TOPICS
TOPICS IN COGNITIVE SCIENCE

Topics in Cognitive Science 00 (2026) e70047

ISSN: 1756-8765 online
DOI: 10.1111/tops.70047

This article is part of the topic "Diverse Minds: Incorporating Diversity into Cognitive Science Research," Annika Tjuka, Yoolim Kim, Yağmur Deniz Kisa, Daniel B. M. Haun, and Russell D. Gray (Topic Editors).

Exploring Amazonian Cognitive Diversity at Chana Research Station

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Received 21 July 2025; received in revised form 30 January 2026; accepted 2 April 2026

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Abstract

The Chana Research Station for Language Sciences and Interculturality is a scientific initiative dedicated to exploring the linguistic, cultural, and cognitive diversity of the Peruvian Amazon. Building on long-standing local partnerships and collaborations, Chana facilitates research on cognition that extends beyond populations from industrialized democracies, traditionally overrepresented in behavioral sciences. Other populations—such as those in Amazonia—exhibit remarkable diversity. With this in mind, current Chana projects and collaborations encompass research on how Amazonian unique linguistic structures and culturally significant practices shape language processing and acquisition, as well as nonlinguistic cognition; studies on cognition focused on quantification practices in cultures with limited or unconventional numeral systems; and cross-cultural investigations of perception, building on prior research in other regions of the Amazon and the world. Beyond human cognition, the station has also supported experimental research on the relationship between domesticated dogs and their owners. Chana prioritizes inclusive and ethical research that benefits and includes local communities and their perspectives by engaging local and Indigenous researchers, and leading social and educational projects focused on cultural revitalization. Chana welcomes collaboration with researchers who are interested in advancing the understanding of Amazonian societies, languages, and knowledge systems.

Keywords: Amazonian cultures; Amazonian languages; cognitive diversity; linguistic diversity; Peruvian Amazon

1. Introduction

It has been 40 years since Slobin (1985) and Cutler (1985) published landmark papers in psycholinguistics, emphasizing the need to study language processing and acquisition across diverse languages and cultural settings. Fifteen years ago, Henrich, Heine, & Norenzayan (2010) extended this concern across the behavioral sciences with their influential critique of the "WEIRD" problem: the overrepresentation of Western, Educated, Industrialized, Rich, and Democratic populations in psychological research. While this intervention gained traction in psychology and economics, the critique had long been present in crosslinguistic research. A decade later, reviews point to some progress, but largely insufficient advances across fields (Apicella, Norenzayan & Henrich, 2020; Clancy & Davis, 2019; Nielsen, Haun, Kärtner & Legare, 2017; Rad & Martingano, 2018; Ochs & Schieffelin, 2018). The central question remains: how and why should science become more diverse? Ironically, efforts to move beyond U.S. undergraduate samples have produced a new bias, with participants from the Confucian sphere of Asia often treated as proxies for all "non-WEIRD" populations (Krys, de Almeida,Wasiel, & Vignoles 2024), resulting in a reductive view of global diversity.

Truly opening science to global diversity requires conducting research in regions where diversity is concentrated. The Chana Research Station for Language Sciences and Interculturality (Chana) seeks to deepen our understanding of the Amazon, a region marked by vast and rapidly changing linguistic, cultural, and ecological diversity. Unlike historical or archival contexts, change here can be observed as it unfolds, across generations, communities, and individuals, offering unique insight into processes of transformation. While some Amazonian

groups remain engaged in subsistence practices grounded in Indigenous knowledge systems and speak endangered languages, others are increasingly integrated into urban life. Much research has overlooked this complexity, often treating South America as uniformly distant from Western experience. In reality, more than five centuries of colonization have produced a continuum of acculturation: some groups were incorporated centuries ago, while others, particularly deep in the Amazon, have only recently come into sustained contact with Western society. With 90 Indigenous languages documented in Peru alone (Hammarström, Forkel, Haspelmath & Bank, 2025; Zariquiey et al., 2019) and more than 300 languages across roughly 50 language families and isolates in the Amazon (Rodrigues, 2000), the region constitutes a crucial global hub of diversity.

Research in the Amazon thus enables a more precise understanding of so-called "non-WEIRD" populations and the range of variation they encompass, including differing degrees of WEIRD influence. Despite its importance, Amazonian cognition remains understudied. The Chana initiative addresses this gap by contributing to a more nuanced account of cognition in the Amazon: one that avoids the simplistic WEIRD versus non-WEIRD dichotomy. If WEIRD populations are indeed "the weirdest people in the world," they cannot serve as a baseline for humanity at large; nor can the rest of the world be reduced to a single contrasting category (Apicella, Norenzayan & Henrich, 2020;). Human diversity is vast, and our scientific understanding of it is still at an early stage.

Advancing our understanding of human cognition requires research in the world's most diverse regions. Located in the Peruvian Amazon, Chana is strategically positioned to fulfill this role. However, the problem of overrepresentation in science extends beyond research subjects to include who formulates research questions and interprets results. Cognitive science has long been shaped by researchers from the global north, whose perspectives are influenced by their own linguistic and cultural backgrounds. Chana seeks to diversify science from within by including Indigenous students, scholars, and community members as active participants in research teams, creating space for new questions, insights, and ways of knowing. Collaborations at Chana extend beyond academic research to include cultural and linguistic revitalization initiatives, often linked to education, filmmaking, and community-based social action, ensuring that the benefits of scientific inquiry flow back to the communities that make it possible. This paper uses Chana as a case study to illustrate how inclusive, community-engaged research practices can be implemented in cognitive science, to highlight the tensions such practices entail, and to encourage researchers to critically examine assumptions about sampling, collaboration, and the distribution of scientific authority.

2. What is Chana?

Founded in 2023, Chana is both a research initiative and a field research facility (Fig. 1), created by scholars from the Pontificia Universidad Católica del Perú (PUCP), the Department of Language and Cultural Evolution at the Max Planck Institute for Evolutionary Anthropology, and the Institute for the Interdisciplinary Study of Language Evolution at the University of Zurich. It is located just outside the city of Pucallpa in the Department of Ucayali, at the

Fig. 1. Chana Research Station for Language Sciences and Interculturality (physical facility).

heart of the Central Peruvian Amazon, a region of immense linguistic and cultural diversity. The name *Chana* comes from the Pano word for the yellow-rumped cacique (*Cacicus cela*), admired for its intelligence and ability to learn and reproduce a wide variety of calls from other birds.

The Department of Ucayali exemplifies the Amazon's complexity, hosting numerous Indigenous communities, predominantly from the Pano and Arawak linguistic families. The Pano-speaking Shipibo-Konibo are the largest group in the region, with a population of around 30,000 people living in communities along the Ucayali River. However, the Pano family also includes the Iskonawa people (currently living with the Shipibo-Konibo), the Kakataibo people (who reside near the Andean foothills), as well as smaller, more remote groups near the Brazilian borders, such as the Amahuaca, Huni Kuin, Sharanawa, Mastanawa, Marinawa, Chitonawa, and Yaminawa. The history of contact with Western society varies greatly among these groups. The Shipibo-Konibo, for example, have a longer history of interaction, particularly through Franciscan missions in the XVIII century. In contrast, other Pano groups like the Iskonawa and Chitonawa only established sustained contact with Peruvian society in recent decades—the 1960s for the Iskonawa and the 1990s for the Chitonawa. This diversity of contact histories provides an opportunity to study processes of cultural change and resilience in real time. Ucayali is also home to the Madijá, an Arawá group living near the Brazilian border. Despite close contact with Pano neighbors, the Madijá maintain a distinct culture and speak a language unrelated to Pano, notable for features such as genderlects (see Rose, 2015). The region also includes several Arawak communities, such as the

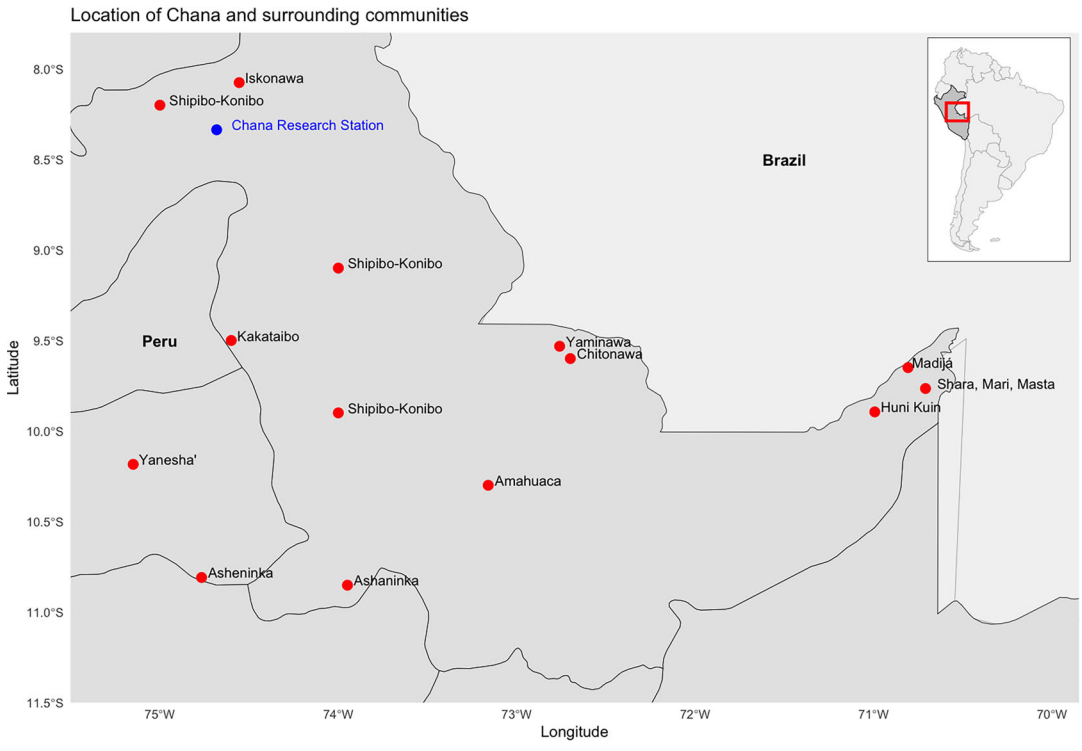

Fig. 2. Approximate location of the Chana Research Station and surrounding indigenous groups.[1]

Ashaninka and Asheninka, as well as the Yanesha' people in the Andean foothills. Fig. 2 shows the approximate location of Chana and the indigenous groups in the region.

Further amplifying the region's significance for research is the presence of the National Intercultural University of the Amazon (UNIA) in Pucallpa. UNIA is a unique institution that hosts Indigenous students from across the entire Peruvian Amazon, creating an unparalleled concentration of linguistic diversity. In a single UNIA classroom, it is possible to find native speakers of over 20 different languages coexisting, making it an ideal environment for comparative research and cross-cultural collaboration. Chana's proximity to this vibrant academic and cultural hub gives it invaluable opportunities for the study of human diversity in the Amazon and beyond.

3. The importance of Amazonian languages and cultures for the study of cognitive diversity

The Amazon is not only a biodiversity hotspot but also a center of linguistic and cultural diversity. Its more than 400 Indigenous groups and dozens of language families encompass a wide range of worldviews, social structures, and communicative practices. While Amazonian

peoples share certain ways of conceptualizing the world, the diversity of their cultures and distinct histories of colonization remain striking. For cognitive science, this diversity offers a unique opportunity to examine how the mind adapts to environments and contexts that differ markedly from those of the WEIRD world.

Amazonian languages are particularly rich in features that provide unique windows into cognition. Many employ evidentiality systems (Aikhenvald, 2004: 292, 303), which require speakers to encode information sources through fine-grained, grammatically conventionalized distinctions (e.g., direct perception, inference, or report). This does not imply differences in perceptual systems themselves, but rather variation in how languages structure and foreground information sources, with potential consequences for knowledge organization and memory. Other languages exhibit elaborate systems of spatial reference (Admiraal, 2016; Skilton, 2019), classifiers (Derbyshire & Payne, 1990), or real-time reference tracking (Van Gijn 2016; Zariquiey & Valenzuela, 2025), each offering a distinct perspective on categorization and interaction. These linguistic structures are closely intertwined with cultural practices and cognitive processes, yet little is known about how they are acquired by children or processed in production and comprehension.

Crucially, the social contexts of language learning in Amazonian communities differ sharply from those in WEIRD settings. Much of what is known about language acquisition is based on children raised in urban, child-centered environments—sleeping separately from caregivers, and entering daycare at early ages. None of these conditions typically apply to children in Indigenous Amazonian communities, underscoring the need for broader empirical foundations in cognitive and developmental science.

Cultural practices in the Amazon further expand the range of cognitive diversity. Kinship systems, classificatory practices for plants and animals, approaches to numeracy, oral traditions, and everyday life in non-WEIRD environments shape how individuals perceive, conceptualize, categorize, and learn. Pirahã practices of non-numerical quantification, for example, have challenged the assumption that conventionalized numeral systems are universal (Gordon, 2004). Similarly, the Tsimane's spatially nondirectional mappings of time, number, and size show that these associations are culturally shaped rather than innate (Pitt, Ferrigno, Cantlon, Casasanto, Gibson, & Piantadosi, 2021). Research on ecological reasoning among Amazonian groups shows that Indigenous knowledge systems often conceptualize nature in holistic and relational terms, in contrast to Western dichotomies (Malt & Majid, 2023). Shaped by long-standing external contact, ongoing acculturation, and market integration, the Amazon's linguistic, cultural, and ecological diversity makes it an ideal setting for research that moves beyond WEIRD-centric science. This is where Chana plays a key role as a space for collaborative, community-driven inquiry that values local epistemologies and promotes ethical research grounded in reciprocity and long-term engagement.

Although this paper highlights the social and linguistic diversity of Amazonia, the projects discussed focus primarily on Shipibo-Konibo communities. This emphasis reflects pragmatic and collaborative conditions within a broader research program rather than any claim of Amazonia-wide representativeness. Chana's work with Shipibo-Konibo builds on decades-long relationships that predate the station's formal establishment, and its location in the

Ucayali region—where these communities are numerically predominant—has enabled the sustained, trust-based collaborations on which this research depends.

Importantly, Shipibo-Konibo communities are themselves far from homogeneous. They emerged historically from the alliance of three distinct groups—the Shipibo, Konibo, and Xetebo—who lived separately along the Ucayali basin and formed a political alliance in the eighteenth century in response to missionary expansion. These groups remained socially and culturally distinguishable into the nineteenth century, with a consolidated Shipibo-Konibo identity emerging only in the twentieth century (Espinosa et al., 2017). Contemporary variation further adds to this diversity: some communities are located near urban centers such as Pucallpa and have road access, electricity, and mobile phone coverage, while others are reachable only after many hours—or more than a full day—of river travel and lack such services. Notably, one of the communities involved in the dog–human interaction study (see Section 4.5) has no access to electricity or mobile phone signal.

Taken together, these divergent historical trajectories and present-day conditions show that research conducted within Shipibo-Konibo communities already spans a range of social, economic, and ecological contexts. The current focus on Shipibo-Konibo should, therefore, be understood as a pilot phase within a larger research agenda. Ongoing and planned projects, including comparative work explicitly engaging multiple communities (e.g., numeral cognition; see Section 4.3), aim to extend this approach to additional Amazonian groups and languages, enabling a more systematic engagement with Amazonia-internal diversity.

4. Some examples of research collaborations at Chana

Chana has been collaborating on and promoting an important list of projects involving both Peruvian and international researchers. These initiatives cover a wide range of topics; in this paper, we focus exclusively on projects related to research in cognitive sciences.

4.1. Language acquisition

Despite decades of crosslinguistic research (e.g., Lieven, 1994; Slobin, 2014; Stoll, 2015), most studies on language acquisition continue to focus on Western, child-centered cultures, where adult−child dyadic interactions are the norm (Kidd & Garcia, 2022). However, anthropological research has documented substantial cross-cultural variation in both the quantity and nature of linguistic input, with important implications for understanding child development (e.g., Gaskins, 2020; Keller, 2022; Ochs & Schieffelin, 1984). This leaves a significant gap in our understanding of how language develops in the diverse cultural settings found around the world. We address this gap by studying language development among Shipibo-Konibo children.

Our approach combines experimental and corpus-based methods, including naturalistic daylong video recordings and LENA (*Language environment analysis*) recordings (Greenwood, Thiemann-Bourque, Walker, Buzhardt, & Gilkerson, 2011) of children aged 1−5 in their home environments. These recordings, transcribed and annotated with the expertise of

an Indigenous community member (see Schick, Daum & Stoll, 2025 for details), allow us to capture the full range of social and linguistic interactions that shape children's language experiences. This partnership ensures that our research is both culturally informed and methodologically robust.

It is this naturalistic recording, as well as the experience of seeing the day-to-day life in the community and speaking to the mothers, that enabled us to uncover evidence showing that peer speech plays a significant role, not only for Shipibo-Konibo children but potentially across diverse linguistic communities (Schick & Stoll, 2025). This research supports previous findings suggesting that peer interactions contribute significantly to language development (Loukatou et al., 2022), and challenges the dominant emphasis on child-directed input by adults by highlighting the evidence of child−child communication. Our results demonstrate that at the age of 2;0 and later, both child-directed and child-surrounding speech from other children are the best predictors of children's own production patterns compared to child-directed versus child-surrounding speech from adults (Schick & Stoll, 2025). This is supported by the fact that child speech shares several acoustic and structural characteristics with the child-directed speech from adults (Lee, Potamianos, & Narayanan, 1999; Potamianos & Narayanan, 2007). The social function of peers and older children in child development is well established (Bailey, Burchinal, & McWilliam, 1993; Zmyj & Seehagen, 2013; Zmyj, Aschersleben, Prinz, & Daum, 2012) and likely facilitates language learning from peers.

Building on these corpus-based findings, we explored the role of child-surrounding speech from other children in a cross-cultural head-turn preference study. Here, we aimed to explore whether infants are more attentive when listening to surrounding speech from other children compared to surrounding speech from adults (not child-directed), comparing infants growing up in the Shipibo-Konibo community with infants growing up in a Western urban area in Switzerland. Results suggest that surrounding speech from other children captures infants' attention more than surrounding speech from adults. When comparing the looking times of the two participant groups, we found no evidence for cultural differences, suggesting that the different sociocultural environments do not seem to impact their attentional behaviors toward child speech (Schick, Daum, & Stoll, 2025). Infants in both settings are more attentive to peer speech than to adult speech, meaning that the importance of child−child communication in language development may be a broader phenomenon.

Our research highlights the importance of examining language development across a broad range of linguistic and cultural settings, not only to document diversity, but also to identify common developmental constraints and their interaction with culturally specific environments. This approach is essential for building more comprehensive, generalizable, and culturally sensitive models of language acquisition.

4.2. Language processing

Another line of research at Chana is concerned with language processing by means of electroencephalography (EEG). Applying this technique, Isasi-Isasmendi, Zariquiey, Bickel, and Andrews (in prep.) investigated the neural mechanisms underlying sentence processing in speakers of Shipibo-Konibo, with particular attention to the processing of evidential mark-

ers. In this language, the evidential clitics *-ra* or *-ronki* are attached to the end of the first phrase in the sentence to indicate the direct or reported source of information, respectively (Valenzuela, 2003). These clitics modify the interpretation of the entire event and create a meta-sentence-level dependency. The processing of evidential markers remains largely unexplored in sentence processing research, with the notable exception of studies on Turkish (e.g., Arslan et al. 2015). This is primarily because evidentiality is not grammatically encoded in the languages most commonly studied in psycho- and neurolinguistics. Isasi-Isasmendi and colleagues leveraged the evidential system in Shipibo-Konibo to compare the processing of sentence-level dependencies (i.e., subject-verb dependencies, marked by case markers) with that of meta-sentence-level dependencies (triggered by the evidential markers). In doing so, their study provides the first electrophysiological evidence on the processing of evidentiality, and opens a unique window to how meta-sentence-level information is processed in the brain, a topic that has received little attention in the field.

Beyond addressing theoretical questions, this study had methodological aims: it sought to introduce the EEG methodology to the Shipibo-Konibo community and to identify the conditions under which EEG research could be effectively conducted in this setting. Prior to this work, no EEG studies had been conducted with speakers of any indigenous Amazonian languages. There are various reasons that explain this. First, speakers of Amazonian languages are located geographically far from universities and research centers, making lab-based neurolinguistics experiments impractical. Second, taking the EEG equipment to the Amazonian regions presents challenges: the heat and humidity can provoke sweat and fatigue in participants, resulting in a degraded EEG signal. More critically, traditional beliefs among some Amazonian groups regard the use of electricity—especially when used by white people—as dangerous or threatening (de Carvalho, 2021), leading to a reluctance to participate in EEG experiments.

Isasi-Isasmendi and colleagues collaborated with Shipibo-Konibo community members to overcome these challenges. They organized a workshop to introduce the EEG methodology to Shipibo-Konibo speakers and inform them about the scientific basis, purpose, and safety of this methodology (Fig. 3). The experimental procedures were additionally designed with community members to ensure that they would be respectful toward their culture and personal well-being, while also offering analyzable EEG data that was gathered with the help of local research assistants, who were trained to use this equipment. Isasi-Isasmendi and colleagues additionally engaged in organizing a follow-up workshop once the data had been analyzed and interpreted, so that participants could learn about their contributions and the study's findings.

This EEG study with Shipibo-Konibo speakers not only offers the first electrophysiological evidence on the processing of evidentiality, but also demonstrates the feasibility and value of conducting neurolinguistic research in Amazonian contexts through close community collaboration. Unlike in languages such as English or Spanish, evidentiality is a pervasive grammatical feature in many Amazonian languages. Our initial work with Shipibo-Konibo provides new important insights into how evidential markers are processed in the brain, and paves the way for research on the neighboring languages around Chana that share this characteristic. This approach also opens new avenues for investigating other typologically distinctive features in Amazonian languages that have yet to be explored within experimental

Fig. 3. Workshop at Chana about EEG methods with Shipibo-Konibo community members.

psycholinguistics, thereby broadening our understanding of the diversity of human language processing.

4.3. Quantitative cognition and non-numerical quantification

Amazonian languages are well-known for their notably limited numeral systems, typically expressing quantities only within the range of "one" to about "four" (Dixon & Aikhenvald, 1999; Epps et al., 2012; Hammarström, 2010). In fact, some Amazonian languages, such as Pirahã, have been claimed to lack numerals altogether (Everett 2005; Everett & Madora, 2012). The absence of extensive numeral systems in these languages has attracted significant interest in the cognitive sciences, particularly regarding the origins and evolution of number concepts and numeral systems (Gordon, 2004; Pica et al., 2004; Frank et al. 2008; Everett & Madora, 2012; Núñez, 2017). In collaboration with researchers from ETH Zürich and in the frame of the ERC-funded Evolution of Cognitive Tools for Quantification (Quanta) project, Chana is contributing to the documentation and analysis of the emergence, variability, and conventionalization of exact quantifying expressions in Amazonian languages with reduced or absent numeral systems. One central aim of this research is to understand how speakers of such languages manage to employ quantity-related concepts in the creation of highly sophisticated objects (e.g., hammocks, arrows, palm roofs) without relying on canonical (from a Western perspective) numeral systems.

Fig. 4. Linguistic fieldwork on quantitative expressions with Huni Kuin speakers at Chana.

This research also investigates how contemporary sociocultural and economic pressures are driving the development of new quantification strategies, including proto-numeral systems, by examining both the linguistic mechanisms involved (such as the formation of loosely conventionalized quantifying expressions based on body-part terms, idiosyncratic combinations of basic numerals, and loanwords) and the cognitive and cultural factors that shape concepts of quantity. This collaboration envisages combining ethnographic and linguistic fieldwork in Pano and other Amazonian communities, comparative analysis with languages that have developed productive numeral systems, and experimental studies on the production and use of quantifying expressions in natural discourse and elicitation contexts (Fig. 4). This approach aims to provide empirical evidence on the evolution of numeral systems, the diversity of quantification strategies, and the role of intra- and inter-speaker variation, contributing to broader debates on numerical cognition, linguistic typology, and cultural change in Amazonia. A first contribution in this line of research is found in Zariquiey, Nuñez, Poblete, and Vásquez-Aguilar (2025).

4.4. Auditory perception and sound preferences

In collaboration with researchers from MIT, Purdue University, and Pontificia Universidad Católica de Chile, Chana has supported research on how auditory perception and musical systems vary across cultures. These researchers have previously worked with the Tsimane', an indigenous Amazonian group in the Beni Department of Bolivia. Their work with the

Tsimane' has revealed surprising diversity in music and auditory perception. For instance, the Tsimane' appear to lack the preference for consonant over dissonant musical intervals, a distinction central to Western music, common among listeners in North America and Europe, and often assumed to be universal (McDermott,, Schultz, Undurraga, & Godoy, 2016). This indifference to consonance is observed even though the Tsimane' people perceive consonant and dissonant intervals as distinct (McPherson et al., 2020). Additionally, when asked to sing back tones, the Tsimane', unlike urbanized USA listeners, do not match the exact pitch or the "chroma" (pitch category corresponding to the letter name in Western music) of the note, but, similar to urbanized USA participants, they replicate heard intervals, with reproductions deteriorating at high frequencies (Jacoby, Undurraga, McPherson, Valdes, Ossandón, & McDermott, 2019). This experiment suggested that some features of pitch perception are universal, but others vary across cultures, plausibly influenced by different musical systems. Similarly, a cross-cultural study of mental representations of rhythm in 39 participant groups, including the Tsimane', revealed how universal cognitive representations are shaped by local music traditions. These experiments with the Tsimane have drawn attention to the rich diversity of auditory perception across cultures. While the studies offer relevant insights, many questions remain about how environmental, cultural, linguistic, and genetic factors influence the perception of music and sounds. A collaboration with Chana enables a unique opportunity to advance cross-cultural research on auditory perception. Preliminary results in a Shipibo-Konibo community (Fig. 5) suggest that they exhibit auditory preferences that are distinct from those of individuals living in WEIRD communities. Through the comparison of Shipibo-Konibo individuals with different degrees of life experience in WEIRD cities and towns, the work aims to clarify the cross-cultural diversity of auditory perception.

4.5. Dog−human interactions

The dog−human bond is considered a mutualistic relationship that has benefits for both species.

However, our knowledge of this relationship mainly comes from Western societies. Thus, in a recent study led by Bräuer (Bräuer et al., submitted), we investigated cultural differences in dog−human interactions worldwide. For that, the researchers developed a set of coordinated tests, along with a questionnaire, to evaluate both psychological and practical dimensions of the dog–human bond.

Dog−owner dyads were presented with six different experiments dealing with obedience, the use of the human pointing gesture, showing behavior, perspective taking, social referencing, and persistence. This study investigated the owner−dog relationship in five rural societies across culturally diverse locations, including the Peruvian Amazon area, which was done in collaboration with Chana. There, we tested dogs with their owners in three Shipibo-Konibo villages in the region of Ucayali.

We compared findings from Peru with rural communities in Vanuatu, Mongolia, Madagascar, and Germany. Despite cultural and environmental differences, dog–human relationships were strikingly similar across sites. Owners everywhere reported enjoying their dogs and feeling their lives were better with them. However, Peruvian Amazon owners felt less under-

Fig. 5. (a–d) Different auditory experimental setups.

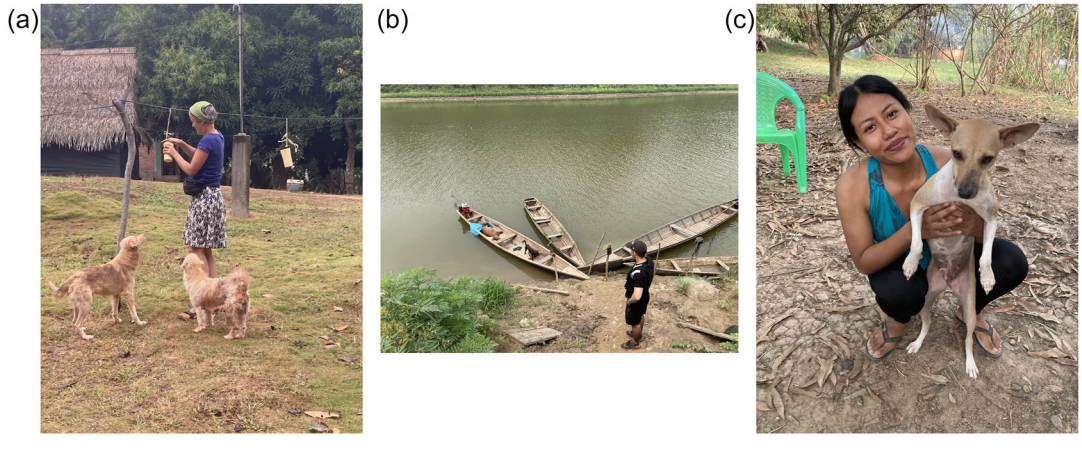

Fig. 6. Fieldwork with dogs in Shipibo-Konibo villages. (a) Experimental setup with cups and hidden food. (b) Hunting dog and its prey. (c) Shipibo-Konibo dog owner and her dog, "Cosita."

stood by their dogs, and more hunters expressed occasional regret about owning a dog. The overall relationship score was slightly lower in Peru, possibly because dogs are not essential for hunting among the Shipibo-Konibo. Still, practices such as applying ritual plants to dogs for hunting success suggest they are valued companions, reflecting a universal bond (Chira, Kirby, Epperlein, & Bräuer, 2023; Bräuer et al., submitted).

Overall, these findings point to remarkable cross-cultural similarities in dog−human interactions. However, a limitation of the study by Bräuer et al. (submitted) is that the assessment tasks were originally designed for Western dogs, which may not fully capture the realities of dog−human relationships in the Amazon. Future experiments will, therefore, be tailored to everyday experiences of Amazonian dogs, such as food competition and independent problem-solving, with additional work comparing communities that keep dogs with those that do not.

5. Methodologies at Chana: Inclusive partnership and collaboration practices

At the core of Chana's approach is a sustained commitment to inclusive, community-engaged research grounded in long-term relationships. Chana supports research based on mutual respect, shared expertise, and ongoing collaboration, working with local partners to ensure that research questions are relevant, methods are appropriate, and outcomes are meaningful beyond academia.

This collaborative model is oriented toward a long-term goal in which Indigenous researchers increasingly lead their own research agendas—a process already underway in parts of the Peruvian Amazon, often at the intersection of research, education, filmmaking, and social initiatives. Such approaches are not only more ethical but also scientifically stronger, as they incorporate local knowledge and perspectives that would otherwise remain invisible (Czaykowska-Higgins, 2009; Levisen, 2019). As a concrete example, Chana members established a scholarship for Indigenous students to pursue a Master's degree in linguistics at the Pontificia Universidad Católica del Perú; in its second open call, the scholarship was awarded to one of Chana's long-term Indigenous collaborators.

Capacity building is, therefore, central to Chana's mission. Chana engages local students and community members as research assistants, collaborators, and trainees, contributing to the formation of a new generation of scholars whose work reflects Amazonian lived realities and epistemologies. Although this process is gradual and relational, it directly addresses longstanding asymmetries in who produces scientific knowledge and who benefits from it.

At the same time, Chana recognizes that academic research is not always a priority for Indigenous communities, where greater urgency is often placed on language transmission, education, and political recognition. Accordingly, Chana devotes substantial effort to collaborations that do not result in academic publications but are essential for community relevance and impact. A key example is its long-term collaboration with the Iskonawa, a PIACI[2] people whose language currently has only three fluent native speakers. Over several years, Chana has worked with Iskonawa community members on a child-focused language revitalization initiative involving material development and institutional advocacy. In collaboration with

Fig. 7. Cultural and linguistic revitalization activity led by an Iskonawa community member at Chana for the *Escuelita Iskonawa* project.

community leadership, this work has contributed to the official appointment of an Iskonawa bilingual teacher and the establishment of an Iskonawa bilingual school. In line with this work, Chana has also organized three seminars in Lima for Indigenous linguistic and cultural activists, creating spaces for exchange, visibility, and mutual strengthening of Indigenous-led initiatives.

Chana's ethical framework is grounded in reciprocity, transparency, and respect for local priorities, and aligns with international standards such as the TRUST Code (2018). Rather than supporting isolated projects, Chana prioritizes sustained partnerships that contribute to linguistic and cultural revitalization (see Fig. 7). This approach reflects a growing consensus that ethical and effective research must resist extractive practices such as "helicopter research" and "ethics dumping" (Nature 2022), and instead commit to equitable collaboration and long-term benefits beyond academic publication.

6. Conclusion: Toward an inclusive cognitive science

The Amazon's extraordinary diversity presents both a profound challenge and a unique opportunity for cognitive science. Embracing the region's linguistic, cultural, and ecologi-

cal richness moves beyond the constraints of WEIRD-centric, Anglocentric (Levisen, 2019; Blasi et al., 2022) research toward a science that truly reflects the breadth of human experience. This requires a commitment to exploring regions across the globe that harbor significant diversity, while resisting the temptation to make sweeping generalizations that oversimplify the minds and lives of people outside the WEIRD world. The findings emerging from Chana do not claim to represent all non-Western, nonindustrialized, or nondemocratic societies. Rather, they offer invaluable insights into the diverse cognitive landscapes of the Amazon, enriching our understanding and prompting more nuanced research questions, questions that can, in turn, be explored in other centers of diversity worldwide. The research collaborations highlighted here reinforce the need to continually revisit and critically examine so-called universalist claims in cognitive science.

As we uncover how Amazonian children acquire languages so distinct from English or Spanish, how individuals foreign to industrialized life perceive and interpret sounds, how they approach quantification without conventionalized numeral systems, how they produce and process language, and how they form relationships with other species, among many other areas of cognition and behavior, we open the door to entirely new lines of inquiry, lines that were previously unimaginable within the confines of WEIRD-focused research. Chana's work proposes that field-based, community-led research is not just a way to fill empirical gaps left by academic biases; it has the power to reshape the very foundations of our theories and methodologies. Our task is clear: to deepen partnerships, expand research horizons, and build a cognitive science that reflects and learns from the full spectrum of human (and nonhuman) diversity.

Notes

1 Names for Sharanawa, Marinawa, and Mastanawa were shortened to "Shara," "Mari," and "Masta" for space reasons.
2 *Pueblos Indígenas en Aislamiento y Contacto Inicial* (Spanish for "Indigenous Peoples in Voluntary Isolation and Initial Contact").

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