# Gigerenzer's Evolutionary Arguments against Rational Choice Theory: An Assessment

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I critically discuss a recent innovation in the debate surrounding the plausibility of rational choice theory (RCT): the appeal to evolutionary theory. Specifically, I assess Gigerenzer and colleagues' claim that considerations based on natural selection show that, instead of making decisions in a RCT-like way, we rely on 'simple heuristics'. As I try to make clearer here, though, Gigerenzer and colleagues' arguments are unconvincing: we lack the needed information about our past to determine whether the premises on which they are built are true—and, hence, we cannot tell whether they, in fact, speak against RCT.

**1. Introduction.** Recently, there has been a dialectical innovation in the long-standing debate surrounding the plausibility of rational choice theory (RCT): the appeal to evolutionary theory. Specifically, in a series of publications, Gerd Gigerenzer and his collaborators have argued that considerations derived from natural selection show that RCT is an utterly unconvincing account of how we make decisions and that their own account of 'simple heuristics' is much more likely to be true.[1] It is this dialectical innovation that I want to assess in this article: in particular, I

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1. Other authors also appeal to evolutionary theory in order to justify or criticize RCT (see, e.g., Skyrms 1996; Robson 2002). However, in order to make the discussion more tractable, I here concentrate solely on Gigerenzer et al.'s arguments (noting, though, that many of the points raised in what follows transfer quite easily to other evolutionary accounts as well).

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seek to determine if Gigerenzer and colleagues' arguments really open up a new front in the debate surrounding the plausibility of RCT or if they lack the substance to make a genuine contribution to this debate.[2]

The structure of the article is as follows. In section 2, I clarify what is meant by RCT. In section 3, I briefly lay out Gigerenzer and colleagues' alternative theory of 'simple heuristics'. In section 4, I present and assess Gigerenzer and colleagues' evolutionary arguments against RCT, and I conclude in section 5.

**2. Rational Choice Theory as a Descriptive Theory.** In general, there are three major interpretations of RCT (Hausman 1995; Bermudez 2009): normative ones (where the theory is seen to express necessary conditions concerning how people ought to choose), predictive ones (where the theory is seen to provide an instrumentally useful set of claims for the prediction of the actions of individuals or groups), and descriptive ones (where the theory is seen to describe the psychological processes that are actually going on when people make decisions). Each of these different interpretations deserves to be taken seriously; however, for present purposes, it is only the last, descriptive reading that is important. Primarily, this is because this reading is most conducive to arguments based on evolutionary theory: when it comes to the normative reading, it is hard to see how appealing to evolutionary considerations could avoid the naturalistic fallacy (inferring what ought to be the case from what is or was the case), and when it comes to the predictive reading, it is hard to see why (and, indeed, how) one should consider facts about our evolutionary history in the determination of the future predictive accuracy of RCT. For these reasons, the descriptive reading alone takes center stage in what follows.

On the descriptive interpretation, RCT claims that, when deciding what to do, an agent determines which action maximizes her desire-satisfaction in light of her beliefs about the states of the world that may occur (Hausman 1992, 1995; Pollock 2006; Bermudez 2009). Put more abstractly, a descriptive reading of RCT has it that decision making is based on a psychological mechanism that is informationally unencapsulated (i.e., one that takes into account all of the considerations available to the agent), optimizing (i.e., one that tries to determine the best solution, given these considerations), and domain-general (i.e., one that works the same way

2. There is also a more indirect appeal to evolutionary theory that is sometimes being made in this context: it is argued that, since we share a (close) common ancestor with numerous other animals, studies about how these other animals make decisions can tell us something about how we make decisions (see, e.g., Carruthers 2006). However, since there are still major differences between us and other animals, and since direct, natural selection–based arguments have a lot of interest on their own, I shall focus solely on the latter here.

in all circumstances). While there is much more that could be said about this descriptive understanding of RCT (see, e.g., Cartwright 1983; Jeffrey 1983), this general picture is sufficient for present purposes.

What does need to be discussed in more detail is the fact that, so understood, RCT cannot literally be true—after all, the theory is highly idealized and assumes that agents are logically omniscient and have nearly unlimited memory powers (Hausman 1992; Selten 2001, 14–15; see also Samuels, Stich, and Faucher 2004, 42–44). To see how RCT can be called descriptively accurate despite this, note that the falsehoods at the theory's heart could be of two kinds: they could be genuine (Galilean) idealizations, or they could be fictions.[3] In the former case, they would refer to actually existing features of our mind (i.e., beliefs and desires of different strengths and a decision-making mechanism that is informationally largely unencapsulated, targeted at optimal outcomes, and fairly domain-general) that are distorted in certain ways to make them theoretically tractable. In the latter case, they would not be based on any facts about our minds at all. Given this, RCT can be seen as descriptively accurate if the former case obtains and as inaccurate if the latter case obtains (see also Pollock 2006).[4]

What, then, ought we think about the descriptive accuracy of RCT (so understood)? This question has turned out to be surprisingly difficult to answer, mainly because the empirical success of RCT is quite ambiguous. On the one hand, it is one of the most powerful and important theories of the social sciences. It is appealed to in many different contexts and has turned out to be highly useful in explaining a large variety of behaviors—from narrowly economic ones (as in standard economic analysis) to broader sociological ones (Becker 1976) and even paleontological and biological ones (Mithen 1990). On the other hand, though, the theory has also been shown to lead to spectacular explanatory failures (Allais 1953; Ellsberg 1961; Kahneman and Tversky 1979; Satz and Ferejohn 1994; Gigerenzer, Todd, and the ABC Research Group 2000).

Because of this ambiguous empirical status, it is very tempting to appeal to an evolutionary perspective here. In particular, given the fact that our minds are biological organs—and thus shaped by the same factors that shape all biological entities—evolutionary theory may be able to provide a novel source of considerations that can help clarify the evidential status of RCT. What remains to be done, therefore, is to see to what extent

3. For more on (Galilean) idealizations, see, e.g., Cartwright (1983, 1990) and McMullin (1985).

4. This point can also be expressed with the help of Chomsky's performance/competence distinction (see also Samuels et al. 2004, 9–11): is it the case that RCT gives an accurate account of our reasoning competences—if not always of our reasoning performances?

evolutionary theory is, in fact, helpful in this way. To determine this, we begin by considering the major alternative to RCT in the literature: Gerd Gigerenzer's theory of simple heuristics.

**3. Gigerenzer et al.'s Theory of Simple Heuristics.** A group of researchers surrounding Gerd Gigerenzer have recently argued that RCT is deeply mistaken about how we make decisions and that this becomes particularly clear if we view the issue from an evolutionary perspective.[5] In this, they take their cue from the work of Herbert Simon (see esp. Simon 1957) but elaborate his theory along several dimensions.[6]

Gigerenzer et al. claim that the interplay between beliefs and desires is not as described above but is, instead, modulated by 'simple heuristics'—basic rules that are easy to apply and that make for quick but often still quite accurate decisions (Gigerenzer and Selten 2001; Sadrieh et al. 2001). Specifically, they argue that we make decisions using mental mechanisms that are diametrically opposed to RCT: they are informationally encapsulated (i.e., only take into account a small subset of the available considerations), satisficing (i.e., only try to yield solutions that go beyond a given threshold of quality), and domain specific (i.e., work fundamentally differently in different circumstances).

While, again, there is much more that could be said about how these simple heuristics work, for present purposes, the above is all that is necessary—what is more important here is a detailed look at the evolutionary arguments that Gigerenzer et al. give for their theory. The next section presents and analyzes these arguments.

**4. Gigerenzer et al.'s Evolutionary Arguments against Rational Choice Theory.** A key component of Gigerenzer et al.'s case for the theory of simple heuristics is a set of arguments that draws on the way in which natural selection tends to work in shaping biological entities (like decision-making mechanisms). Before considering these arguments in more detail, though, it is worthwhile to make a general remark concerning their structure. As is well known, natural selection is not the only factor influencing the evolution of a trait: there will always be an element of randomness in what evolves, and there is always the possibility of various genetic, developmental, or environmental constraints altering the course of evolution (Dawkins 1982, 1986; Kitcher 1985). Hence, it might seem that

5. In what follows, I shall refer to this (not necessarily closely knit) group as "Gigerenzer et al."

6. Just as in the case of RCT, Gigerenzer et al.'s theory can be read in normative, predictive, or descriptive ways; however, for the same reasons as sketched above, only the descriptive reading is relevant here.

Gigerenzer et al.'s focus on natural selection is in danger of being overly narrow and, thus, biologically unconvincing.

However, while generally very important, these antiadaptationist worries ought not to be overstated here. Showing that some trait was adaptive in the relevant set of environments (i.e., in the environments in which the type of organism in question is likely to have evolved) does give a prima facie reason to think that the trait actually evolved. While such a reason may be defeasible, it still ought to be given some weight in one's investigations: it is universally accepted that natural selection has significantly shaped the evolution of many (if not most) traits (Orzack and Sober 1994). Because of this, it must be accepted that establishing the adaptive importance of some trait provides evidence of its existence (even though that evidence may not be conclusive). Since this is all that Gigerenzer et al. are seeking to show, their focus on natural selection can be seen to be entirely innocuous in the present context.

To see what the issues here really are, it is necessary to look at the details of their arguments. These arguments fall into two categories: direct arguments favoring the evolution of minds based on simple heuristics over minds based on RCT, and indirect arguments suggesting that simple heuristics better fit our general cognitive evolution than RCT does. I consider the issues in turn.

*The Adaptive Value of Decision-Making Speed, Frugality, and Accuracy.* Gigerenzer et al. claim that, from an evolutionary point of view, there are (at least) three features of a decision-making mechanism that have important consequences for its adaptive value (see also Sober and Wilson 1998, chap. 10; Todd 2001, 53–54). First, the faster an organism can make decisions, the fitter it is (Laland 2001, 244; Carruthers 2006). Second, the more valuable resources (like energy) the organism gets to save for other uses, the fitter it is. Third, the more accurate the organism is in adjusting its behavior to the state of the world, the fitter it is. Of course, since there are often interdependencies among the three factors—so that improvements in one dimension lead to losses in others—it frequently will be impossible to maximize all three factors simultaneously; instead, joint maximization will be all that is in the offing. What is clear, though, is that, from an evolutionary point of view, all three factors ought to be taken into account in evaluating a decision-making mechanism, as they all affect its adaptive value.

Given this, Gigerenzer et al. claim that RCT seems to make the mistake of overlooking exactly this point: the theory does not appear to pay any heed to factors other than accuracy.[7] However, as just noted, this may

7. It may be tempting to reply that one could use RCT to calculate the optimal amount

well be highly maladaptive: there may be many cases where sacrificing accuracy for speed or frugality may be greatly beneficial (Gigerenzer 2001; Sadrieh et al. 2001). By contrast, simple heuristics are tailored to allow for fast and frugal decision making: they place strong restrictions on the amount of information they consider and on how thoroughly that information is processed; in turn, this cuts down the time and energy it takes to compute the right decision (Sadrieh et al. 2001; Todd 2001).

This impression of adaptive advantage may be further strengthened when it is noted that many simple heuristics can be just as accurate—or even more so—than RCT in many situations (Gigerenzer 2001; Sadrieh et al. 2001). This is primarily due to the fact that, sometimes, only very few cues are needed to obtain good evidence about the state of reality, so it is unnecessary to acquire a lot of information when trying to make an accurate decision. This is important, as it suggests not only that simple heuristics may be faster and more frugal than RCT in getting the agent to act but also that the losses in accuracy that they entail may be quite small, or even zero (a sort of dominance argument in favor of simple heuristics).[8]

However, there are several problems with this argument that make it ultimately unconvincing. In the main, these problems center on the fact that we lack the information necessary to assess whether the considerations Gigerenzer et al. put forward really speak in favor of simple heuristics, or against them. This becomes clear from noting that, in order to assess whether simple heuristics really come out on top by being able to compromise accuracy for decision-making speed and frugality, a rich understanding of the environment in which we evolved is necessary (as is also accepted by Gigerenzer et al.; see, e.g., Sadrieh et al. 2001, 87; Todd 2001, 67–68).

To see why this is so, note that Gigerenzer et al. seem to think that the fitness of a decision-making mechanism is determined by an equation of the following sort:

$$W = a\,S + b\,F + c\,A,$$

where $S$, $F$, and $A$ are the values of decision-making speed, frugality, and accuracy of the decision-making mechanism in question, and $a$, $b$, and $c$ are their relative adaptive importances. Given this, what we need to know in order to determine whether simple heuristics are more adaptive than

of time that should be spent on deliberating about a certain decision. However, this may invite an infinite regress: how much time should we spend on calculating how much time we should spend on deciding what to do (and so on)? This is a well-known problem for RCT, but not one that needs to be solved here (Smith 1991).

8. There is a more general point in the background here: as noted, e.g., by Forster and Sober (1994) and Forster (1999), parsimony in a model often significantly enhances its predictive accuracy.

an RCT-based decision-making mechanism is, first, the values of the parameters ($a$, $b$, $c$) and, second, the values of the variables ($S$, $F$, $A$) for the two decision-making mechanisms in the environments in which we evolved. However, as yet, we have absolutely no idea about what these values might be.

In particular, at this point, we are in no position to rule out values for ($a$, $b$, $c$) and ($S$, $F$, $A$) that entail that RCT was more—not less—adaptive than simple heuristics (Sadrieh et al. 2001, 88). In the main, this is because we do not know the exact environmental conditions under which we evolved, which decision problems we were facing, when these problems became particularly pressing, how we went on to solve them, what the consequences were of the various solutions we tried out, and so on (for a case study of the complexities involved in this sort of project, see Mithen 1990; see also Todd 2001, 67–68; Richardson 2007). In short, as it stands, we lack any of the information that is required to get Gigerenzer et al.'s argument off the ground.

Moreover, what we do know about the conditions under which we evolved seems to make the relative adaptiveness of RCT actually quite plausible. In particular, it is by now widely accepted that a key role in our cognitive evolution was being played by our social environment (Byrne and Whiten 1988; Sterelny 2003, 208–9). However, *pace* Gigerenzer and Selten (2001, 10), it seems that simple heuristics cannot handle these kinds of environments very well (Stanovich and West 2003; Buller 2005, 158–60). This comes out easily from noting that when it comes to predicting the decisions of other organisms, there are many problems of strategic interaction to take into account. In turn, this need for strategic interaction quite plausibly entails that relying on simple heuristics is highly maladaptive: the resultant behavior is likely to be very rigid and, thus, easily exploited.[9]

For these reasons, Gigerenzer et al.'s first evolutionary argument is unable to provide much in the way of support for a move away from RCT. As it turns out, however, their second evolutionary argument does not fare much better—and for similar reasons.

*Massive Modularity.* The second evolutionary argument to which Gigerenzer et al. appeal in order to support simple heuristics rests on the idea that the latter fit much better with recent advances in evolutionary psychology than RCT does—in particular, they connect much more easily

9. Note that, given the uncertainties involved, this does not make for a particularly strong argument in favor of RCT, either. The point is just that if one were to make an evolutionary argument based on the kinds of considerations Gigerenzer et al. put forward, it seems at least as likely to be an argument in favor of RCT as one against it.

to the 'massive modularity thesis' (MMT; Cosmides and Tooby 1992; Todd 2001; Samuels et al. 2004). This thesis states that the mind consists of a collection of special-purpose modules that are adapted to deal with particular environmental problems (Cosmides and Tooby 1992; Pinker 1997; Carruthers 2006). Two specific reasons are commonly cited for why this kind of massively modular mind is likely to have evolved; one focuses on the benefits of this massively modular structure itself, and the other focuses on the nature of a cognitive adaptation in general and its implications for what our minds are like.

The first reason centers on the (alleged) fact that having a massively modular mind is itself adaptive: it is said that only this kind of mind allows for easy, quick, and biologically cheap alterations in our cognitive traits (Samuels 1998; Carruthers 2006, 12–29). The idea here is that it is highly adaptive to be able to change parts of our minds without having to redesign the whole: since any change in some part of an organism is likely to be costly, the fewer changes one has to make, the better.

The second reason centers on the (alleged) fact that all that natural selection can design are specific solutions to the specific adaptive problems that were faced (not general solutions to general problems). Hence, it is argued that our minds ought to be expected to consist of a large number of specialized adaptations, and not one domain-general reasoning mechanism (Cosmides and Tooby 1992).

In this way, Gigerenzer et al. can claim that there is further evolutionary support for the theory of simple heuristics—namely, via the evolutionary support for the MMT (see, e.g., Hammerstein 2001; Todd 2001). Once again, though, there are major problems with this argument. To see this, consider the two aspects of this argument in turn.[10]

First, upon closer consideration, the more specific version of that argument turns out to be fallacious: there is no reason—either theoretical or empirical—to think that independent alterability is generally adaptive: in particular, for traits that are functionally integrated, evolutionary integration may be highly adaptive (Schulz 2008). For example, if successful locomotion requires the integration of visual and auditory information, then it may be highly adaptive to ensure that changes in one's visual processing are correlated with changes in one's auditory processing. This is important, as it means that any reason for thinking that it was adaptive for our decision-making mechanism to be organized in a massively modular way must rest on the specifics of that mechanism. However, we again

10. In what follows, I assume that the overall argument here is valid: i.e., I accept that the truth of the MMT really favors the theory of simple heuristics over RCT. However, this may be questioned as well—for it might be that massive modularity is consistent with there only being one, RCT-based, decision module.

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lack any of the required empirical information to assess this situation: we do not know if it was adaptive to be able to change each of our decision-making abilities individually or whether they are so highly integrated that a domain-general approach was more beneficial. For this reason, until the key premises of the first version of the massive modularity-based argument become further substantiated, this version cannot be seen to be very compelling.

Alas, the second, more general version of that argument turns out to be not much better. The major problem here is that it is not clear that it is true that all specific adaptive problems require specific solutions (Sterelny 2003, chap. 10; Buller 2005, 144–46). In particular, it is not clear why a novel solution has to be found for every novel problem—sometimes old solutions may be put to use also in different and novel circumstances (Dawkins 1986). Importantly, whether specific solutions were needed in the case of our decision-making abilities is highly questionable: we lack exact knowledge about what the adaptive problems were that we had to face (see also Sadrieh et al. 2001, 88), and what we do know suggests that, in many cases, our adaptive problems were instances of a general problem—namely, that of dealing with a complex social environment. Without more information on this score, therefore, we are not in a position to determine if our adaptive problems were numerous and variegated enough to warrant the evolution of specific solutions or if they were merely ‘variations on a theme’ that could be handled well by a nonspecialized decision mechanism (see also Buller 2005, 145–47).

On the whole, it thus seems clear that Gigerenzer et al.’s evolutionary arguments cannot (yet) play a major role in the debate surrounding the plausibility of RCT. However, before this conclusion can be fully accepted, it is useful to consider an objection that might come to mind at this point. This objection notes that Gigerenzer et al. may be using their evolutionary arguments merely to suggest novel hypotheses about how our decision-making mechanism might work (which are then further investigated using traditional social psychological methods). If this is the case, then the above, evidence-focused criticisms are beside the point: the evolutionary considerations here are used only heuristically, not evidentially.[11]

However, it is not clear that Gigerenzer et al.’s arguments, in fact, can live up to this objection. As noted earlier, much of Gigerenzer et al.’s work is an extension of the work of Simon (1957), which questioned RCT in essentially the same way—without, however, appealing to evolutionary theory. This is further supported by the fact that many of the particular heuristics Gigerenzer et al. are putting forward—like ‘Take the First’—

11. I thank Gerd Gigerenzer for some useful discussion concerning this objection.

do not seem to be directly inspired by rigorous evolutionary thinking at all but by casual observations of current everyday life. For this reason, it is not clear that much that is novel has in fact been suggested by Gigerenzer et al.'s evolutionary perspective—and, hence, appeals to a heuristic reading of their arguments ring somewhat hollow.

**5. Conclusion.** I have tried to argue that the evaluation of the plausibility of RCT as a theory of how we actually make decisions does not gain much by Gigerenzer et al.'s appeal to evolutionary theory: their arguments lack the empirical basis to make a substantive contribution to this debate. Importantly, moreover, this conclusion also yields a more general lesson. For evolutionary arguments to be compelling elements in the debate surrounding RCT, it matters whether they are robust under changes in their assumptions and whether the appropriate kind of information about our ancestral environment exists. In particular, unless it can be shown that the arguments support the same conclusion no matter what the exact historical circumstances were, or unless it can be shown that their assumptions do not fundamentally misrepresent these circumstances, the evidential strength of these arguments will not be great. For this reason, the above can also be read as a call for more work that connects the rather abstract arguments that are given in this context with the actual empirical facts on the ground—for only this is likely to make for progress in our understanding of how we make decisions.

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