

The developmental origins of social hierarchy: how infants and young children mentally represent and respond to power and status

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The learnability problem of social life suggests that innate mental representations and motives to navigate adaptive relationships have evolved. Like other species, preverbal human infants form dominance hierarchies where some systematically supplant others in zero-sum conflict, and use the formidability cues of body and coalition size, as well as previous win-lose history, to predict who will prevail. Like other primates, human toddlers also seek to affiliate with allies of high rank, but unlike bonobos they pay unique attention whether others voluntarily defer to their precedence, reflecting the importance of consensual authority in cooperative human society. However, young children appear not to readily infer authority from benevolence, and expectations for inequality correlate with unwillingness to share resources even among infants.

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The distribution of resources, territory, mates, priority decision rights and help is a central dilemma in the life of group-living species. To this end, young children must discover the structure of their social world; who is friend or foe, above or below, peer and reciprocator; and what this means for how people will and should interact. Arguably, because of the plethora of information and possible inductions in any given social situation, this *learnability problem* requires that children somehow already know what are the basic kinds of social relationships to look for, and what are the relevant cues for

recognizing them [1]. This suggests that innate, early developing and reliably developing core representations and motives might have evolved for recognizing and navigating basic kinds of social relationships that have critical adaptive value [1,2]. Such core infant representations with deep evolutionary roots may reveal assumptions and motives that are part of human nature and likely operate intuitively in the back-ground across the life-span [3]. Thus, they presumably govern the rules of the games of social and societal life in intuitive, taken-for-granted ways [1–4]. Here, I focus on the representations and motives for social hierarchy that manifest already in infancy and earliest childhood and likely undergird the social psychology of hierarchy among adults.

Social hierarchies are ubiquitous across species and culture such that some individuals enjoy better access to scarce resources, mates, living conditions or influence than others [2,5–20]. Across species, the resolution of zero-sum conflict over contested resources is often governed by dove–hawk dynamics where more formidable, usually larger [5–7,21], individuals dominate weaker ones, who will yield before costly fighting escalates, benefitting dominants and subordinates alike [21]. Triangulation suggests that the mutual ancestor of humans and the two *Pan* species lived in pronounced dominance hierarchies, but early humans likely lived in egalitarian bands, suggesting that overt oppression and domineering bullying was sanctioned to be less influential within the group, as is often the case in human society today [10,22,23]. This suggests that humans may be endowed with dispositional trade-offs for hierarchical and egalitarian strategies that should also respond to ecological context (cf. [4,13,14,21,24]).

However, human status hierarchies not only reflect formidability-based dominance, but also consensual deference for legitimate authorities, leaders, and competent and prestigious experts, who may facilitate social coordination and serve as models for culturally transmitted learning, receiving precedence and freely conferred respect in return [2,15–20]. Whereas relative linear rank is inherently zero-sum, many aspects between prestigious authorities and their followers are positive sum (e.g. among advisors and graduate students). Prestigious authorities are also often expected to help and take care of their followers, and modestly step back to let others go first [2,25] (e.g. resume last authorship on common papers). Of particular interest is thus the degree to which

fundamental, early developing representations and motives for social status are undergirded by who is able to achieve their goals and by who confers benefits versus imposes cost on others. Critical is also the role that the consensual recognition of precedence plays for the ways in which human infants infer and respond to the social rank of others.

Preverbal infants infer the outcome of future zero-sum conflict from cues of formidability

Early ethological, naturalistic observations in daycare groups demonstrated that preschoolers [26–28], and even infants from 8 [29] and 11 [30] months of age, form transitive dominance hierarchies like those of other species such that more formidable and agonistic individuals systematically supplant others in contests over scarce resources (e.g. toys).

Consistent with the adaptive importance of accurately perceiving and coordinating along formidability in such dominance hierarchies, 9–13 month-old infants also mentally represent social dominance, and use relative body-size – a cue which not only marks formidability, but also status and authority across cultural practices and conceptual metaphors [2,31–33] – to predict who will prevail in novel zero-sum conflicts *before* any physical coercion ensues. Although they unlikely have extensive personal experience engaging in right-of-way conflicts, infants looked longest, indicating that their expectations were violated, when a large cartoon figure prostrated and yielded the way to a smaller one in a ‘game-of-chicken’, where the two figures blocked each other from crossing a stage in opposite directions. These effects hinged critically upon the existence of zero-sum conflict so that one agent completed its goal at the expense of the other: When the agents moved alone on the stage or in the same direction behind one another, so that both could have achieved their goals, infants made no prediction whether the large or small figure would manage to cross the stage [33]. Nor did they do so if the animations were stopped immediately after the prostration event, suggesting that in the absence of zero-sum conflict, infants do not associate relative size/formidability with this conventional display of submission and deference across culture and species [34].

Infants also use the formidability cue of previous win-lose history to predict who will dominate whom across conflict domains and dyadic relationships. When a novel agent uses coercive force to push another one out of a contested territory, they expect that the former loser will later yield a contested resource to the winner without physical fight [35] (see also Refs. [36]). Importantly, and as previously demonstrated among even fish [37], recent work now confirms that human infants, too, make transitive inferences and predict relative dominance based on the previous win-lose history that individuals had with (common) third-parties [38*]. Finally, like other species including dolphins, spotted hyenas, lions and several non-human

primates [7–10,39,40–45], humans engage in coalitional conflict, which the archeological record indicates also characterized the context in which we evolved [13,19,46,47]. Coalitional conflicts manifest from pre-school and primary school playgrounds [48,49] to large-scale politics [13,14,50], resemble dove–hawk dominance dynamics (cf. 14,21), and have profound psychological and societal implications [4,13,50,51]. And indeed, even 6–9 month-old infants were found to understand coalitional formidability, using the relative number of allies to predict which individuals will yield and prevail [52*] in the right-of-way dominance paradigm [33].

However, representing the combined formidability of a set of individuals by their number is unlikely a psychologically simpler, more salient or reliable indicator of dominance than is individual strength, as indicated by the fact that infants from eight months of age form interpersonal dominance hierarchies [29,30], long before they presumably engage in any joint inter-coalitional conflict. Surely, coalitional formidability relies in part upon the strength of individual members. Consistent with this, several non-human primates selectively recruit and join the more formidable individuals in coalitional conflict [43]. When predicting the outcome of coalitional conflict, three-year-olds, as well as adults, also flexibly weigh the parties’ body sizes against the number of allies, emphasizing the former for smaller, and latter for larger, coalitions [69]. In fact, by primary school, children integrate a full range of asymmetric factors to weigh the total expected costs and benefits of engaging in resource conflict, and make no systematic prediction whether one large or two smaller, allied individuals will win a conflict [48].

Indeed, group-living does not make interpersonal dominance obsolete, but potentiates the long-term fitness implications of rank-based, recurrent outcomes within the group, as they are remembered by individuals who know one another [43,53–55]. Accordingly, a suite of dedicated cognitive architecture translates individual, physical strength into claims for both personal resources, coalitional dominance, and allocated social status [56–60], and also supports inductions about the physical strength and competitive motives of others, even from vocal pitch [61–63]. Further supporting the importance of individual strength, even three-month-olds induce physical size from voice pitch [64*] and pre-schoolers adeptly induce and relate both ‘who is strongest’ and ‘who is in charge’ from non-verbal cues of body posture, muscularity and facial configuration [65–68].

Befriend and obey those to whom others defer, avoid those who must coerce

Any adaptive gains from representing fundamental forms of social relations stem not simply from accurately perceiving them, but from using this information to navigate the social world in appropriate, strategic ways [1]. And indeed information about status rank motivates the way

infants, toddlers and preschoolers themselves relate to, and coordinate with, others.

Whereas dominant individuals are avoided in many species, so as to not provoke aggression, in highly social species they may offer access to resources and influence, so that approaching, ingratiating and affiliating oneself with other individuals of high rank may be adaptive [43,71**]. This relationship between rank and resources is well understood: Infants expect third-party distributions of resources to benefit a physically dominant over subordinate agent [72]; three-year-olds and four-year-olds will themselves favor a dominant individual in third-party distributions of resources [73], and they explicitly expect that those giving or withholding access to use resources will be in charge [74*]. Young children also intuitively enact these dynamics in controlled settings: In a game of chicken — where a child yielding the way to the other lost some of its resources, but both children lost all their resources if nobody yielded — dyads of five-year-olds coordinated such that previously dominant children received higher pay-offs because their partner yielded and deferred to them more often [75*]. Similarly, when 4–5 year-olds dominate a dyad, monopolizing a coveted toy from another child, they later donate less stickers to other, anonymous children than do subordinates, and experimentally induced changes of dyadic rank have similar effects as baseline dominance [76].

Consistent with these expectations that rank begets resources, young toddlers selectively approach those of high rank and so reach for a puppet who prevails in the right-of-way dominance paradigm [33] over one who yields [71**]. However, when one puppet was able to pave the way for both to cross the stage, toddlers reached for the more competent puppet [71**]. This was also the case in another study where two puppets both achieved their goals in the absence of zero-sum conflict, but one did so competently on the first try and the other only after repeated failed attempts [77]. Preschoolers also think that those who receive higher pay-offs are smarter [78], and recent evidence suggests that toddlers may also endorse the preferences and opinions of resource-rich over resource-poor puppet dolls [79], consistent with an ingratiation-for-potential-resources perspective on these findings.

If, on the other hand, one puppet prevails in right-of-way conflict by retorting to brute force, knocking the other one over, then toddlers avoid this coercively dominant puppet [71**]. By comparison, infants selectively avoid even a prevailing puppet for whom another voluntarily yields [80**] in the right-of-way paradigm [33]. These findings stand in stark contrast to results that bonobos prefer a dominant individual who monopolizes a territory using brute force [81**] (cf. [35]). Furthermore, a recent study found that toddlers expect that cartoon figures will continue to obey the orders of someone they prostrated

before and gave their resources, even when this individual is no longer around, but hold no such expectations for an individual who just beat them up [82**]. Thus, although human toddlers pay close attention to whether someone was able to achieve their goal at the expense of others, compared to our primate relatives including even the generally egalitarian and unaggressive bonobos [83], human toddlers also appear uniquely attuned to whether someone prevails in zero-sum conflict through consensually recognized precedence, rather than through brute coercion, reflecting its importance in cooperative, human societies [2,15–20,23,47], (see also Refs. [84–86]).

Similarly, in the political psychology of adults, inequalities between groups are not legitimized by appeal to differences in brute formidability, but by appeal to other, commonly and consensually recognized principles of precedence and merit [4,13,14,50] (e.g. the protestant work ethic). Robust cross-cultural findings, and evolutionary reasoning, supported by evidence from some non-human primates [43] including chimpanzees [9,40], indicate that such coalitional dominance motives are greater among males [13,46,50,87]. Mirroring this, a recent study also found that even three-year-old Norwegian boys predominantly chose a member of a more formidable and larger, rather than smaller, group when they were asked which of two cartoon figures they liked best and wanted to play with and befriend. In contrast, three-year-old girls chose randomly between the two [88].

Benevolent versus malevolent authority

Leaders in both human and non-human mammalian societies facilitate within-group coordination and conflict resolution [20,89]. Consistent with this, just-linguistic infants expect that a larger puppet, or a puppet whose directions were previously followed, will intervene to rectify resource monopolization between subordinates [90] (cf. also Ref. [82**]). But whereas young children, and even infants, understand that those in power will control resources, permitting or sanctioning their use [74*,90], and contrary to expectations that legitimate authorities take care of their followers and that status may stem from the benefits one can confer upon others, children do not appear to readily infer consensual authority from benevolent help: In fact, although even infants prefer helpers over hinderers [91,92], when North American 4–7 year-olds, as well as adults, view someone refuse a request for help, they take this as evidence that person is in charge [93**]. With the exception of permitting access to scarce resources, it was also easier for young North American children, as well as for adults, to induce such authority from malevolent (imposing costs) rather than benevolent (conferring benefits) ways of using of power [74*]. It is important to find out if this is also the case using more implicit measures and across subsistence systems, culture, languages and less enculturated ages. For instance, future studies might investigate if toddlers also

expect novel agents to continue to obey someone towards whom they displayed submissive deference after *receiving* a resource from them (rather than after offering them a resource, as previously demonstrated [82**]).

In terms of learning, North American preschoolers endorsed and imitated the domain-specific preferences and labels of a model whom bystanders had selectively attended over someone whom they ignored [94], supporting the importance of prestige-cues that someone is an expert for culturally transmitted learning (but see also Refs. [78,95]). But other studies reported that French and Mayan preschoolers also selectively endorsed the testimony (which way did the animal go) and word-labels (what is the name of a novel object) of someone who dominated resources with brute force [96,97], although, from an epistemic point of view, such coercive dominance need not imply any superior knowledge. In contrast, however, five recent studies did *not* find evidence that 249 blind-tested, Norwegian preschoolers selectively endorsed the labels and testimony provided by the prevailing agent in the otherwise robustly dominance-inducing right-of-way paradigm [33,98] (see also Ref. [99] for similar results among a smaller sample of Japanese preschoolers using resource monopolization as dominance cue). Finally, although North American and Chinese 5–7 year-olds distinguish prestige and dominance, neither group was recently found to explicitly predict the outcome of resource-conflict based on dominance rank [100], raising further questions as to how their explicit reasoning link the two.

Equality versus hierarchy

Finally, although infants, toddlers, and preschoolers understand and strategically respond to hierarchical rank, in fact the default expectations and preferences of most of them appear egalitarian, as is the case for adults cross-nationally [4,13,14,101]. Thus, in the absence of other social information such as relative dominance [72] or effort/merit/deservingness [102,103], most infants expect equal resource distributions between third-parties, prefer people who distribute resources equally, expect others will also prefer them, and expect equal distributors will be more helpful [72,92,102–104,105**,106–110]. Reflecting the appeal of personal resource holding, however, young children themselves react earlier and cross-culturally more reliably when they are personally suffering from disadvantageous, rather than benefitting from advantageous, inequity [109,110]. Nevertheless, the most widely used coordination strategy among five-year-olds when distributing resources in a game of chicken was, in fact, that of turn-taking [75*].

As is the case among adults [4,13,14,50,87,101], individual differences among infants in whether they expect equal versus unequal resource-distribution between others also predict whether infants are themselves willing to share their valued resources [105**,109,110,111]. This is

consistent with emergent evidence that dispositions towards hierarchical versus egalitarian expectations and redistribution motives are in part genetically underpinned and related [113], presumably reflecting the balancing selection equilibria of both hierarchical and egalitarian strategies [4,101,113].

Conclusions

Although human societies display unprecedented levels of cooperation, help and egalitarianism compared to our nearest primates relatives, hierarchies within and between groups are ubiquitous across culture. Humans display rich and sophisticated representations to perceive, navigate, and coordinate these dilemmas of resource distribution and conflicting interests that cooperative group living poses: Most of even the youngest humans prefer equal distributors and helpers, but they also prefer not only the most competent, but also those that prevail in zero-sum conflict at the expense of others who defer to them. Expectations that resources will be unequally distributed among third parties relate to unwillingness to share personal resources, and help and benevolence appear not to readily license inferences of authority. Consistent with our evolutionary history, these relational representations and motives reflect, and must optimize, ecological trade-offs between different forms of hierarchical and egalitarian strategies for resource distribution, and are active from earliest childhood and even infancy. It is critical that future work investigate whether, when and how they reliably manifest across culture and subsistence systems to address which relational logic forms part of our innate endowment, undergirding the regulation of social life.

Conflict of interest statement

Nothing declared.

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[70,112].

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- This paper demonstrates that human preverbal infants also use the formidability cue of agents' relative number of allies to predict the outcome of zero-sum conflict. This is an important finding, demonstrating that for human infants it is not inherently more difficult to understand coalition-based, rather than strictly interpersonal, dominance relations, even though they unlikely have any personal experience engaging in inter-coalitional, 'gang' conflict. This highlights the degree to which the human mind evolved to navigate social groups and coalitional dynamics. The present results indicated that even 48 6-9 month-old infants looked significantly longer (3.6 s) when a member of a smaller coalition prevailed over a member of a bigger coalition in the right-of-way dominance paradigm [33], than they did in the reverse case, indicating their expectations were violated. In comparison, the original study using relative body size to cue formidability in the right-of-way dominance paradigm found that a subsample of 16 9-month-olds looked 5.2 s longer, but only marginally significantly so, when a large agent yielded to a smaller one rather than the reverse, and no significant effect among 8-month-olds [33]. On the basis of this, the authors of the present paper proposed that '(i)n comparison with physical size, numerical group size may be a more reliable or salient indicator of social dominance. Often the consequences of being outnumbered are greater than the consequences of being out-sized'. However, the differential onset of significant findings across the right-of-way dominance studies cueing formidability by relative body and coalition size may also simply reflect the different sizes and inherent noise of these small infant samples, as well as the inclusion of attention-grabbing design-modifications that may ease cognitive processing for the youngest infants in the coalition study, such as supporting, convergent sounds and frontal, rather than profile, face depiction of the cartoon figures. That preverbal infants themselves form dominance hierarchies based on individual, physical formidability before they presumably engage in joint coalitional conflict would indeed suggest that infants are unlikely to understand coalitional before individual formidability.
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- This paper demonstrates that three-month-old infants use vocal cues of relative voice frequency pitch and formant quality, both of which reliably covary with body size across species, to predict the size of an unseen character. Infants were familiarized to puppet shows where a stuffed animal was wiggling while a sound was played, suggesting it was vocalizing. It then moved inside a closed box which then moved while the sound was playing, suggesting the character was still wiggling and vocalizing. Another closed box then started moving, suggesting another, unseen character was inside, while another vocalization sound was playing. This sound was of either higher frequency and formant (covarying with smaller body size across species) or lower frequency and formant (covarying with greater body size across species). The two boxes were then flipped over to reveal that the unseen character was either much larger or smaller than the focal character. Infants looked longer to unexpected trials (where vocal cues of greater body size had been played, but a smaller puppet was revealed or where vocal cues of smaller body size had been played, but a bigger puppet was revealed) than they did to expected trials (where the relationship between vocal cues and body size was consistent with their covariation across the animal kingdom). Thus, even three-month-old human infants make use of dedicated cognitive mechanisms that infer the body size of unseen characters from vocal cues, as do several other species (as reviewed by the paper). This further highlights the adaptive importance of body size as a cue for individual formidability for human and non-human animals alike.
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- This line of experiments provides controlled evidence that toddlers prefer those for whom others defer and yield, akin to the selection of high-rank allies among other primates [43,81••]. Using enacted puppet theater shows of the right-of-way dominance paradigm [33], it demonstrated that human 20-24 month-old toddlers selectively approached (reached for) the puppet who prevailed in zero-sum conflict because the other deferred to it, prostrating before it and yielding the way by moving to a stand-still at the back of the stage. As is the case for preverbal infant representations of social dominance [1,33,34], these preferences hinged critically upon the

existence of zero-sum conflict: Like infant predictions whether a large or small figure would manage to cross the stage or yield and face down, toddlers showed no preference for the puppet who crossed the stage if the puppets moved behind each other in the same direction (so both could have achieved their goals), nor if the puppet show was stopped immediately after one puppet prostrated before the other. If, however, the puppet show stopped immediately after one puppet yielded the way, bowing down and moving to the back of the stage, but before the prevailing puppet went on to complete its goal, toddlers now preferred the puppet to whom the other deferred. This suggests that the preference of toddlers was solicited by the very fact of being given precedence so that one *could* have achieved one's goal at someone else's expense, rather than by actually doing so. By contrast, if the loser of the right-of-way conflict did not voluntarily defer, but was instead pushed out of the way by the winner, toddlers now avoided the prevailing puppet that had retorted to brute force, reaching instead for the subordinate. This effect was not simply driven by avoidance of physically strong figures, because when a puppet instead pushed a barrier, rather than another agent, down in the very same manner, toddlers preferred it. Future studies should include neutral figures in the paradigm to test whether toddlers favor those for whom others yield and/or disfavor the yielders. One may speculate that toddlers prefer those for whom others defer because it is indicative of stable, uncontested, consensual rank, and thus whether someone is likely a beneficial long-term ally in human society. It is also possible that unlike many other primates [43] including bonobos [83], human toddlers may simply be repelled by coercive oppression (cf. [10,22,84–86]). Being themselves beginning to form peer relationships, however, toddlers may nevertheless be motivated to gain access to the potential benefits which those of consensual high rank enjoy at the expense of others. Indeed, observational studies suggest that preschoolers in daycare groups prefer and befriend resource-controlling peers and that infants and toddlers selectively imitate them [27–30]. It would be important to know if there are also specific and especially potent motivational consequences of seeing peers voluntarily defer to another child in such naturalistic settings, as opposed to being coerced by it (and to know the degree to which such consensual deferral is maintained by the threat of occasional aggression, cf. [27,43]).

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74. Gülgöz S, Gelman SA: **Who's the boss? Concepts of social power across development.** *Child Dev* 2017, **88**:946-963.
 This paper carefully traces the development of the explicit understanding of power (i.e. 'who is in charge') across the domains of resource control, goal achievement, permission, giving orders, and setting norms among North American 3–9 year-old children and adults, looking at both benevolent (benefitting others) and malevolent (imposing costs on others) uses of power in these domains. It found that it was easier for children and adults alike to identify who was in charge based on malevolent rather than benevolent uses of power, and that with the exception of giving permission to use a resource, the youngest children did not identify who was in charge in situations of benevolent power use. It will be important to establish if such is also the case across more implicit measures, languages, cultures and subsistence systems.
75. Gruenisen S, Tomasello M: **Children coordinate in a recurrent social dilemma by taking turns and along dominance asymmetries.** *Dev Psychol* 2017, **53**:265.
 This study uses a game-of-chicken, right-of-way conflict akin to the situation where preverbal infants use formidability cues to predict who will prevail [33,52]. Importantly, in the present experimental set-up yielding the way is actually costly: The study uses toy trains carrying rewards that are on a crash course, so that the children who turn their train aside on a different course lose some of their rewards, but both children lose all of their rewards if nobody yields. In this situation, dyads of preschoolers coordinated their repeated encounters along dominance lines so that the children who received the highest pay-offs (because their partner most often deferred to them) were in fact the children who had previously controlled (held) a resource (toy) the longest between the two, and who were also evaluated as most dominant by their teachers. Importantly, however, the most common coordination strategy between the preschool dyads was in fact that of egalitarian turn-taking.
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80. Thomas AJ, Sarnecka BW: **Infants choose those who defer in conflicts.** (in press) *Curr Biol* 2019 <http://dx.doi.org/10.1016/j.cub.2019.05.054>.
 This line of studies demonstrated that 12–16 month-old infants selectively avoided even a puppet for whom another puppet yielded voluntarily, using the same right-of-way stimuli and control studies as studies revealing contrasting effects among toddlers [71], although the participating infants were just few months younger in the present study. This paper also added an important further control to previous work [33,71] in which one puppet first yielded the way to the other, but then *also* went on to reach its goal of crossing the stage. Again highlighting the importance of zero-sum conflict for early developing representations and motives of social status, infants showed no preference for the prevailing or yielding puppet if they both ended up achieving their goals. That infants avoid even the puppet for whom another voluntarily defers may reflect a developmental shift, such that infants start out by resembling many other species (avoiding dominant others) before developing uniquely human processes in toddlerhood (approaching others of high-rank). This has previously been found to be the case for other psychological phenomena such as joint attention and overimitation, as discussed in the paper. However, in principle it is also possible that toddlers, unlike infants, realize that they are themselves more formidable than the small puppets used in these studies and so, like infants, might also avoid more formidable, toddler-sized puppets or adults who prevail in right-of-way conflict because others defer to them. If so, this would suggest that approach-decisions based on another's rank might be calibrated relative to one's own formidability, and thus the potential danger posed by the dominant other, but that these motives themselves may not differ qualitatively between infants and toddlers.
81. Krupenye C, Hare B: **Bonobos prefer individuals that hinder others over those that help.** *Curr Biol* 2018, **28**:280-286.
 This line of experiments demonstrates that adult bonobos prefer dominant individuals who use force to hinder others reach their goals. Following seminal work with human infants [91] (see also Ref. [92]) the authors first showed bonobo participants animated stimuli of two agents who either helped or hindered a third agent climb a hill. After this, bonobos chose between retrieving a reward (hidden below cut-out figures of the animated agents) from either the helper or hinderer (Experiment 1). The authors find that bonobos approached/reached for the helper over the hinderer, in contrast to human infants. These preferences generalized to live demonstrations by human actors who helped or hindered a third person receive a toy: bonobos again chose to approach the human hinderer over the human helper for a reward (Experiment 2). In fact, upon demonstration of the helping and hindering acts, bonobos even switched their previous base-line preferences for the human actors to favor the hinderer (Experiment 3). Finally, the participating bonobos were shown animations of one character monopolizing a central territory with physical force, akin to earlier demonstrations of infant representations of social dominance [35,36]. Again, bonobos selectively reached for (rewards hidden below the cut-out figure of) the coercively dominant figure over the subordinate (Experiment 4), supporting the interpretation that they preferred hinderers in previous experiments because they viewed them as dominant. Thus, even the generally unaggressive and egalitarian bonobos show qualitatively different relational preferences to those of human infants and toddlers regarding helping/hindering and dominance, preferring those who prevail at the expense of others, using brute force or simply hindering others reach their goals.
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 This paper shows that 21-month-old toddlers expect novel agents to continue to obey a character they have previously prostrated before and given their resource, even when this agent is no longer around. In familiarization trials, toddlers watched a group of agents play with a ball and then bow before a 'leader figure' giving away their ball in tribute to it. The leader then ordered the little agents to go to bed inside their house and left the scene. Results from subsequent test trials indicated that toddlers were surprised, and looked longer, if the agents left rather than stayed put in their house once the leader figure had left the scene, but this was not the case if toddlers had instead been familiarized to a figure who just beat them up

before ordering them to go to bed. Future studies should seek to replicate this important finding that young toddlers expect others will continue to obey authorities whom they have paid respect, even in their absence, and also investigate if these expectations generalize to situations in which agents paid their respect for a benevolent authority who helped by conferring a benefit to them (i.e. giving them a ball) rather than receiving costly tribute from them (i.e. receiving their ball) (Cf. [74•,93••]).

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93. Terrizzi BF, Woodward AM, Beier JS: **Young children and adults •• associate social power with indifference to others' needs**. *PsyArXiv* 2019 <http://dx.doi.org/10.31234/osf.io/45uca>. Preprint.
This study directly tested the effect of helping on young children's inferences about authority, using controlled, non-verbal video-stimuli showing two women entering a room. While one woman sits down on a chair, reading a magazine, the other stands up on another chair, about to put up a picture on the wall. However, she is unable to reach a stapler that she needs to put up the picture and gestures towards it on the table beside the woman reading a magazine. In the *Help Condition* the sitting woman makes eye-contact and then stands up and passes the stapler. In the *No Help Condition* the sitting woman makes eye contact and then ignores the request, continuing to read her book. Across all age-ranges, North American 4–5 year olds, 6–7 year olds, and adults inferred that the woman who refused to help was 'in charge' over the one asking for help, but they made no such inferences about a helper and a helpee. This suggests that even in the absence of more controlled resources or competence, the simple act of withholding requested help for others to reach their goals may license inferences about greater authority. This draws lines to bonobo views that those who hinder others are dominant [81••] and the specific importance of zero-sum conflict for how infants and toddlers think about social rank [33,71••,80•]. Given the importance of consensual authorities across culture (and the theoretical premium placed on their benevolence and ability to confer benefits) [2,15,19], it is important to establish if the effect of withholding help on inferred authority replicates across more implicit measures, language, culture and subsistence systems.
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This line of experiments replicates earlier findings that infants who expect resources to be distributed equally (2:2) rather than unequally (1:3) between third parties are themselves more likely to share their favorite of two toys with an adult experimenter. In contrast, infants who expect unequal over equal third-party distributions are more likely to share their least favored toy or refuse to share any of them. Furthermore, the paper pin-points the developmental onset of differentiating equal (2:2) from unequal (1:3) outcomes at around 9 months, where the emergence of this expectation correlates with the onset of naturalistic sharing at home (as well as with having siblings). Thus, while general expectations that third-party resources will be distributed equally need not in principle relate to willingness to share one's own scarce resources, this paper highlights the systematic relationship between orientations towards proto-egalitarianism and altruistic sharing, even in preverbal infancy (see also review in Ref. [108]). This mirrors decades of work among adults at the intergroup level, predicting willingness to share resources with less well-off groups from individual differences in social dominance orientation (e.g. [4,13,14,50,87,99,111]).
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