

EAORC BULLETIN 1,072 – 31 December 2023

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NOTICES

PUBLICATION ALERTS

If you have had a paper or book published, or you see something which would be of interest to the group, please send me a publication alert so that I can include it in the newsletter. Many thanks to those who have already sent in alerts.

If there is a journal you feel I should be tracking on a regular basis, let me know.

And if you have any other ideas for extending the “EAORC experience”, please contact me.

EDITORIAL INTERJECTIONS

Comments in curly brackets are editorial interjections. The Editor reserves the right to be wrong.

ACADEMIA.EDU – Supra-Regional Networks in the Neolithic of Southwest Asia

Journal of World Prehistory 21, 139-171 (2008).

TREVOR WATKINS – Supra-Regional Networks in the Neolithic of Southwest Asia

When prehistoric archaeologists write accounts of the Epi-palaeolithic or Neolithic of southwest Asia, they resort to an archaic narrative style of culture-history that was formulated by Gordon Childe in the first half of the last century. These narratives frame their account of events within the format of a succession of archaeological cultures. In addition, the received form of the narrative is founded within a core-area of the Levant, the Mediterranean corridor zone; it is assumed that all the important social and economic innovations of the Epi-palaeolithic and early Neolithic occurred within that corridor, from where the cultures and their innovations spread through diffusionary processes to dominate wider parts of the region. The first part of this paper is a critique of the unwarranted assumption of the existence of archaeological cultures, and of the Levantine primacy hypothesis. The second part proposes an alternative to the notion of the archaeological culture. First, we review the evidence for wide-area cultural net-working through the exchange of goods and materials and the sharing of cultural behaviours that characterises the Neolithic. We can view the Epi-palaeolithic and early Neolithic periods as a time when new cultural processes were being employed to build and maintain novel sedentary, permanently co-resident communities of unprecedented scale. At a higher level, we see communities engaged in the construction and maintenance of more and more extensive networks of communities, in a form similar to, but not identical with, the peer polity interaction sphere model first described by Colin Renfrew in a different context.

https://www.academia.edu/160031/Supra_Regional_Networks_in_the_Neolithic_of_Southwest_Asia

NEWS

SCIENCEADVISER – Making friends

Samuni, L and M Surbeck. Cooperation across social borders in bonobos. *Science* 382, 805-809 (2023).

Over the past few decades, a great many of the traits once assumed to be unique to humans have been shown to be present in other animal species. One human behavior, however, has held on more tightly to this status than others. Though humanity is capable of horrific atrocities, we also share high levels of altruism and are often eager to help others, even if they are not related to us, or in our own cultural group.

Altruism has repeatedly been shown in other animals, but its existence between unrelated individuals, that are not members of the same group, without a clear pay-off has been harder to find. Samuni and Surbeck characterized altruistic interactions, such as grooming and food sharing, between two groups of bonobos (*Pan paniscus*). Such interactions occurred regularly

across groups, but not all individuals took part. Specifically, those animals that were more likely to have positive, reciprocal interactions in their own group were also more likely to have such interactions across groups.

These results show that humans are not the only species to positively interact with others they are not related to, nor directly benefiting from. Bonobos, along with chimpanzees (*Pan troglodytes*) are our closest relatives, so these results may also inform our understanding of our own evolution. I like this paper because it yet again knocks us off the pedestal on which we like to sit (in terms of how unique we are). Perhaps our ancestors took a middle path between the more conflictual behavior of chimps and the more altruistic behavior of bonobos... given today's conflict-filled world, however, it seems it's time to be more bonobo.

<https://www.science.org/doi/10.1126/science.adg0844>

THE CONVERSATION – A tooth that rewrites history? Challenging what we knew about Neanderthals

What could the extinction of Neanderthals tell us about our own species? An archaeologist explains in The Conversation Weekly podcast.

<https://theconversation.com/a-tooth-that-rewrites-history-the-discovery-challenging-what-we-knew-about-neanderthals-podcast-215313>

PUBLICATIONS

American Scientist

PAPERS

PATRICK NUNN – Memories within Myth

The stories of oral societies, passed from generation to generation, are also scientific records.

<https://www.americanscientist.org/article/memories-within-myth>

Animal Behaviour

PAPERS

MARIA G. SMITH, JOSHUA B. LAPERGOLA & CHRISTINA RIEHL – Workload inequality increases with group size in a cooperatively breeding bird

Groups of animals often cooperate on shared tasks, but individual contributions are not necessarily equal: individuals can specialize on different tasks (division of labour) or vary in total work performed. Either of these patterns can have fitness consequences. However, few studies have examined division of labour and workload inequality in vertebrates. We analysed individual contributions to parental care in the greater ani, *Crotophaga major*, a bird that nests communally in groups of two or three pairs and up to two nonbreeding helpers. We examined nearly 600 h of video footage of 10 groups to quantify individual contributions to nest building, incubation, brooding and nestling feeding. There was no clear evidence of division of labour; rather, contributions across some behaviours were positively correlated, suggesting individual differences in overall work performed. Indeed, helpers and one of the breeding pairs in three-pair groups contributed significantly less than the other two pairs. Inequality in overall workload, as measured by the Gini coefficient, was significantly higher in three-pair groups than in two-pair groups, as predicted by collective action theory. However, there were no significant differences in inequality of specific behaviours between two- and three-pair groups, possibly due to low sample size. Finally, anecdotal observations of aggression directed at the pair that contributed the least to parental care in three-pair groups suggested that the lowest-contributing pair's access to the nest might be limited by such aggression, which could be driven by conflicts of interest over group size and membership.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347223002701>

NOAH M.T. SMITH & REUVEN DUKAS – Winner and loser effects in humans: evidence from randomized trials

In many animals, contest winners are more likely to win subsequent matches while contest losers tend to lose their later fights. Such winner and loser effects can have long-lasting impacts on individual behaviour and fitness. Recent observations suggest that winner and loser effects may occur in humans, and we thus critically tested this proposition in two experiments involving video games and reading comprehension. We randomly assigned human participants to either win or lose in phase 1 by manipulating their task difficulty. Then we tested their performance in phase 2, which was moderately difficult for all participants. In both experiments, randomly assigned phase 1 winners performed significantly better in phase 2 than did randomly assigned phase 1 losers. The effect size was higher in the video game experiment than in the reading comprehension test, perhaps because the former involved an overt contest with one winner and one loser. Finally, men and women exhibited similar magnitudes of winner and loser effects. Our experimental approach as well as further critical experiments with humans can help us better understand winner and loser effects in general as well as their possible important influence on human performance.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347223002725>

KINGA KOCSIS et al – Harbour seals use rhythmic percussive signalling in interaction and display

Multimodal rhythmic signalling abounds across animal taxa. Studying its mechanisms and functions can highlight adaptive components in highly complex rhythmic behaviours, like dance and music. Pinnipeds, such as the harbour seal, *Phoca vitulina*, are excellent comparative models to assess rhythmic capacities. Harbour seals engage in rhythmic percussive behaviours which, until now, have not been described in detail. In our study, eight zoo-housed harbour seals (two pups, two juveniles and four adults) were passively monitored by audio and video during their pupping/breeding season. All juvenile and adult animals performed percussive signalling with their fore flippers in agonistic conditions, both on land and in water. Flipper slap sequences produced on the ground or on the seals' bodies were often highly regular in their interval duration, that is, were quasi-isochronous, at a 200–600 beats/min pace. Three animals also showed significant lateralization in slapping. In contrast to slapping on land, display slapping in water, performed only by adult males, showed slower tempo by one order of magnitude, and a rather motivic temporal structure. Our work highlights that percussive communication is a significant part of harbour seals' behavioural repertoire. We hypothesize that its forms of rhythm production may reflect adaptive functions such as regulating internal states and advertising individual traits.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347223002439>

MELISSA C. PAINTER et al with THORE J. BERGMAN – Acoustic variation and group level convergence of gelada, *Theropithecus gelada*, contact calls

The acoustic structure of nonhuman primate vocalizations can vary substantially within a call type and may converge between social partners. Examining which social partners share call structure can inform our understanding of the function of vocal learning and communication in nonhuman animals. We assessed vocal convergence of female gelada contact grunts within multiple levels of gelada society: small female-philopatric reproductive units that maintain close proximity and larger bands of units that preferentially associate while foraging. We also measured the extent to which grunt acoustic structure varied by caller identity and behavioural state at the time of the call, as well as genetic relatedness, when assessing acoustic similarity between females' grunts. The acoustic structure of female gelada grunts differed between individuals as well as between foraging, travelling and socializing behavioural states. Female gelada grunts were more similar between pairs living in the same band than between pairs living in different bands. This effect was not found for pairs living in the same unit compared to pairs living in different units within the same band. As genetic relatedness did not predict similarity in grunt acoustic structure, we propose that vocal convergence within bands is the result of vocal learning. Vocal convergence at the higher level of gelada society suggests this vocal learning is selective and not simply the result of auditory exposure to conspecific calls. Vocal convergence in geladas may function to maintain spatial cohesion, which is a more critical challenge for bands than for units.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347223002464>

MORGANE LE GOFF et al – Environmental, social and morphological drivers of fission–fusion dynamics in a social ungulate

Social groups exist because some individuals within the group accrue a net benefit from sharing space. The profitability of sociality, however, varies with ecological context. As ecological context varies, tension emerges among the costs and benefits of social grouping. Fission–fusion societies are fluid in their group dynamics across spatial and temporal contexts, permitting insights into how context affects whether animals choose to join or depart from a group. We tested four nonmutually exclusive hypotheses driving variation in fission and fusion in caribou, *Rangifer tarandus*: (1) risky places, (2) environment heterogeneity, (3) activity budget and (4) social familiarity. The risky places hypothesis predicts that animals are unlikely to diffuse when habitats are open and the risk of predation is elevated. The habitat heterogeneity hypothesis predicts that fission is more likely in a heterogeneous landscape due to the rising conflicts of interest between group members. The activity budget hypothesis predicts that dyads associate by body size due to similar food passage rates. The social cohesion hypothesis predicts that familiar individuals are less likely to fission. We tested the hypotheses using time-to-event (time before fission) analyses and a linear model that assesses spatial, social and body size relationships among female caribou (N = 22) on Fogo Island, Newfoundland, Canada. Contrary to our prediction for risky places, probability of fission was not influenced by habitat openness. The hypothesis of environmental heterogeneity was partially supported, as caribou remained less cohesive in environments with a higher richness of habitats. No direct evidence emerged to support the activity budget hypothesis. However, it appears that caribou maintain the strongest social bonds among variably sized individuals and that these social bonds do decrease the propensity to split. Collectively, our findings showed that social interactions may depend not only on individual identity and characteristics, but also on the spatial context in which these interactions occur.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347223002695>

SEVERINE B.S.W. HEX & DANIEL I. RUBENSTEIN – Using networks to visualize, analyse and interpret multimodal communication

Multimodality is a virtually ubiquitous feature of communication. With the increasing interest in how animals, including humans, use multimodal and multicomponent signals in social interactions, there is an acute need for standardized and rigorous tools that will allow us to visualize and analyse these signals as they occur in naturalistic interactions as a complex,

integrated system. Network theory is a powerful methodology for intuitively visualizing and investigating the relationships between entities. Here, we propose a new framework for analysing multimodal communication. Using a case study of natural multimodal interactions in wild plains zebras, *Equus quagga*, we introduce the descriptive power of network metrics by providing an objective set of metrics to (1) describe the relationships between simultaneously produced signals within and between modalities and (2) infer signal meaning and function. We embed these tools in a theoretical framework that can be used to interpret and describe both the global structure of the repertoire and the role individual signals play in shaping and modulating meaning. Next, we review an array of common questions in animal behaviour that could benefit from the use of multimodal networks to facilitate meaningful comparisons of communication across social and environmental contexts, timescales and species. Finally, we discuss extending the use of network analyses to multimodal communication through the use of directed networks and the challenges to be overcome from this application.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347223002749>

Cell Reports

PAPERS

RUNNAN CAO et al – Neural mechanisms of face familiarity and learning in the human amygdala and hippocampus

Recognizing familiar faces and learning new faces play an important role in social cognition. However, the underlying neural computational mechanisms remain unclear. Here, we record from single neurons in the human amygdala and hippocampus and find a greater neuronal representational distance between pairs of familiar faces than unfamiliar faces, suggesting that neural representations for familiar faces are more distinct. Representational distance increases with exposures to the same identity, suggesting that neural face representations are sharpened with learning and familiarization. Furthermore, representational distance is positively correlated with visual dissimilarity between faces, and exposure to visually similar faces increases representational distance, thus sharpening neural representations. Finally, we construct a computational model that demonstrates an increase in the representational distance of artificial units with training. Together, our results suggest that the neuronal population geometry, quantified by the representational distance, encodes face familiarity, similarity, and learning, forming the basis of face recognition and memory.

[https://www.cell.com/cell-reports/fulltext/S2211-1247\(23\)01532-2](https://www.cell.com/cell-reports/fulltext/S2211-1247(23)01532-2)

eLife

PAPERS

PIERMATTEO MORUCCI et al – Language experience shapes predictive coding of rhythmic sound sequences

Perceptual systems heavily rely on prior knowledge and predictions to make sense of the environment. Predictions can originate from multiple sources of information, including contextual short-term priors, based on isolated temporal situations, and context-independent long-term priors, arising from extended exposure to statistical regularities. While the effects of short-term predictions on auditory perception have been well-documented, how long-term predictions shape early auditory processing is poorly understood. To address this, we recorded magnetoencephalography data from native speakers of two languages with different word orders (Spanish: functor-initial versus Basque: functor-final) listening to simple sequences of binary sounds alternating in duration with occasional omissions. We hypothesized that, together with contextual transition probabilities, the auditory system uses the characteristic prosodic cues (duration) associated with the native language's word order as an internal model to generate long-term predictions about incoming non-linguistic sounds. Consistent with our hypothesis, we found that the amplitude of the mismatch negativity elicited by sound omissions varied orthogonally depending on the speaker's linguistic background and was most pronounced in the left auditory cortex. Importantly, listening to binary sounds alternating in pitch instead of duration did not yield group differences, confirming that the above results were driven by the hypothesized long-term "duration" prior. These findings show that experience with a given language can shape a fundamental aspect of human perception - the neural processing of rhythmic sounds - and provides direct evidence for a long-term predictive coding system in the auditory cortex that uses auditory schemes learned over a lifetime to process incoming sound sequences.

<https://elifesciences.org/reviewed-preprints/91636>

ADRIANO R. LAMEIRA et al – Recursive self-embedded vocal motifs in wild orangutans

Recursive procedures that allow placing a vocal signal inside another of similar kind provide a neuro-computational blueprint for syntax and phonology in spoken language and human song. There are, however, no known vocal sequences among nonhuman primates arranged in self-embedded patterns that evince vocal recursion or potential insipient or evolutionary transitional forms thereof, suggesting a neuro-cognitive transformation exclusive to humans. Here, we uncover that wild flanged male orangutan long calls feature rhythmically isochronous call sequences nested within isochronous call sequences, consistent with two hierarchical strata. Remarkably, three temporally and acoustically distinct call rhythms in the lower stratum were not related to the overarching rhythm at the higher stratum by any low multiples, which suggests that these recursive structures were neither the result of parallel non-hierarchical procedures or anatomical artifacts of bodily constraints or resonances. Findings represent a case of temporally recursive hominid vocal combinatorics in the absence of syntax, semantics, phonology or music. Second-order combinatorics, 'sequences within sequences', involving hierarchically

organized and cyclically structured vocal sounds in ancient hominids may have precluded the evolution of recursion in modern language-able humans.

<https://elifesciences.org/reviewed-preprints/88348>

Evolutionary Anthropology

PAPERS

KRISTA M. MILICH – Male-philopatric nonhuman primates and their potential role in understanding the evolution of human sociality

In most primate species, males transfer out of their natal groups, resulting in groups of unrelated males. However, in a few species, including humans, males remain in their groups and form life-long associations with each other. This pattern of male philopatry is linked with cooperative male behaviors, including border patrols and predator defense. Because females in male-philopatric species form weaker kin networks with each other than in female-philopatric species, they are expected to evolve counter-strategies to male sexual coercion that are relatively independent of support from other females. Studies of male-philopatric nonhuman primates can provide insight into the evolutionary basis of prosocial behaviors, cooperation, and group action in humans and offer comparative models for understanding the sociality of other hominin species. This review will discuss patterns of dispersal and philopatry across primates, explore the resulting male and female behaviors, and argue that male-philopatric nonhuman primate species offer insight into the social and sexual dynamics of hominins throughout evolution.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.22014>

Frontiers in Education

PAPERS

ERIN SPARKS & JAMIE L. METSALA – Morphological awareness predicts reading comprehension in first grade students

Research examining a role for morphological awareness in first grade students' reading comprehension is scarce, although it is a well-established predictor for students in mid-to-late elementary school. One question that remains is whether morphological awareness explains unique variance in these young readers' comprehension after accounting for other oral language skills. In this longitudinal study, we assessed Grade 1 students' inflectional morphological awareness as a predictor of their concurrent (n = 58) and Grade 2 (n = 55) reading comprehension. When controlling for decoding and vocabulary, Grade 1 morphological awareness explained unique variance in concurrent and subsequent reading comprehension (4% and 5%, respectively). In novel analyses that controlled for decoding, vocabulary, and syntactic awareness, morphological awareness explained unique variance in Grade 2 reading comprehension (5%), but not in concurrent reading comprehension. This unique contribution only in second grade may be because decoding skills accounted for less of the overall variance in second than in first grade comprehension or due to the expectation that polymorphemic words are more frequent in second grade texts. Overall, morphological awareness emerged as the strongest oral language predictor in all models. These results support morphological awareness' relevance to reading comprehension from early in children's reading development and highlight the need for research to further explore the effects of targeting English morphological awareness with young students.

<https://www.frontiersin.org/articles/10.3389/feduc.2023.1304688/full>

Frontiers in Psychology

PAPERS

VIOLA OLDRATI et al – Development of implicit and explicit attentional modulation of the processing of social cues conveyed by faces and bodies in children and adolescents

Emotions and sex of other people shape the way we interact in social environments. The influence of these dimensions on cognitive processing is recognized as a highly conditional phenomenon. While much of researches on the topic focused on adults, less evidence is available for the pediatric population. This study aimed at examining the development of the modulation of attention control on emotion and sex processing using facial and body expressions in children and adolescents (8–16 years old). In Experiment 1a, participants performed a Flanker task (probing space-based attention) in which they had to indicate either the emotion (happy/fearful) or the sex of the target stimulus while ignoring the distracting stimuli at the side. We found evidence for intrusion of the sex, but not emotion, of the stimuli during both sex and emotion recognition tasks, thus both at an explicit (i.e., task relevant) and implicit (i.e., task irrelevant) level. A control experiment consisting of an emotional Flanker task confirmed that, in contrast with previous findings in adults, emotion did not modulate attention control in children and adolescents even when task relevant (Experiment 1b). In Experiment 2 participants performed a same-or-different judgment task (probing feature-based attention) in which they indicated whether the central stimulus matched the lateral ones for emotion or sex. Results showed that emotional features exerted an implicit influence during sex judgements; likewise, sex features intruded on the processing of both faces and bodies during emotion judgments. Finally, Experiment 3 explored the development of the explicit attention modulation exerted by the sex dimension on the processing of faces and bodies. To this aim, participants performed a Flanker task in which they were asked to recognize the sex of faces and bodies. The results indicated that, while younger participants showed a task-relevant influence of sexual features when

processing faces, older participants showed such influence when processing bodies. These findings point to a greater attentional modulation exerted by sex, as compared to emotion, during social processing in children and adolescents and suggest a developmental trend of the saliency of facial and bodily cues for the perception of others' sex.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1320923/full>

Nature Scientific Reports

PAPERS

YUFEI REN, GANG CUI & STELLA CHRISTIE – Facts in counterfactuals-cognitive representations of Chinese counterfactuals

How do people represent counterfactuals? As languages differ in expressibility of counterfactuals—some languages employ explicit grammatical marking for counterfactuals while others do not—are some speakers' representations of counterfactuals less explicit? Prior studies examining this question with Chinese speakers—a language devoid of explicit counterfactual markings—found mixed results. Here we re-examined the issue by using a more sensitive test: people's sensitivity to detect anomalies in sentences. We asked Chinese speakers to rate the acceptability of sentences employing “ruguò (if)...jiù (then)” configuration—the typical but non-unique, non-explicit marking of counterfactuals. Critically, we varied the semantic adherence to real-world facts [factuality], with some sentences containing made-up conditions [-fact as in “If fish had legs, then...”] versus real facts [+ fact: “If dogs had legs, then...”]. If speakers represent counterfactuals clearly, they should give higher acceptability ratings to [- facts] than to [+ facts] sentences, because the ostensible point of counterfactuals is to express non-factual situations. That is, expressing a true fact under a syntactic counterfactual construction makes the sentence anomalous. Instead, we found that Chinese speakers gave the opposite ratings: factual “if...then” sentences were rated as more acceptable than non-factual ones. This suggests that Chinese speakers find the processing of counterfactuals to be more challenging than processing facts, and that their representation of counterfactuals may be less explicit. Overall, this research contributes to our understanding of the link between linguistic markings and cognitive representations.

{Is this an artefact of the “Chinese language”, presumably Putonghua; or is it a cultural thing, like the difference between “I couldn't care less” and “I could care less”?}

<https://www.nature.com/articles/s41598-023-49775-x>

New Scientist

NEWS

Monkeys in Thailand took up stone tools when covid-19 stopped tourism

Long-tailed macaques on the island of Koh Ped appear to have learned a new way to forage when the pandemic put a stop to feeding by tourists.

<https://www.newscientist.com/article/2409075-monkeys-in-thailand-took-up-stone-tools-when-covid-19-stopped-tourism/>

ARTICLES

PHILIP SEARGEANT – Is artificial intelligence about to free us from the curse of Babel?

Artificial intelligence will make it easier than ever to communicate across linguistic borders. But is this a good thing?

<https://www.newscientist.com/article/mg26034711-700-is-artificial-intelligence-about-to-free-us-from-the-curse-of-babel/>

Patterns

PAPERS

JINGE WANG – A critical period for developing face recognition

Face learning has important critical periods during development. However, the computational mechanisms of critical periods remain unknown. Here, we conducted a series of in silico experiments and showed that, similar to humans, deep artificial neural networks exhibited critical periods during which a stimulus deficit could impair the development of face learning. Face learning could only be restored when providing information within the critical period, whereas, outside of the critical period, the model could not incorporate new information anymore. We further provided a full computational account by learning rate and demonstrated an alternative approach by knowledge distillation and attention transfer to partially recover the model outside of the critical period. We finally showed that model performance and recovery were associated with identity-selective units and the correspondence with the primate visual systems. Our present study not only reveals computational mechanisms underlying face learning but also points to strategies to restore impaired face learning.

[https://www.cell.com/patterns/fulltext/S2666-3899\(23\)00297-0](https://www.cell.com/patterns/fulltext/S2666-3899(23)00297-0)

PLoS One

PAPERS

JEREMY GORDON et al – Information foraging with an oracle

During ecological decisions, such as when foraging for food or selecting a weekend activity, we often have to balance the costs and benefits of exploiting known options versus exploring novel ones. Here, we ask how individuals address such cost-

benefit tradeoffs during tasks in which we can either explore by ourselves or seek external advice from an oracle (e.g., a domain expert or recommendation system). To answer this question, we designed two studies in which participants chose between inquiring (at a cost) for expert advice from an oracle, or to search for options without guidance, under manipulations affecting the optimal choice. We found that participants showed a greater propensity to seek expert advice when it was instrumental to increase payoff (study A), and when it reduced choice uncertainty, above and beyond payoff maximization (study B). This latter result was especially apparent in participants with greater trait-level intolerance of uncertainty. Taken together, these results suggest that we seek expert advice for both economic goals (i.e., payoff maximization) and epistemic goals (i.e., uncertainty minimization) and that our decisions to ask or not ask for advice are sensitive to cost-benefit tradeoffs.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0295005>

PNAS

PAPERS

CAMILLE R. JOHNSTON et al – Social feedback biases emerge during recall but not prediction and shift across the development of social anxiety

Memory is a reconstructive process that can result in events being recalled as more positive or negative than they actually were. While positive recall biases may contribute to well-being, negative recall biases may promote internalizing symptoms, such as social anxiety. Adolescence is characterized by increased salience of peers and peak incidence of social anxiety. Symptoms often wax and wane before becoming more intractable during adulthood. Open questions remain regarding how and when biases for social feedback are expressed and how individual differences in biases may contribute to social anxiety across development. Two studies used a social feedback and cued response task to assess biases about being liked or disliked when retrieving memories vs. making predictions. Findings revealed a robust positivity bias about memories for social feedback, regardless of whether memories were true or false. Moreover, memory bias was associated with social anxiety in a developmentally sensitive way. Among adults (study 1), more severe symptoms of social anxiety were associated with a negativity bias. During the transition from adolescence to adulthood (study 2), age strengthened the positivity bias in those with less severe symptoms and strengthened the negativity bias in those with more severe symptoms. These patterns of bias were isolated to perceived memory retrieval and did not generalize to predictions about social feedback. These results provide initial support for a model by which schemas may infiltrate perceptions of memory for past, but not predictions of future, social events, shaping susceptibility for social anxiety, particularly during the transition into adulthood.

<https://www.pnas.org/doi/abs/10.1073/pnas.2308593120>

LAURA S. LEWIS et al – Bonobos and chimpanzees remember familiar conspecifics for decades

Recognition and memory of familiar conspecifics provides the foundation for complex sociality and is vital to navigating an unpredictable social world [Tibbetts and Dale, *Trends Ecol. Evol.* 22, 529–537 (2007)]. Human social memory incorporates content about interactions and relationships and can last for decades [Sherry and Schacter, *Psychol. Rev.* 94, 439–454 (1987)]. Long-term social memory likely played a key role throughout human evolution, as our ancestors increasingly built relationships that operated across distant space and time [Malone et al., *Int. J. Primatol.* 33, 1251–1277 (2012)]. Although individual recognition is widespread among animals and sometimes lasts for years, little is known about social memory in nonhuman apes and the shared evolutionary foundations of human social memory. In a preferential-looking eye-tracking task, we presented chimpanzees and bonobos (N = 26) with side-by-side images of a previous groupmate and a conspecific stranger of the same sex. Apes' attention was biased toward former groupmates, indicating long-term memory for past social partners. The strength of biases toward former groupmates was not impacted by the duration apart, and our results suggest that recognition may persist for at least 26 y beyond separation. We also found significant but weak evidence that, like humans, apes may remember the quality or content of these past relationships: apes' looking biases were stronger for individuals with whom they had more positive histories of social interaction. Long-lasting social memory likely provided key foundations for the evolution of human culture and sociality as they extended across time, space, and group boundaries.

<https://www.pnas.org/doi/full/10.1073/pnas.2304903120>

ELIKA BERGELSON et al – Everyday language input and production in 1,001 children from six continents

Language is a universal human ability, acquired readily by young children, who otherwise struggle with many basics of survival. And yet, language ability is variable across individuals. Naturalistic and experimental observations suggest that children's linguistic skills vary with factors like socioeconomic status and children's gender. But which factors really influence children's day-to-day language use? Here, we leverage speech technology in a big-data approach to report on a unique cross-cultural and diverse data set: >2,500 d-long, child-centered audio-recordings of 1,001 2- to 48-mo-olds from 12 countries spanning six continents across urban, farmer-forager, and subsistence-farming contexts. As expected, age and language-relevant clinical risks and diagnoses predicted how much speech (and speech-like vocalization) children produced. Critically, so too did adult talk in children's environments: Children who heard more talk from adults produced more speech. In contrast to previous conclusions based on more limited sampling methods and a different set of language proxies, socioeconomic status (operationalized as maternal education) was not significantly associated with children's productions over the first 4 y of life, and neither were gender or multilingualism. These findings from large-scale naturalistic data advance

our understanding of which factors are robust predictors of variability in the speech behaviors of young learners in a wide range of everyday contexts.

<https://www.pnas.org/doi/abs/10.1073/pnas.2300671120>

CORRECTIONS

ADAM MORRIS et al – Correction for Morris et al., Evolution of flexibility and rigidity in retaliatory punishment

Original Paper in EAORC BULLETIN 744 – 17 September 2017,

<http://www.pnas.org/content/pnas/early/2017/09/06/1704032114.abstract.html>

The authors note that on page 4, right column, fourth full paragraph, line 6, “We fit a mixed-effects model, regressing participant choices on their role, the round number, and the interaction between role and round. The interaction between role and round is significant [likelihood ratio test, $\chi^2(1) = 24.3$, $P < 0.001$; $\eta^2G = 0.03$, 95% CI = (0.024, 0.24)].” should instead appear as “We fit a mixed-effect model, regressing participant choices on their role, the round number, and the interaction between role and round. The interaction between role and round is significant [likelihood ratio test, $\chi^2(1) = 21.7$, $P < 0.001$; $\eta^2G = 0.03$, 95% CI = (0.024, 0.24)].” The online version has been corrected.

The authors also note that, in the SI Appendix, page 7, right column, first full paragraph, line 4, “The interaction between role and round was significant [$\chi^2(1) = 25.0$, $P < 0.001$, $\eta^2G = 0.03$, 95% CI = (0.011, 0.20)].” should instead appear as “[$\chi^2(1) = 22.0$, $P < 0.001$, $\eta^2G = 0.03$, 95% CI = (0.011, 0.20)].” The SI Appendix has been corrected online.

<https://www.pnas.org/doi/full/10.1073/pnas.2320273120>

Science

PAPERS

LIRAN SAMUNI & MARTIN SURBECK – Cooperation across social borders in bonobos

Cooperation beyond familial and group boundaries is core to the functioning of human societies, yet its evolution remains unclear. To address this, we examined grooming, coalition, and food-sharing patterns in bonobos (*Pan paniscus*), one of our closest living relatives whose rare out-group tolerance facilitates interaction opportunities between groups. We show that, as in humans, positive assortment supports bonobo cooperation across borders. Bonobo cooperative attitudes toward in-group members informed their cooperative relationships with out-groups, in particular, forming connections with out-group individuals who also exhibited high cooperation tendencies. Our findings show that cooperation between unrelated individuals across groups without immediate payoff is not exclusive to humans and suggest that such cooperation can emerge in the absence of social norms or strong cultural dispositions.

<https://www.science.org/doi/10.1126/science.adg0844>

Trends in Cognitive Sciences

ARTICLES

MICHAEL INZLICHT et al with PAUL BLOOM – In praise of empathic AI

In this article we investigate the societal implications of empathic artificial intelligence (AI), asking how its seemingly empathic expressions make people feel. We highlight AI’s unique ability to simulate empathy without the same biases that afflict humans. While acknowledging serious pitfalls, we propose that AI expressions of empathy could improve human welfare.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(23\)00289-9](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(23)00289-9)

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