

that only applied research allows normative evaluations. In fact, some tasks have just one undisputed normative reading, and not only pathological gamblers but also normal individuals sometimes need normative guidance. To conclude, normative evaluations are inevitable in the investigation of human thinking.

With some “increasingly rare” exceptions, the tasks used to investigate human thinking have multiple normative readings. Hence, one cannot establish whether they elicit correct or incorrect answers. This is the main argument used by Elqayam & Evans (E&E) against the normative evaluation of thinking performance. One problem with this argument is that some experimental paradigms for investigating human thinking have just one normative reading. E&E examine one class of these paradigms (i.e., the conditional syllogisms) and claim that it is actually subject to normative dispute. Thus, E&E conclude that sooner or later alternative normative systems will be proposed for any thinking paradigm.

There is reason to doubt this conclusion. Consider the typical estimation tasks wherein respondents judge the total or relative frequency of the items of a given class (e.g., Tversky & Kahneman 1973). Since there is an objective yardstick for enumerating the items (e.g., men in a list of people, words that begin with *r*), these tasks have one objectively correct answer. In some cases, respondents do not produce that answer. For example, Tversky and Kahneman’s respondents judged that the class of men in a list was more numerous than the class of women, when in fact the list contained 19 names of men and 20 names of women. Accordingly, one has to conclude that these respondents erred. And such a conclusion will hold until some alternative account proves that judging a class of 19 items greater than a class of 20 items is normatively correct. E&E may be right in claiming that paradigms of this kind are becoming “increasingly rare” (target article, sect. 3, para. 3). The existence of such paradigms, however, shows that investigating human thinking is not destined to use tasks with competing normative readings, and that evaluating the normative status of a given judgment is not always open to dispute.

E&E correctly insist that one should understand what individuals are doing and why, rather than “discussing what they are *not* doing” (sect. 8, para. 2, authors’ emphasis). The latter motivation may have driven some of the studies that have documented biases in human thinking. Other studies of this sort, however, have investigated the limits of human thinking processes in order to understand them. For example, consider Tversky and Kahneman’s studies mentioned above. They were not aimed to simply reveal the faulty nature of respondents’ estimations, but instead tested the hypothesis that the ease of recall of instances affects frequency and probability judgments in tasks for which there is a normative standard (e.g., judging the frequency of men in a list), as well as in tasks for which there is no such standard (e.g., judging the probability that a given depressed patient will commit suicide). Quite ironically, E&E contrast the controversial nature of thinking studies with the undisputed nature of memory studies, and indicate the “acute” problems derived from adopting memory paradigms to thinking research. Yet, as Tversky and Kahneman’s studies show, memory search is the basis of many judgmental activities, and investigating recall processes may shed light on thinking processes.

E&E concede that in some cases one is entitled to evaluate thinking performance: “If your objective is to improve thinking (rather than to understand it), then you must have criteria for distinguishing good thinking from bad” (sect. 5.2, para. 5). E&E refer to individuals who behave against their interests, such as pathological gamblers. They argue that one has to help these individuals by modifying their wrong beliefs and teaching them the rules of probability calculus. According to E&E, such an instrumental approach is necessary in applied research but totally inappropriate in “basic theoretical research” (sect. 8, para. 2). The point is that even basic research has discovered individuals who need some normative help. Consider

respondents who *bet* on the conjunction of events A&B, rather than on event A (Tversky & Kahneman 1983). If you follow E&E’s recommendation, you should refrain from judging respondents’ bets. Yet, these respondents behave against their interests. They miss a chance of winning the bet, the one in which the conjunction of events A¬-B occurs. Therefore, you should inform them that they have made a bad decision. In doing so, you employ a normative standard; that is, you inform respondents that they do not conform to basic norms of probabilistic calculus. In sum, even basic research may force you to evaluate respondents’ performance and to improve it by means of normative guidance.

Besides applied domains, there is an entire domain of basic research, neglected by E&E, wherein evaluating thinking performance is inevitable. According to E&E, when respondents have to evaluate a posterior probability, in order to “get the problem *right*” (sect. 6, para. 5, emphasis added), respondents need to reason about frequencies or to learn Bayes’ rule. This claim is inaccurate, since respondents, including preschoolers, may solve this problem without reasoning about frequencies (Giroto & Gonzalez 2001; 2008). Preschoolers, of course, are not familiar with the rules of probability calculus. Yet, at around the age of five, they solve this sort of problem. Before that age they fail to, and after that age their performance improves. This example is relevant because it concerns a problem for which even E&E accept that there is only one right solution. However, the entire investigation of the development of thinking processes speaks in favor of normative evaluation. If one does not use normative standards, how could one compare the answers produced by children of different ages? More generally, how could one claim that children’s thinking processes improve (or, for that matter, worsen; see Noveck 2001), if one does not have normative standards to assess them?

E&E are probably right in claiming that some psychologists say, “Respondents should not think this,” in the same evaluative sense in which they say, “Poverty should not exist.” Yet, there are cases, like the ones mentioned above, in which psychologists are entitled to say, “Respondents should not think this,” in the same evaluative sense in which they say, “You should not eat this.”

Normative theory in decision making and moral reasoning

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Abstract: Normative theories can be useful in developing descriptive theories, as when normative subjective expected utility theory is used to develop descriptive rational choice theory and behavioral game theory. “Ought” questions are also the essence of theories of moral reasoning, a domain of higher mental processing that could not survive without normative considerations.

Normative theories may be superfluous in certain specific cases discussed in Elqayam & Evans’ (E&E’s) stimulating and informative target article. But the fact that some people may be tempted by a fallacious is-ought inference is not sufficient reason for abandoning normative theories in all cases.

A widely held position in philosophy of science is that all scientific observations are theory laden (e.g., Kuhn 1962), partly

because investigators’ theories influence what data they consider it worthwhile to collect. Further, when interpreting behavior, we tend to apply Davidson’s (1973) “principle of charity,” originally intended for interpreting sentences but more widely applicable. This involves assuming that people are generally rational and interpreting their behavior in that light. Thus, behavioral researchers implicitly draw on a normative theory.

Normative theories have also been useful in generating powerful descriptive theories, using a style of theorizing that does not fall foul of the is-ought fallacy. For example, subjective expected utility (SEU) theory is evidently normative, specifying what choices rational agents ought to make in order to satisfy their own desires. By appending to SEU a hypothesis of weak rationality, according to which people try to do the best for themselves in any circumstances that arise, we derive the descriptive principle of *methodological individualism* (Weber 1922/1978, Ch. 1), a mainstay of the contemporary social sciences, reflected in rational choice theory and behavioral game theory, both direct descendants of SEU theory (Elster 1989).

It was Savage (1972), not von Neumann and Morgenstern (1947), who introduced a normative interpretation into SEU theory: “One idea now held by me that I think von Neumann and Morgenstern do not explicitly support, and that so far as I know they might not wish to have attributed to them, is the normative interpretation of the theory” (Savage 1972, p. 97). Normative considerations seem quite natural and useful in judgment and decision making research. If you invite people to make a snap choice between 96 × 69 cents and 87 × 78 cents, most will choose 96 × 69 cents; but if you point out that 96 × 69 = 6,624, whereas 87 × 78 = 6,786, they will swiftly change their minds, if allowed to (Binmore 2009, pp. 22–23). This illustrates two important facts: first, people generally try to act rationally in the sense of maximizing their expected utilities; but second, they are limited by bounded rationality and are prone to error.

A domain of higher mental processing within which normative considerations seem quite unavoidable is moral reasoning. Evaluative “ought” questions are the very essence of moral reasoning. We are currently engaged in a research project investigating judgments as to whether it is morally acceptable to sacrifice one life to save five in the following famous Trolley problem (Foot 1967):

A trolley is running out of control down a railway track. In its path are five people who will be killed if it continues on its course. By operating a lever, you can divert the trolley on to a different track, where a solitary man in its path will be killed. Is it morally permissible to operate the lever?

Most people (90%, according to Hauser 2007) say yes; but Thomson’s (1976) closely related Footbridge problem elicits very different responses:

A trolley is running out of control down a railway track. In its path are five people who will be killed if it continues on its course. You are on a footbridge over the tracks next to a large man. The only way to save the five people is to push the man off the bridge, into the path of the trolley, where only he will be killed. Is it morally permissible to push the man off the footbridge?

Most people (90%, according to Hauser 2007) say no. Why do most people consider it morally acceptable to sacrifice one life to save five in one problem but not the other?

From the perspective of cognitive psychology, the differences in responses to the two problems are reminiscent of the classic demonstration of a *framing effect*, in which two different descriptions of a problem involving a certain number of lives at risk elicit difference responses (Tversky & Kahneman 1981). Greene (2007) has argued that the Footbridge problem tends to engage our emotions to a greater extent than the Trolley problem, and that our emotions deflect us from the utilitarian judgment in the Footbridge problem.

Some philosophers have argued that there are morally relevant distinctions between the two problems. Foot (1967) drew attention to the *doctrine of double effect*, first suggested by the medieval scholastic philosopher Thomas Aquinas, according to which harm is acceptable if it occurs as a foreseen but unintended consequence of an action serving a greater good, as in the Trolley problem, but not as a means to an end, as in the Footbridge problem. Quinn (1989) argued that the difference in responses is justified by the *doctrine of doing and allowing*, according to which pushing the man off the bridge is unacceptable because the harm results from intentional action, rather than from an omission, or failure to act. However, some psychologists have argued that the distinction between omission and commission is the result of a psychological bias (e.g. Ritov & Baron 1992; but see DeScioli et al., in press).

Others have proposed a *universal moral grammar* or UMG (Hauser 2007; Mikhail 2007), according to which normative moral principles, such as a prohibition of killing, are arrived at by an unconscious computational model, analogous to Chomsky’s (1995) universal grammar for human languages, this grammar being in accord with the doctrine of double effect.

How could moral problems possibly be freed from normative considerations? Perhaps some theories of higher mental processing can manage without such considerations, but it is hard to see how this could (or why it should) be generalized to all domains of research.

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Why rational norms are indispensable

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Abstract: Normative theories provide essential tools for understanding behaviour, not just for reasoning, judgement, and decision-making, but many other areas of cognition as well; and their utility extends to the development of process theories. Furthermore, the way these tools are used has nothing to do with the is-ought fallacy. There therefore seems no basis for the claim that research would be better off without them.

It is uncontroversial that a full understanding of behaviour involves multiple aspects. Psychology seeks to identify lawful regularities: We seek to understand the “what” of behaviour such that we can predict it. We also seek to understand why these regularities obtain. This involves two distinct kinds of causal explanation: (1) an understanding of the mechanisms/processes that give rise to the behaviour, and (2) functional explanation, that is, an understanding of why this behaviour and not others. Finally, psychology considers how such understanding allows performance to be improved in practice.

For all these questions, normative standards, that is, characterizations of how something “ought to be,” seem indispensable. Trivially, performance cannot be improved without knowing what would count as “better.” Likewise, functional explanation will make reference to the fact that a behaviour maximizes some “desirable” criterion – where both “desirability” and “maximization” typically invoke normative considerations. Even the basic task of identifying behavioural regularities cannot afford blindness to normative considerations.

Rational standards provide essential interpretative tools. Human behaviour typically affords many different interpretations.

human reasoning in order to assess the relevance and empirical grounding of normative theories (**Douven; Quintelier & Fessler; Schurz**; also **Hrotic**, an anthropologist). We can assure Quintelier & Fessler that we have no desire to outlaw experimental philosophy. What does surprise us is the enthusiastic support for empirical assessment of normative theories from some of the psychologists, such as **Nickerson**, who insists that we need to know not only how we reason but how we *should* reason. For our part, while we can see that empirical studies of thinking are of interest to those who earn their living debating the value of normative theories, such as logicians and economists, we do not see their objectives as being directly *psychological*. For their part, they still have to solve the problem of is-ought inference.

A second argument for the value of normativism in psychological research is that a close comparison of the discrepancy between normative theory and actual behaviour is of direct value in constructing psychological theories (**Hahn; Nickerson; Oaksford & Chater; Pfeifer; Waldmann**). A general theme is that of iterative refinement of normative theories in the light of psychological evidence, with an increased convergence between normative and descriptive accounts (see also **Buckwalter & Stich** on reflective equilibrium). Thus, Pfeifer talks about how the psychology of reasoning has moved on from bivalent to probability logics, which are now seen as a much closer approximation of actual human reasoning. Hahn describes the iteration involved in ideal observer analysis and Oaksford & Chater lay out in detail the research strategy for their rational analysis programme. We do wonder, however, whether some of these authors are really talking of competence or computational rather than normative accounts (see sect. R2). It seems to us that the force of a normative theory lies in its *a priori*, evaluative oughtness. We cannot imagine, for example, a strict religious sect with a ban on premarital sex, revising its dogma in the light of observation of regular deviations in the behaviour of its young members.

If the process of iteration described by **Oaksford & Chater** really means comparing formal computational accounts to observed behaviour, and iteratively refining them, then we have no problem at all with rational analysis. It is a method strongly founded in the directive ought, but need not be evaluative. We just wonder why their earlier writing on this topic has needed to emphasise good and bad reasoning in the way it has. The same probably applies to some other critical commentators, such as **Pfeifer** and **Sun & Wang**, who talk of the value of developing alternative normative theories on the basis of their favoured empirical research paradigm. If that is really what they are doing, then they are committing is-ought inferences which are hard to defend. But if, instead, they are developing improved computational accounts of the processes, drawing on available formal theories as they do so, then we do not have a problem with this, as we made quite clear in our target article.

R8. Conclusions

We think it important that researchers in any field of science raise their heads above the parapets of their paradigms from time to time, and reflect more broadly on what

they are doing. Our purpose was to stimulate such head-raising for those engaged in the psychological study of reasoning and decision making: fields which, while purportedly signing up to the methods and objectives of the much wider field of cognitive psychology, also have a history of application of normative theory that sets them apart. We are grateful to the number of colleagues who have taken the time to comment and note the considerable diversity in the views expressed. Whether or not we succeed in moving the field towards a more descriptivist approach, we hope at least that we have raised consciousness of the important issue of normativism in these fields, and that researchers will think a little more carefully and clearly about what they are doing, following this lively and informative debate.

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[The letters “a” and “r” before author’s initials stand for target article and response references, respectively.]

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