E

Emergence of Deontic Reasoning

Denise D. Cummins
Depertment of Psychology and Depatment of Philosophy, University of Illinois, Champaign, IL, USA

Synonyms

Practical reasoning; Social reasoning

Definition

Reasoning about what one may, ought, or must not do in a given set of circumstances.

Introduction

Deontic reasoning is reasoning about what one *may*, *must*, or *must not* do in a given set of circumstances. Virtually all of our social institutions presuppose a capacity to understand and reason about what is *permitted*, *obligated*, *prohibited*, or *advised*. Failure to reason effectively about deontic concepts can have disastrous consequences, including social rejection, punishment, and even incarceration.

Deontic reference emerges quite early in children's speech, appearing in children's justifications of their behavior as early as 24 months of age.

Toddlers use terms such as *must* and *may* to talk about obligation and permission (e.g., "*You **must** stay*"), while epistemic uses of the same terms (e.g., "*It **must** be raining*") do not reliably emerge until the 4th or 5th year of life.

Deontic reasoning is closely related to the concepts of *social norms* and *social contracts*. Social norms differ from social contracts in much the same way as laws differ from contracts; norms (like laws) are prescriptive rules established by authority that dictate what is permitted or obligated under specified conditions, whereas contracts are agreements entered into freely by agents who promise a conditionalized exchange of benefits. Violating a norm means engaging in proscribed behavior, and there need not be any direct or immediate benefit to the agents controlled by the norm (other than avoiding punishment). In fact, many systems of social norms are enacted and enforced precisely to benefit some members of society over others. A violation of a social contract, on the other hand, is simply failure to reciprocate a benefit received that was given conditionally on reciprocation.

Denise D. Cummins has retired.

T.K. Shackelford, V.A. Weekes-Shackelford (eds.), *Encyclopedia of Evolutionary Psychological Science*,
DOI 10.1007/978-3-319-16999-6_2629-1

Emergence of Social Norm Reasoning

Beginning around 3 years of age, young children do not just follow social norms, they actively enforce them on others, even in situations in which they are not directly involved. They do not need to be explicitly instructed about the rules by an authority; they simply need to see an adult engage in it. For example, 3-year-olds will actively correct and admonish a puppet that interacts with an object in a way that is different from the way that an adult previously interacted with it, and they will use deontic/normative language to do so (e.g., "You have to do it this way") (Schmidt and Tomasello 2012). Cummins (1996a) found that children as young as 3 years of age perform as well as adults when asked to monitor compliance with a norm. Children were shown toy mice, some of which squeaked when squeezed. Children were told either "*The Queen Mouse says all the squeaky mice are in the house*" (epistemic) or "*The Queen Mouse says all the squeaky mice must stay in the house*" (deontic). They then had to choose whether to squeeze toy mice that were inside or outside of a toy house to "*make sure no one is disobeying the rule*" (deontic) or "*find out if she's wrong*" (epistemic). Across two experiments, two thirds of 3-year-olds correctly chose to squeeze the mice that were outside the house in the deontic case, but only one third chose to do so in the epistemic (truth-testing) case. Similarly, Harris and Nuñez (1996) showed children cards that illustrated compliance with or violation of social rules such as "When Julie rides a bicycle, Julie wears a helmet." Children were required to find the picture that showed either that the sentence was wrong (epistemic) or that Julie was doing something wrong (deontic). Preschool children were found to perform nearly optimally on the deontic versions of the task but frequently made errors on the epistemic versions of the task.

Emergence of Social Contract Reasoning

Within the first year of life, infants engage in reciprocal turn-taking behavior with caregivers, and by at least the third year of life, children are selective in their distribution of altruistic acts, preferring to aid those who have aided them in the past. Children as young as 4 years of age reason effectively about reciprocal exchange, correctly identifying instances of contract compliance as well as instances of cheating (Harris et al. 2001).

Explanations of Early Emergence

Differences in learning opportunities. One explanation for the ease and speed with which children induce deontic reasoning strategies is the frequency and urgency with which deontic reasoning situations present themselves during early childhood. In other words, there is ample opportunity to induce a schema for reasoning about deontic situations given their ubiquity. Yet children are exposed to instances of lying (epistemic violations) as frequently as instances of misbehavior (prescriptive violations).

Despite this, we induce no efficient schemas for testing truth. Children and adults agree on what constitutes a violation of a social rule, but considerable disagreement exists among theorists concerning how the truth of statements should be tested. Moreover, both adults and children frequently employ deficient strategies (e.g., confirmation bias) when asked to test the truth of statements (see Cummins 1996b for a review).

Differences in the complexity of meta-representations and satisfaction conditions. Some researchers have argued that epistemic reference emerges later than deontic reference because the former is more demanding of meta-representational cognitive resources. But epistemic sentences do not require more complex operators than deontic sentences to capture their logical forms. Deontic sentences usually include modals to express permission ("You *may* do that") and obligation ("You *must* do that"). Epistemic sentences use the same modals to express possibility ("You *may* be right") or necessity ("You *must* be the one who did it"). Epistemic sentences also need not make use of modals ("It is raining")

and hence are syntactically simpler than deontic sentences.

The same can be said about task complexity. Deontic and epistemic versions of reasoning tasks require children to detect discrepancies between a mental representation of what should be (e.g., "Squeaky mice must stay/are in the house") and the actual situation (e.g., "Squeaky mice are not in the house"). In both cases, the state of affairs described and the actual state of affairs must be compared in order to assess whether their satisfaction conditions have been met.

Despite this, epistemic tasks appear to impose greater cognitive load than deontic tasks. Van Lier et al. (2013) found that reasoning about deontic content does not depend on cognitive capacity or age and is unaffected when cognitive resources are burdened by performing a concomitant secondary task. In contrast, performance on a nondeontic version of the same task was found to depend on available cognitive capacity. This suggests that it is something about our cognitive architecture that makes it easier for us to understand and process deontic tasks.

Evolutionary explanations. Evolutionary accounts explain early emergence in deontic reasoning by arguing that this type of reasoning was a target of selective pressure. The first researchers to offer an evolution-based explanation were Cosmides and Tooby (1989), who proposed **Social Contract Theory**. They argued that performance improves only when people interpret the materials as social contracts with reciprocal benefit structures. An offer to engage in social exchange can be expressed by a rule of the form: If Benefit [to Party X, from Party Y] then Benefit [to Party Y, from Party X]. Subjects encountering such a rule should perceive that individuals who have accepted a benefit without returning a benefit are cheating. Cosmides and Tooby argued that algorithms for reasoning about social exchange evolved in protohumans during the Pleistocene, making them species-specific cognitive architecture.

Cummins and Cummins (1999) offered an alternative evolutionary explanation which they call the **Learning Bias and Canalization View.** Learning bias refers to attentional biases for social stimuli (e.g., the preference of newborns to look at faces as opposed to equally complex stimuli). Canalization refers to the degree to which the development of a trait is robust across normal environmental variations. According to this view, all infants are "primed" to rapidly acquire social rules due to an attentional bias toward social stimuli, but *which* rules are acquired depends on the norms characterizing their particular social groups (canalization).

They further argue that this kind of cognition is not unique to humans but instead reflects cognitive functions that were shaped over evolutionary time by the exigencies of living in social groups. Numerous primatologists have noted that primates are endowed with cognitive abilities that are especially well suited to tracking social information. They are able to recognize individuals, identify kin, keep track of past interactions with group members, discriminate between cooperators and defectors in reciprocal interactions, and form alliances based on reciprocal obligations (such as grooming and food sharing) (Silk 2007). These characteristics of primate cognition have measurable fitness consequences, that is, measurable impact on the frequency of an individual's genes in the gene pool via differential reproductive success. It is difficult to defend the position that humans were exempt from this evolutionary pressure.

These accounts are bolstered by neuroimaging of reasoning pathways. For example, in a study conducted by Canessa et al. (2005), the effect of content on brain activation was investigated with functional magnetic resonance imaging (fMRI) while people solved the truth-testing and deontic versions of the Wason selection task. They found that both tasks activated a left-hemispheric frontoparietal network, which is consistent with a number of studies that report left hemisphere involvement in deductive reasoning. But deontic content was also found to recruit activity in right-hemisphere frontal and parietal regions while truth-testing content did not. This selective recruitment of right hemisphere areas is consistent with other studies showing a major role of the

right hemisphere in the processing of social content.

Conclusion

Thriving in a complex social environment depends crucially on deontic reasoning. Humans and other social animals appear to be biologically prepared to rapidly learn what is permitted and what is forbidden in a social group, and readily detect transgressions of social norms and contracts. They also readily form alliances based on reciprocal obligations, and monitor transactional imbalances. These basic social cognitive functions are, in a very real sense, what the social brain evolved to do.

Cross-References

- ▶ Adaptations for Reciprocal Altruism
- ▶ Adapted Mind, The
- ▶ Altruism Norms
- ▶ Cheater Detection
- ▶ Cognitive Development
- ▶ Cooperation and Social Cognition
- ▶ Developmental Evidence
- ▶ Emergence of Indicative Reasoning. Development
- ▶ Evolution of Cooperation
- ▶ Evolutionary Cognitive Psychology
- ▶ Fairness in Primates
- ▶ Human Reciprocal Altruism
- ▶ Ingredients of Reciprocal Altruism
- ▶ Judgement and Decision-Making
- ▶ Language Development
- ▶ Leda Cosmides and John Tooby
- ▶ Non-Human Reciprocal Altruism
- ▶ Psychology of Reciprocal Altruism
- ▶ Robert Trivers
- ▶ Social Learning and Social Cognition

References

Canessa, N., Gorini, A., Cappa, S. F., Piattelli-Palmarini, M., Danna, M., Fazio, F., & Perani, D. (2005). The effect of social content on deductive reasoning: An fMRI study. *Human Brain Mapping, 26*, 30–43.

Cosmides, L., & Tooby, J. (1989). Evolutionary psychology and the generation of culture, part II. Case study: A computational theory of social exchange. *Ethology and Sociobiology, 10*, 51–97.

Cummins, D. D. (1996a). Evidence of deontic reasoning in 3- and 4-year-olds. *Memory & Cognition, 24*, 823–829.

Cummins, D. D. (1996b). Evidence for the innateness of deontic reasoning. *Mind & Language, 11*, 160–190.

Cummins, D. D., & Cummins, R. C. (1999). Biological preparedness and evolutionary explanation. *Cognition, 73*, B37–B53.

Harris, P. L., & Nuñez, M. (1996). Understanding of permission rules by preschool children. *Child Development, 67*, 1572–1591.

Harris, P. L., Núñez, M., & Brett, C. (2001). Let's swap: Early understanding of social exchange by British and Nepali children. *Memory & Cognition, 29*, 757–764.

Schmidt, M. F. H., & Tomasello, M. (2012). Young children enforce social norms. *Current Directions in Psychological Science, 21*, 232–236.

Silk, J.B. (2007). Social components of fitness in primate groups. Science, 317, 1347–1351.

Van Lier, J., Revlin, R., & De Neys, W. (2013). Detecting cheaters without thinking: Testing the automaticity of the cheater detection module. *PloS One, 8*, e53827. doi:10.1371/journal.pone.0053827.