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Emergence of Social Reasoning About Hierarchies

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Synonyms

Cognitive development; Dominance hierarchies; Social status

Definition

The development of the ability to use cues to dominance, such as physical power, social power, or access to resources, to reason and make inferences about species-specific social hierarchies.

Introduction

Social hierarchies, defined here as organizational structures in which certain individuals or groups have greater social power and/or access to resources than others, are ubiquitous across cultures and species (Cheney and Seyfarth 2007). These hierarchies shape many aspects of life, from one's desirability as a social partner or mate, to overall health and well-being (Marmot and Sapolsky 2014). Social hierarchies serve to reduce the need for physical aggression, maintain group stability, and enable predictability in social environments; by knowing each individual's position in the hierarchy, one can predict the likely outcomes of interactions with group members and behave accordingly.

Given the ubiquity and importance of social hierarchies, it is not surprising that species from fish (Grosenick et al. 2007) to nonhuman primates (Bergman et al. 2003) can reason about hierarchies. For example, Hamadryas baboons expect dominance relations to be stable, and can infer – based on vocalizations alone – when unexpected dominance interactions occur (e.g., when a subordinate individual gives a threat-grunt – signaling dominance – to a more dominant individual: Bergman et al. 2003). Although social hierarchies are present in many species, most research in nonhuman species has only examined the *consequences* of hierarchies, such as investigating how an individual's rank in a hierarchy shapes physiological functioning, mortality rate, or access to food or mates (see Cheney and Seyfarth 2007; Marmot and Sapolsky 2014). The question of *how* individuals develop the ability to reason about hierarchies has largely been asked only in humans. Therefore, this entry reviews the literature on the emergence of reasoning about hierarchies in humans, shown to be capable of this type of social reasoning before reaching their first birthday.

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Hierarchies: Simply Complicated

Dominance hierarchies are simultaneously simple and complicated. They are simple because the defining trait of a hierarchy is an asymmetric relationship. In other words, hierarchies arise when two individuals are in a zero-sum situation where only one can achieve the desired outcome. For example, if two children both want to play with a toy, but there is only one toy, then a hierarchy is formed between those two children, and the child who gets to play with the toy is the dominant individual and the child who does not get the toy is the subordinate.

Hierarchies are also complicated. First, although each individual dominance relation is established between two individuals, hierarchies are often constructed at the group level and therefore include more than two individuals. Thus, to learn the larger, group-level hierarchy, group members must keep track of dyadic (i.e., one-to-one) dominance relations and then construct the group-level hierarchy from each of these dyadic relationships. Importantly, individuals can construct the group-level hierarchy by observing some (but not all) of the dyadic dominance relations, inferring unseen dyadic relations through transitive inference. In this context, transitive inference is the ability to derive an unknown dominance relation between two actors based on knowledge of the dominance relations each of those actors has with a shared, third actor. In other words, after observing A prevail in an asymmetric interaction with B, and B prevail over C, transitive inference would lead one to expect A to prevail over C, even without seeing any prior interactions between A and C. Second, hierarchies can be constructed both within a single group (*intragroup* hierarchy, as described above) as well as between groups (*intergroup* hierarchy). Therefore, in addition to constructing intragroup hierarchies based on interactions between two individuals, individuals must also develop the ability to see groups as cohesive units and construct intergroup hierarchies based on the interactions of two groups. Third, asymmetries can be based on a wide variety of factors, from access to resources, to social power, to influence over others. Thus, children must learn how to detect cues to asymmetric dominance relations using each type of factor; for example, being able to represent concepts such as "more" versus "less" (for asymmetric resource-based relations). Fourth, and relatedly, the factor that a given hierarchy prioritizes is likely to vary across different contexts. For example, while playing in their neighborhood, children might form a hierarchy on the basis of the number of toys each kid has (prioritizing access to resources). In contrast, when at school, children might form a hierarchy on the basis of power or prestige (prioritizing influence over others), putting the school principal at the top of the hierarchy, teachers in the middle, and students at the bottom (for a detailed review of reasoning about dimensions of status hierarchies in adults, see Mattan et al. 2017). Despite the sometimes complicated nature of hierarchies, humans – even from infancy – are remarkably good at identifying cues to dominance that signal hierarchies.

Learning Cues to Dominance

In fact, humans seem predisposed to organize the world in a hierarchical fashion from an early age. Infants as young as 15-months-old learn and remember dyadic dominance relationships and use these to construct linear dominance hierarchies (e.g., where A > B > C > D, and so on: Mascaro and Csibra 2014). When presented with two actors that infants have seen interact separately with a third actor, but not interact with each other, 10-month-olds use principles of transitive inference to predict the outcome of this novel interaction (Gazes et al. 2015). A predisposition toward hierarchical organization continues into adulthood. Adults can better perceive, remember, learn (and even prefer) asymmetric relationships (in which one actor is dominant to the other) than relationships in which both actors are equal in status (Zitek and Tiedens 2012). Finally, although it has yet to be examined in infants, 5-year-old children have spatial representations of hierarchy, representing dominance in a vertical space where the powerful are higher than the weak (Lu et al. 2017).

In infancy, one particularly salient cue to dominance is size (reviewed in Pun et al. 2017). Ten- (but not eight-) month-old infants expect bigger individuals to be dominant to smaller individuals (Thomsen et al. 2011). When shown a video where two blocks – one larger and one smaller – vie for the same goal, infants expect the larger block to prevail, exhibiting surprise when the larger block bows down (acts subordinate) to a smaller block, but not when the smaller block acts subordinate to the larger block. By 12 months of age, infants expect these dominance relations to be stable across different contexts; when shown a video where one actor (A) wins a physical contest over another actor (B) in one context (i.e., gaining access to a contested space), infants then expect actor A to prevail over B in a new context (Mascaro and Csibra 2012). However, when infants are shown A interacting with a new actor (not-B), the infants do not expect A to prevail in this new interaction context, suggesting that infants view dominance relations as specific to a given pair of individuals (in this case, specific to A and B, and not generalizable to A and not-B). Even younger infants are sensitive to cues of dominance, using numerical group size to infer dominance. Employing a similar paradigm of contested interactions as described above (in Mascaro and Csibra 2012; Thomsen et al. 2011), Pun et al. (2016) found that 6-month-olds expect groups with fewer members to be subordinate (and defer) to groups with a greater number of members.

Infants and children are capable of using even more subtle cues, such as facial physiognomy (i.e., facial structure or features), to detect dominance. Faces with more masculine and mature features (e.g., rated as looking aggressive and older by adults) are perceived as more dominant by adults, as well as by children as young as 3-years-old (Cogsdill et al. 2014). Even infants are sensitive to these types of cues; 13-month-olds differentiate between scenarios where puppets with more masculine faces prevail from scenarios in which puppets with less masculine faces do (Hartstein et al. under review).

Young children can use more dynamic cues to infer dominance relations as well, although this ability has only been documented later in development (i.e., after infancy). By 3-years-old, children can use a variety of cues to detect dominance, including physical supremacy (e.g., who prevails in a physical fight), number of resources (e.g., who has more toys), and age (e.g., who is older: Charafeddine et al. 2015). Five-year-olds (but not 3- or 4-year-olds) can infer which actor is dominant based on nonverbal cues such as body posture (e.g., standing with shoulders back vs. hunched over, head up making eye contact vs. head down with no eye contact, etc.: Brey and Shutts 2015). Providing multiple cues to dominance appears to simplify the task; when given verbal input in addition to seeing nonverbal cues (i.e., when the dominant individual gave instructions and the subordinate asked for instructions), then even 3-year-olds are able to identify who is in charge (Brey and Shutts 2015). In contrast, a separate research study conducted on 4- to 9-year-olds found that children were incapable of understanding that the one who gives instructions is dominant to the one who accepts them before the age of 7 (Gülgöz and Gelman 2016). Some of the variation across studies in the age at which children have the ability to detect and infer dominance from various behavioral cues is likely to be due to methodological differences. Thus, more research studying how and when children come to use different cues to construct social hierarchies will help clarify the developmental trajectory of this aspect of cognitive development. In sum, when presented with a variety of cues to dominance in dyadic interactions, children are remarkably accurate at inferring who is dominant and who is subordinate, and even infants are capable of using dyadic interactions to construct group-level hierarchies (Mascaro and Csibra 2014).

Applying Dominance Hierarchies to Real-World Social Groups

Understanding how children come to organize the people and social groups around them into social hierarchies is important. Children, and adults, often prefer people and groups at the top of the hierarchy (Bigler and Liben 2007), perhaps due to

the fact that high-status individuals have preferential access to resources as well as social capital and thus are likely to be beneficial social or coalitional partners (Cheney and Seyfarth 2007). This preference for high-status groups is evident even among individuals who belong to stereotypically low-status groups (e.g., a pro-White bias among Black children in the USA, see Raabe and Beelmann 2011). Much of the work on children's ability to reason about hierarchies and to apply hierarchical organization to the social groups around them has focused on two social categories that are important in much of western culture – race and gender.

In cultures where race and socioeconomic status co-vary, children begin to view racial categories in a hierarchical fashion during early childhood, and children make inferences about status using a variety of cues to dominance. When given information about occupations that differ in prestige, 6-year-old children in the USA believe Black people are more likely than White people to have low-status occupations, and expect novel occupations to be lower status when they are described as held by Black people (Bigler et al. 2003). When presented with differences in resource holding (by being shown possessions that vary in quality or quantity), preschool-aged children expect White people to have higher quality and quantity of resources than Black people in both the USA (Elenbaas and Killen 2016; Mandalaywala et al. under review; Shutts et al. 2016) and South Africa (Shutts et al. 2011).

Resource holding might be a useful cue to dominance for racial categories, given the types of input children are likely to be exposed to (through media, in their daily interactions, etc.). However, information about resources might be less informative when considering how status hierarchies map onto gender categories. For instance, although the gender pay gap is well discussed among adults, wealth differences between men and women might not be salient to children, particularly those growing up in heterosexual two-parent households. Indeed, previous work found that 3- to 9-year-old children in South Africa did not use gender to predict who had nicer possessions, although they did use race in this manner (Olson et al. 2012). In contrast, when presented with prestige-based cues to dominance, such as occupation, 5- and 6-year-olds organize gender categories in a hierarchical fashion, rating stereotypically male-biased professions (e.g., scientist) as higher status than stereotypically female-biased professions (e.g., teacher: Liben et al. 2001). When given information about symmetry in social power (i.e., differential ability to make decisions for others), children as young as 3.5-years-old say that males are higher in the social hierarchy than females (Mandalaywala et al. under review). Less work has examined how young children reason about hierarchies outside the context of race or gender, for example, in the context of the caste system in India (but see Dunham et al. (2014) for evidence that children as young as 9-years-old are aware of the relationship between caste and wealth, rating Brahmins as wealthy and Dalits as poor).

Applying Hierarchies to the Self

Although children are aware of the dominant stereotypes about status, at least as they are applied to culturally-relevant social groups, they do not readily apply these stereotypes to themselves. This suggests a disconnect between knowledge of stereotypes and internalization of stereotype content. Although children between the ages of 3.5- and 7-years-old display awareness of culturally relevant stereotypes about status hierarchies, these same children do not apply societal stereotypes about status hierarchies to themselves. At these ages, even children who belong to groups that are stereotyped as lower-status (e.g., female or African-American children) perceive their own status to be high (Mandalaywala et al. under review). In other words, children's subjective social status (e.g., their perception of their place in a social hierarchy) does not shift in accordance with their objective social status (e.g., their status based on group-membership is a stereotypically higher or lower status social group). This is an important point, as subjective social status is a strong predictor of health and well-being. Although socioeconomic status (SES, often determined through a combination of educational attainment, occupational prestige, and

income) is obviously important for determining access to resources and opportunities, among adults, subjective status can differ from SES. Importantly, people who feel lower in the hierarchy than their SES would imply (i.e., having lower subjective status) have more health problems and are likely to die at a younger age than their SES-matched peers who do not feel low in the hierarchy (Singh-Manoux et al. 2005). Whereas young children seem relatively immune to the potentially pernicious consequences of subjective status, by 10-years-old, children's subjective status assessments begin to match family SES (Mistry et al. 2015). Better understanding exactly when and why children begin to view their subjective status as lower, and when they start to view themselves as members of group-based social hierarchies more generally, will help us understand the development of reasoning about hierarchies.

Conclusion

From an early age, humans are able to use a variety of cues to infer dominance and can use these cues to construct social hierarchies. Although this work sheds light on the types of dominance cues individuals use to determine social standing, it is unclear how infants and children determine what cues to dominance are the most relevant and informative in their environment and to the particular hierarchy in question. A cue such as being physically larger in body size is used to signal and infer dominance relations across a broad swath of nonhuman species and thus is likely to have ancient evolutionarily roots. Therefore, we might expect among humans that larger body size is cross-culturally understood as signaling dominance and that individuals infer dominance based on larger body size from early in development. However, other cues, especially those based on culturally-specific concepts of prestige, are likely to be culturally dependent (e.g., being a priest may be prestigious in Italy, a predominantly Catholic country, but not in Saudi Arabia, a predominantly Muslim country). To best understand the role of cultural input on the development and consequences of children's reasoning about hierarchies, cross-cultural work looking directly at the types of input about status hierarchies that children are exposed to will be necessary. Finally, although very little work has examined the development of reasoning about dominance relations in nonhumans, comparative research would shed light on the cognitive adaptations underpinning the evolution of humans' rather remarkable (but not unique) abilities to structure complex societies into stable, informative hierarchies.

Cross-References

- ▶ Domain-Specific Reasoning About Dominance Hierarchies
- ▶ Dominance Hierarchies
- ▶ Dominance Versus Prestige
- ▶ Evolutionary Theories of Status, Dominance, and Prestige
- ▶ Function of Dominance
- ▶ Group-Focused Versus Individual-Focused Dominance
- ▶ Marks of Status
- ▶ Sex Differences in Expression of Dominance

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