

## 11.2 Deontic Reasoning in Psychology

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### Summary

Deontic reasoning is the branch of the psychology of reasoning that studies how we reason with and about normative rules, using logical operators such as “must,” “allowed,” and “forbidden.” Thanks to its dual nature, combining reasoning with social context, deontic reasoning provides a unique, multilevel view on human rationality, bridging between normative and social and pragmatic rationality. This chapter reviews some of the historical as well as contemporary findings regarding deontic thinking, starting with the deontic selection task; considers aspects of the normative, social, and pragmatic rationality of deontic thinking; explores its cognitive variability; and outlines its implications for the great rationality debate. The chapter concludes with some thoughts about the future of research in deontic reasoning.

### 1. Reasoning *about* Norms and *with* Norms

Normative rules surround us wherever we turn: as we drive, we conform (hopefully) to traffic laws. We conform to norms when we play games, be it chess, Go, or online role-playing. Indeed, children as young as two years old make spontaneous normative utterances when a player deviates from the rules of a game (Rakoczy, Warneken, & Tomasello, 2008). We have norms in law, in religion, in education, in medical practice. Norms, as Searle (2005) aptly put it, are the glue that holds society together. Normative rules have their own language; we use terms such as *must*, *ought*, *allowed*, and *forbidden* to express them: “I *ought* to visit my aunt”; “You *must* support drug recommendations with evidence”; “Smoking is *forbidden* anywhere on this train”; “Students are *allowed* to use a pocket calculator at the exam”; and so on. In logic, this language is called *deontic*, from the Greek *deon*, obligation.<sup>1</sup> Thus, *deontic logic* is the logic of rules, norms, and regulations (McNamara, 2010; and see chapter 11.1 by Horty & Roy, this handbook), and *deontic reasoning* is the

branch of the psychology of reasoning that studies how we reason with and about normative rules.

Deontic reasoning provides a unique, multilevel view on human rationality, bridging between normative rationality, on the one hand, and social and pragmatic rationality, on the other: the rationality of conforming to normative standards versus the rationality of achieving one’s goals, respectively (Evans & Over, 1996). We can of course ask how well people perform on deontic deductive competence (pretty well), but there is much more to deontic reasoning than straightforward deduction: deontic reasoning is about norms, firmly linking it to social rationality; it also provides the bridge to action, so it is perhaps more directly linked to practical rationality than most other domains of human inference. Moreover, given that deontic reasoning is about norms, it occupies a curious, dual place in the great rationality debate, with both first-order and second-order implications: we can ask whether people reason normatively *about* deontic premises, but we can also explore the type of deontic judgments that scientists make when they theorize about reasoning and decision making; after all, rationality is about *should* and *ought*.

This chapter reviews some of the historical as well as contemporary findings regarding deontic thinking, starting with the deontic selection task; considers aspects of normative, social, and pragmatic rationality of deontic thinking; explores its cognitive variability; and outlines its implications for the great rationality debate. I conclude with some thoughts about the future of research in deontic reasoning.

### 2. How It All Started: The Deontic Selection Task

To understand some of the historical context for the appearance of deontic reasoning on the stage of the psychology of reasoning, it helps to keep in mind that for a long time, psychologists of reasoning acknowledged one type of logic only: the two-valued, extensional, first-order

classical logic of Introduction to Logic textbooks. Perhaps the most famous (or, if you will, infamous) example of this approach is the Wason selection task (Wason, 1960; for reviews, see Evans & Over, 2004, chapter 5; Ragni, Kola, & Johnson-Laird, 2018). In the abstract version of this fiendishly difficult task, reasoners are presented with (typically) four cards and are told that each card has a letter on one side and a number on the other side. Only one side of each card is visible, for example, A, N, 8, 4. They are also presented with a conditional of the form “If  $p$ , then  $q$ ,” for example, “If there is an A on one side of the card, then there is an 8 on the other side.” They are told that the conditional is a rule that applies to the cards and may be true or false. Their task is to pick the cards—and only the cards—that need to be turned over in order to test if the conditional is true or false. Wason’s normative standard was classical logic and Popper’s philosophy of science: with this standard in place, the normatively correct choices are the  $p$  cards (A in this case) and the not- $q$  cards (4 in this case) (although cf. Oaksford & Chater, 1994). In this abstract version (technically known as *indicative*), success rates (in this classical normative sense) are extremely low—around 10%, a finding replicated many times since.

Performance on the abstract task was so dismal that psychologists soon started looking for variations of the task that produced better success rates. In the famous “drinking age” problem (Griggs & Cox, 1982), participants are invited to imagine that they are a police officer responsible for ensuring that the following regulation was followed: “If a person is drinking beer, then the person must be over 19.” Four cards represented four people sitting at a table and bore the legends “Drinking beer,” “Drinking coke,” “22 years of age,” and “16 years of age” ( $p$ , not- $p$ ,  $q$ , and not- $q$ , respectively). Selections of  $p$  and not- $q$  were a staggering 74%—more than seven times as much as in the typical abstract version. This facilitation effect is extremely robust (Ragni, Kola, & Johnson-Laird, 2018).

You might have identified the drinking age rule as deontic: not only is the term “must” mentioned in the conditional itself, but the task also clearly refers to a regulation, identifying the context as deontic. This is typical: deontic versions usually need at least a minimal context to trigger facilitation (Evans & Over, 2004). It was not long before Cheng and Holyoak (1985) identified this version as deontic, thereby introducing the term “deontic” to scientific discourse for the first time. Their theory of *pragmatic reasoning schemas* proposed that people reason by using generalized, yet context-sensitive, knowledge structures (the eponymous *schemas*) defined in terms of classes of goals and relationships to these goals. These schemas

included the deontic rules of permission and obligation as well as the nondeontic schema of causation.

With the theory of pragmatic reasoning schemas criticized for offering little explanation beyond labeling the effect (Cosmides, 1989; Evans & Over, 2004), a new theory emerged: Cosmides and Tooby’s evolutionary theory of reasoning (e.g., Cosmides, 1989; Cosmides & Tooby, 1994; see also chapter 10.6 by Cosmides & Tooby, this handbook). Reasoning, according to this theory, consists of *Darwinian algorithms*, specialized information-processing mechanisms that organize behavior meaningfully and adaptively. Deontic reasoning, specifically, was argued to be easier because it triggered the Darwinian algorithm of *social contract*, exchange between individuals for mutual benefit. Cosmides was the first to identify the important role of *utility*, articulated as costs and benefits, in deontic reasoning. In decision theory, “utility” is the technical term for things we want to happen (benefits) or want not to happen (costs). Cosmides showed that participants were quick to identify the  $p$  and not- $q$  cards if they referred to cheaters—individuals who violated the social contract by taking a benefit without paying the cost.

Pragmatic reasoning schemas and Darwinian algorithms moved the psychology of deontic reasoning away from classical logic, first by identifying it as deontic and, second, by highlighting the psychological importance of goals and utility. Both theories relied on what came later to be known as “content-specific rules.” Manktelow and Over (1991), in contrast, made a direct appeal to a more general, decision-theoretic approach to utility, rather than specialized evolutionary mechanisms. Where utility lies, they argued, depended on perspective (see also Gigerenzer & Hug, 1992)—in this case, social roles. Thus, suppose a mother tells her son:

(a) “If you tidy up, you may go out and play.”

The utility for the mother is a tidy room, whereas the utility for the son is the opportunity to play. Participants told to reason from the mother’s perspective tended to pick up the not- $p$  &  $q$  card (playing without tidying up), whereas participants told to reason from the son’s perspective tended to pick up the  $p$  & not- $q$  card (that is, not being allowed to play even after tidying up). A more comprehensive decision-theoretic approach was soon to follow: Oaksford and Chater (1994) drew on the constructs of utility and probability to argue that selection of cards in the Wason selection task was driven by the quest for *information gain*. Reasoners picked, they proposed, the cards that provided the most informative answers to the question if  $q$  depended on  $p$ . These cards

differed for the abstract and the deontic version, which explained the differences in performance.

Of course, it is also possible to examine the purely logical relations between deontic operators, detached from considerations of utility. These, too, demonstrate a high degree of conformity to classical logic (Beller, 2008, 2010). Nevertheless, reasoners also deviate occasionally, an effect labeled “illusory inference” in Bucciarelli and Johnson-Laird’s (2005) naive deontics theory.

### 3. The Social and Pragmatic Rationality of Deontic Thinking

Our use of language to draw inferences and make decisions is anchored in social context. Under the heading of “conversational pragmatics,” philosophers have highlighted the function of language as a tool of action and communication, in a tradition going back to Austin (1961), Searle (1969), and Grice (1975). Language has a *performative* function: it does things in the world. When we promise a collaborator to finish writing up our share of a manuscript by a particular deadline, we create a new social reality in which we are under an obligation (Beller, Bender, & KuhnMünch, 2005). A promise is thus a *deontic speech act*: it acts on the world through language, changing it, laying down a new deontic commitment, and people are adept at relating deontic speech acts to situations and actions in the world (Beller, 2008). In psychology of reasoning, the study of conversational pragmatics goes back to Fillenbaum (e.g., 1976), who was the first to identify these functions in his work on *inducement* and *advice conditionals* (promises and threats, and tips and warnings, respectively). Utility is the telltale sign: deontic speech acts create situations in the world where costs and benefits attach to actions and their outcomes (Bonnefon, 2009; see also chapter 6.4 by Bonnefon, this handbook).

Given the rich pragmatic nature of inducement and advice conditionals, a purely deductive approach is unlikely to provide a full psychological understanding of their scope and function: psychologists advocated a multilevel approach (Beller et al., 2005; Ohm & Thompson, 2004; Thompson, 2000) encompassing aspects such as perlocutionary force (the intended effect), emotion, linguistic interpretation, and associated utility. For example, if the mother in (a) violates her promise and does not let the son out to play, the son is likely to feel anger (Beller, 2008; Beller et al., 2005). Furthermore, promises and threats (aka inducements) create stronger obligations than advice conditionals (tips and warnings) because they have stronger perlocutionary force: the

agent has more control over the consequences (Beller et al., 2005; Fillenbaum, 1976).

The same rich pragmatic nature also makes it difficult to disentangle deduction from social pragmatics and normative from practical and social rationality—the latter *leak* into the former (Bonnefon, 2009). For example, the effectiveness and acceptability of deontic speech acts are typically associated both with their truth conditions and their costs and benefits (Evans, Neilens, Handley, & Over, 2008; Evans & Twyman-Musgrove, 1998; Thompson, Evans, & Handley, 2005; for a review, see chapter 6.4 by Bonnefon, this handbook). Deontic speech acts also evoke a complex net of pragmatic implicatures (linguistic social inferences licensed by world knowledge). For example, the promise in sentence (a) invites the implicature that if the son does *not* tidy up, then he will not be allowed to go out and play. Indeed, inducement and advice conditionals, relative to indicative conditionals, tend to inspire a more biconditional interpretation (i.e., “If and only if  $p$ , then  $q$ ”): participants are more likely to draw all four conditional elimination inferences from threats and promises (Beller, 2005, 2008; Newstead, Ellis, Evans, & Dennis, 1997); but not from the weaker tips and warnings (Ohm & Thompson, 2004). This sometimes takes the form of a *defective* biconditional interpretation. A full biconditional licenses the inference of both the *inverse* (aka *complementary*: “If *not-p*, then *not-q*”) and the *converse* (aka *reversed*: “If  $q$ , then  $p$ ”) forms, respectively. However, the inverse inference is more common than the converse (Beller et al., 2005; Newstead et al., 1997), sometimes resulting in what Newstead et al. dubbed as “pattern X,” that is, TT and FF cases are judged to be true, TF cases are judged false, and FT cases are judged irrelevant. This does not extend to conditional inference, though: there is no particular preference for Denial of the Antecedent (“If  $p$  then  $q$ ; *not-p*; therefore *not-q*”) as might have been expected given the preference for the inverse implicature.

### 4. Deontic Reasoning and Cognitive Variability

Deontic thinking might be one of the prime candidates for a cognitive universal, transcending individual and cultural differences. The first line of evidence is cross-cultural comparison: deontic speech acts elicit similar interpretations at least in two WEIRD<sup>2</sup> and two non-WEIRD cultures, Germany and the United Kingdom, as well as China and Tonga, respectively (Song, Bender, & Beller, 2009; Sztencel & Clarke, 2018), although there was also some variation in responses, mainly based on locally accepted behaviors and differing emotional

reactions. For example, in a choice task between linguistic formulations, German participants were more likely to choose the explicit threat form in comparison to Tongan participants, who preferred the indirect speech act formulation of promise, while U.K. participants were in between.

An additional line of evidence comes from developmental studies concerning deontic thinking, particularly in early childhood: the normative advantage of deontic rules appears in some studies as early as three to four years of age (Cummins, 1996a, 1996b; Harris & Núñez, 1996; Kanngiesser, Köymen, & Tomasello, 2017). The early development of normativity is of such significance that the *Journal of Experimental Child Psychology* has recently published a special issue on the topic (Paulus & Schmidt, 2018). The precise age is a matter of debate and might be as late as seven years (Dack & Astington, 2011) or as early as two years (Rakoczy et al., 2008); nevertheless, the weight of the evidence is that children do not need very long to develop adult-like sensitivity to deontics. For example, like adults (Kilpatrick, Manktelow, & Over, 2007), children are sensitive to power relations and authority (Chin & Lin, 2018; Dack & Astington, 2011).

In the study of individual differences, Stanovich and West (e.g., 2000) demonstrated a consistent pattern in which able, motivated participants tend to do normatively better on a variety of reasoning and decision-making tasks. These results do not always extend to performance on the deontic selection task. Here the results are more mixed, with some studies finding that cognitive ability had no predictive power (e.g., Stanovich & West, 1998) and some studies establishing some predictive power (Newstead, Handley, Harley, Wright, & Farrelly, 2004).

With these converging lines of evidence, it would seem that deontic thinking has a universal core in understanding and interpreting conditionals, which is in turn tempered by relative sensitivity to cultural and contextual cues.

## 5. Generating Deontic Norms: Is–Ought Inference

Ben wants to cook an Italian dish to impress his girlfriend. If he uses a certain brand of Italian olive oil, his dish will taste better. Does it then follow that Ben *should* use that brand? Most reasoners agree that he should (Elqayam, Thompson, Wilkinson, Evans, & Over, 2015), and they also think that someone hearing this would be persuaded that he should (Thompson et al., 2005). People readily infer the “ought” from the “is,” in effect generating brand-new, bespoke deontic rules, where

none existed before. Philosophers sometimes refer to inferring deontic conclusions from indicative premises as the “is–ought fallacy,” or the “is–ought problem” (Hudson, 1969; Schurz, 1997).<sup>3</sup> Hume (1739–1740/2000) was the first to identify it—as well as condemn it as invalid: if the premises contain no deontic operators, we cannot validly draw deontic conclusions.

But if we cannot generate new norms, how can we bridge between goals and actions in a fast-changing world? Perhaps more than any other inference, inference from *is* to *ought* (aka deontic introduction) epitomizes the tension between normative rationality, on the one hand, and social and practical rationality, on the other (Evans & Elqayam, 2020). Normatively speaking, deontic introduction is deductively invalid, but pragmatically, we cannot achieve our goals without being able to convert goals to norms. We need to be able to infer “I ought” from the “I want” of goals and desires, and to function in society, we need to be able to convert desires to socially binding rules and norms. Deontic introduction does all this for us. We also need this inference to be flexible, to allow us to act in changing circumstances, and it is. Is–ought inference is defeasible: reasoners withdraw it when the causal link between action and outcome is undermined, or in the presence of conflicting norms or conflicting goals. For example, if we know that the olive oil is manufactured using exploitative agricultural practices, we would no longer think that Ben ought to use it.

Elqayam and Evans (2011) argued that psychologists sometimes draw on various forms of is-to-ought inference to defend their normative stance. For example, consider the following question, which is the appropriate normative solution to the indicative Wason selection task: the classic *p* & *not-q* selection, or the *p*-only or *p* & *q* selections? Stanovich (1999; see also Stanovich & West, 1998) argued for the former, based on the positive (albeit moderate) correlation between these selections and cognitive ability and cognitive motivation. Oaksford and Chater (2007), in contrast, argued in favor of the latter, based on the modal responses to the task. These approaches establish the selection among competing normative models—which models we *should* follow—by drawing on empirical evidence, hence arguably drawing an is–ought inference. Normative rationality in psychology is thus arguably difficult to establish, because there are competing normative models, and to support any of them with empirical evidence is self-defeating (for responses to the debate, cf. Oaksford, 2014; Oaksford & Chater, 2011; Stanovich, 2011; and contributions to Over & Elqayam, 2016). Moreover, the inference may be

pragmatically infelicitous in the context of normative rationality—recall that people withdraw deontic conclusions in the presence of conflicting norms.

## 6. Where Do We Go from Here?

The selection task wars are long behind us, but deontic reasoning keeps drawing attention and further research, particularly from the viewpoint of social pragmatics (Hilton, Charalambides, & Hoareau-Blanchet, 2016; Sztencel & Clarke, 2018). Much is now integrated into the useful framework of the theory of utility conditionals (Bonnefon, 2009; chapter 6.4 by Bonnefon, this handbook). There are still some relatively little-explored areas, however, such as cultural differences both in childhood (Miller, Wice, & Goyal, 2018) and adulthood. We are also missing studies that examine directly the link between moral judgment and deontic reasoning, as well as studies that explore further the link to action. Given deontic premises, reasoners are happy to draw inferences about other agents' readiness to act (Beller, 2005, 2008; Sztencel & Clarke, 2018); what we do not know is if endorsement of deontic rules also translates to actual action in the world, or at least to self-reported readiness to act. Similarly, there is some evidence that utilitarian moral judgment draws on deontic conclusions inferred from *indicative* premises (Elqayam, Wilkinson, Thompson, Over, & Evans, 2017), while deontological moral judgment correlates with drawing deontic conclusions from *deontic* premises. We need more studies looking at relations between deontic reasoning and moral judgment.

Another relatively neglected issue is the variety of deontic operators: many studies incorporate just the classic permissions and obligations. Very few studies examine the middle-strength operators such as “ought” and “should not,” although these operators are ubiquitous in everyday life.

Lastly, the recent debates on the scientific rigor of psychological science are pretty much deontic debates—that is to say, normative: they are about the *should* and the *ought* (and sometimes downright *must* and *must-not*) just as much as they are about the *is*. Exploring deontic scientific thinking could help inform this important debate.

### Notes

1. Not to be confused with deontological morality, the type of moral judgment that relies on preexisting absolute normative rules (see section 12 in this handbook for moral judgment).
2. WEIRD: Western, Educated, Industrialized, Rich, Democratic (Henrich, Heine, & Norenzayan, 2010).

3. A special case of the is–ought fallacy is the naturalistic fallacy, where the “ought” is identified as stemming from natural properties (Ridge, 2019); see the introductory chapter by Knauff and Spohn (this handbook).

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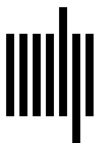
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