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Uniquely Human Cognition

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Uniquely human cognition refers to aspects of cognition that are specific to our evolutionary lineage and distinguish us from other animals, including our closest living relatives, the nonhuman primates. Understanding these unique aspects embeds theories of human cognition within an evolutionary framework and informs accounts of the foundations of behaviors found in no other species, such as language and religion. Knowledge about uniquely human cognition shapes our understanding of what it means to be human within the broader context of biological species and thereby sets the backdrop for human attitudes toward other animals. This places the cognitive sciences at the forefront of some of the oldest debates in philosophy and broader culture about what makes humans human.

History

Questions of uniquely human cognition have a long history. Across several major traditions, philosophers like Plato (ca. 427–347 B.C.E.), Aristotle (384–322 B.C.E.), Vasubandhu (ca. fourth century C.E.), and Al-Farabi (ca. 870–950 C.E.) characterized human cognition as uniquely capable of abstract reasoning, moral deliberation, spiritual insight, and future planning. Zhuangzi (ca. 369–286 B.C.E.) challenged this view, suggesting fluid boundaries between species' cognitive abilities. Much later, the taxonomic label *Homo sapiens* ([von Linné & Salvius, 1758](#)) reinforced the belief in human cognitive distinctiveness. However, the debate persisted: Descartes described humans as unique “creatures of reason” ([Descartes, 1641](#)), whereas Darwin argued that “there is no fundamental difference between man and the higher animals in their mental faculties” ([Darwin, 1871](#), pp. viii, 423). This tension carried into the rise of experimental psychology, where comparative studies with other species became a key approach to understanding human cognition ([Wundt, 1863](#)) [see [Animal Cognition](#)].

Core concepts

Unique vs. autapomorphic traits

Unique traits are features specific to a species, distinguishing it from all others. These traits arise from adaptations that are unique to that species' evolutionary history. For example, understanding others' false beliefs is a candidate for a uniquely human cognitive trait ([Call & Tomasello, 2008](#)). *Autapomorphic* traits are unique to a species among its close phylogenetic relatives. Human vocal imitation is an autapomorphic cognitive trait, as it is unique among primates, even though some other mammals (e.g., seals) also exhibit vocal imitation ([Janik & Slater, 1997](#)). Unique and autapomorphic traits are not necessarily universal among individuals [see [Cultural Universals](#)] of that species or even common (i.e., species typical). Even if only some individuals of a species have a trait that cannot be found in any other species, it is a unique trait ([Haun, 2015](#)).

Qualitative vs. quantitative differences

Differences between human cognition and that of other animals can be *quantitative* (e.g., greater inhibitory control) or *qualitative* (e.g., only humans understand false beliefs). Distinguishing between

these kinds of differences is challenging. Critically, gradual quantitative differences in some cognitive traits can lead to qualitative differences in others. For example, gradually increased memory capacity can result in categorically better pattern detection: To recognize “ABAB” requires remembering at least four items. Animals with a memory capacity of fewer than four items would be incapable to recognize it ([Cantlon & Piantadosi, 2024](#)).

Unique traits vs. trait composition

Cognition is weakly decomposable ([Simon, 1969](#)), meaning it arises from interactions among cognitive traits, not simply their sum. Therefore, comparing *trait composition* across species is essential. Even if all individual human cognitive traits exist elsewhere, their unique co-occurrence in humans may distinguish human cognition ([Laland & Seed, 2021](#)).

Questions, controversies, and new developments

Domain-specific vs. domain-general accounts

Domain-specific accounts propose that human cognition consists of evolutionarily adaptive, functionally specific, innate input analyzers also called cognitive modules ([Fodor, 1983](#)). Some of these innate modules are claimed to be uniquely human, such as recursive representation ([Dehaene et al., 2022](#)) or cheater detection—the ability to identify violations of social exchange rules ([Cosmides et al., 2005](#)). *Domain-general* accounts suggest that human cognition arises not from single-purpose adaptations but broad cognitive abilities affecting multiple domains, emphasizing learning. For example, unique understanding of relations between relations (e.g., A is to A as B is to B) influences abstract thinking, causal reasoning, metacognition, theory of mind, and cultural innovation ([Penn et al., 2008](#)).

Core knowledge vs. constructivist accounts

Core knowledge accounts propose that human cognition is rooted in innate developmental primitives that organize along core knowledge domains like objects, numbers, and agents ([Spelke, 2022](#)). Core knowledge is evolutionarily ancient and shared with other animals. Uniquely human cognition arises through recombination and extension of their function throughout ontogeny ([Carey, 2009](#)). In contrast, *constructivist* theories reject strong innateness. They argue that uniquely human cognition emerges from gradually constructing knowledge via interaction with the environment ([Piaget, 1952](#)) or social and cultural learning ([Vygotsky, 1978](#)) rather than from recombining cognitive modules. Core knowledge accounts have stronger domain specificity constraints than constructivist accounts.

The role of culture

In cultural intelligence accounts of human cognition, it evolved primarily to handle the challenges of living in complex, cooperative, socially organized groups. Theories in this category emphasize the central role of social politics ([Byrne & Whiten, 1989](#)), cooperation ([Tomasello, 2009](#)) [see [Shared Intentionality](#)], social learning ([Henrich, 2015](#); [Heyes, 2018](#)) [see [Social Learning](#)], and

prosociality ([Burkart et al., 2009](#)) as drivers of uniquely human cognition. Cognitive differences between humans and other animals in these accounts are often quantitative. Importantly, these quantitative differences enable culture, which drives qualitative species-level cognitive differences.

The role of language

Many domain-general accounts emphasize the role of language in shaping uniquely human cognition, whether through an innate “mentalese” system that structures all thought ([Fodor, 1975](#)) or through language as a necessary tool for higher-order cognition, including, for example, abstract reasoning ([Vygotsky, 1978](#)) [see [Reasoning and Argumentation](#)], metacognition ([Dennett, 1991](#)) [see [Metacognition](#)], or relational thinking ([Gentner, 2003](#)) [see [Analogy](#)]. In core knowledge accounts of cognitive development, language enables the recombination and extension of core knowledge modules ([Carey, 2009](#)) [see [Cognitive Development](#)].

Within-species variation

For slowly developing species with complex cognition, such as primates, understanding within-species variation is crucial before making species-level comparisons ([Bohn et al., 2024](#); [Haun, 2015](#); [Nielsen & Haun, 2016](#)). Yet, within-species variation is commonly underestimated when comparing cognition between species. Human cognition is often inferred from studies with psychology students in the Global North ([Henrich et al., 2010](#)) [see [WEIRD](#)]. For instance, it was long assumed that all humans share a universal capacity for exact, symbolic number, distinguishing humans from other animals ([Gelman & Galistel, 1978](#)). However, cross-cultural studies have shown that such number concepts depend on cultural tools like numerical language, making them uniquely human, but not universal ([Frank et al., 2008](#)). Similarly, models of animal cognition often rely on small, homogeneous samples in specific living conditions ([van Leeuwen et al., 2018](#)). Chimpanzees, for example, have been characterized as less socially tolerant in contrast to other primates, especially humans ([Hrdy, 2011](#)). However, recent findings have shown that chimpanzee social tolerance varies with demographic conditions, producing within-species variation that exceeds proposed between-species differences ([DeTroy et al., 2021](#)).

Human vs. machine cognition

Human cognition is unique not just when compared to other intelligent biological species but also when compared to artificial intelligences. While synthetic systems now make decisions, create art, and solve scientific problems ([Brinkmann et al., 2023](#)), they do so in ways that are different from the human approach to the same challenges ([Griffiths et al., 2024](#)) [see [Large Language Models](#)]. Understanding these differences and commonalities constitutes a new comparative psychology, including biological and synthetic species.

Broader connections

Questions about human cognitive uniqueness are central to many fields within the cognitive sciences [see [Animal Cognition](#); [Animal Culture](#); [Cultural Evolution](#)]. Recently, they have gained significance in artificial intelligence, aiming to synthesize uniquely human intelligence, and in animal ethics, where the value of animal life is evaluated based on their capacity for human-like thoughts.

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