, despite the formal training given. Interviewers may have varied in their level of encouragement to children, whether they offered their own examples, or the time they allowed for participants to answer. However, given that our emphasis was on gathering culturally-fair data reflecting lived experience (Hofstede, 2001; Thajib et al., 2025), we maintain that by having a community member speaking their language (rather than an unfamiliar researcher less aware of cultural norms), and in a setting the participants were familiar with (e.g., in their school or house, with family present) – in our opinion our methods are an important improvement at the cost of controlled lab conditions.

Secondly, it is important to note that we sampled from a limited number of communities in most countries (up to 3, excepting Indonesia where 7 communities were sampled) and that adult samples were small. Using Bayesian analyses allowed for partial-pooling of the data through nested random slopes (McElreath, 2018), which meant that predictions for country and community effects were based on data from the entire sample. Nevertheless, our results should be generalized with caution, and further adult samples gathered to examine the reliability of these patterns. Still, the uniformity we observed in responses across diverse communities provides strong evidence that some views of animal experience are widely shared, while others are more culturally flexible.

Similarly, we asked children, adolescents and adults questions about whether 'animals' as a collective group have thoughts/feelings. This was because our main aim was to examine beliefs about human uniqueness. However, we acknowledge that this treats animals as uniform (Žakula, 2024), and recognize our participants likely held additional beliefs about the minds of specific animal species. For example, we know that adults (Herzog & Galvin, 1997; Knight et al., 2004; Sevillano & Fiske, 2016), and children (Hawkins & Williams, 2016; Kozachenko & Piazza, 2021; Wilks et al., 2021) perceive some animal species (such as chimpanzees and dogs) as having higher intelligence and greater similarity to humans than other species (such as rats or pigs). Further, children and adults appear to roughly follow phylogenetic patterns of relatedness when judging similarity to humans (i.e. mammals over birds, birds and amphibians, and amphibians over invertebrates; Eddy et al., 1993; Hawkins & Williams, 2016). Again, future research could select several animals that represent different categories (i.e. domesticated versus wild, pets vs. pests etc.) and see how participants answers might change.

5. Conclusion

In conclusion, we documented that from a young age, participants from 33 diverse communities believe that animals do not have human-like thoughts. Our findings suggest that these intuitions about human mental exceptionalism are early emerging, stable across childhood and adolescence, persist in adulthood and are potentially universal. There was, however, significant cultural variation in the tendency for both children and adults to assign feelings to animals, which suggests cultural belief and lived experience shape our understanding of animal capacities. Our results provide insights into the cultural and developmental origins of our beliefs about who we are as a species and our relationship with the rest of the animal kingdom. By uncovering the developmental and cross-cultural roots of these beliefs, our study offers important insights for environmental education, conservation efforts, and public engagement strategies aimed at fostering empathy and responsibility toward nonhuman animals.

CRediT authorship contribution statement

Karri Neldner: Writing – review & editing, Writing – original draft, Project administration, Investigation, Conceptualization. **Luke Maurits:** Writing – original draft, Formal analysis. **Magie Junker:** Writing – review & editing, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Lara Abbas:** Writing – review & editing, Project administration, Investigation. **Nayrouz Abbas:** Writing – review & editing, Investigation. **Arianna Abis:** Writing – review & editing, Investigation. **Federica Amici:** Writing – review & editing, Project administration, Investigation. **Bernardo Arroyo-Garcia:** Writing – review & editing, Investigation. **Negar Asghari:** Writing – review & editing, Investigation. **Giovanna Barragán Pardo:** Writing – review & editing, Investigation. **Zhen Zhang:** Writing – review & editing, Project administration, Investigation. **Junior Peña Chumacero:** Writing – review & editing, Investigation. **Ardain Dzabatou:** Writing – review & editing, Investigation. **Dustin Eirdosh:** Writing – review & editing, Project administration, Conceptualization. **Susan Hanisch:** Writing – review & editing, Project administration. **Tom Herrnsdorf:** Writing – review & editing, Project administration, Investigation. **Tom Hovehne:** Writing – review & editing, Investigation, Conceptualization. **Alicia Junker:** Writing – review & editing, Project administration, Investigation. **Patricia Kanngiesser:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Felipe Villa Larens:** Writing – review & editing, Investigation. **Safaa Mahmoud:** Writing – review & editing, Investigation. **Sandra Masaquiza:** Writing – review & editing, Investigation. **Iino Masato:** Writing – review & editing, Project administration, Investigation. **Risma Illa Maulany:** Writing – review & editing, Project administration, Investigation. **Tongtong Meng:** Writing – review & editing, Investigation. **Kardelen Mutlu:** Writing – review & editing, Investigation. **Putu Oka Ngakan:** Writing – review & editing, Project administration. **Ebru Peközer:** Writing – review & editing, Investigation. **Ljubica Petrović:** Writing – review & editing, Investigation. **Mirella Christy Rehatalanit:** Writing – review & editing, Investigation. **Kadek Sonia Piscayanti:** Writing – review & editing, Investigation. **Sarah Pope-Caldwell:** Writing – review & editing, Project administration, Investigation. **Maria Inés Sandoval Sernaque:** Writing – review & editing, Investigation. **Dennis Shishala:** Writing – review & editing, Investigation. **Doriana Sportelli:** Writing – review & editing, Investigation. **Roman Stengelin:** Writing – review & editing, Project administration, Investigation. **Thomas Stodulka:** Writing – review & editing, Project administration, Methodology, Investigation, Conceptualization. **Blanca Striegler:** Writing – review & editing, Investigation. **Wanting Sun:** Writing – review & editing, Investigation. **Jahnavi Sunderarajan:** Writing – review & editing, Investigation. **Sebastian Tempelmann:** Writing – review & editing, Investigation. **Ferdiansyah Thajib:** Writing – review & editing, Project administration, Investigation. **Noemi Thiede:** Writing – review & editing. **Disney Tjizao:** Writing – review & editing, Investigation. **Linus Useb:** Writing – review & editing, Investigation. **Lena Woidich:** Writing – review & editing, Investigation. **Janina Weyrowitz:** Writing – review & editing, Investigation. **Daniel Haun:** Writing – review & editing, Resources, Methodology, Funding acquisition, Conceptualization. **Katja Liebal:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Funding acquisition, Conceptualization.

Data and materials availability

The original data that generated the results and visualizations of this study is available on GitHub at https://github.com/ccp-eva/thoughts-and-feelings. Model summaries and outputs, additional interpretation of results, as well as demographic descriptions of each community, have been deposited in the Open Science Framework (https://osf.io/ahp7w/overview).

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Competing interests

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2025.102861.

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