

Belief and Cognitive Limitations

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1 Introduction

A number of philosophers have argued that it is hard for finite agents like us to reason and make decisions relying solely on our credences and preferences—they hold that for us to cope with our cognitive limitations, we need *binary beliefs* as well. For instance, Holton (2008) writes:

We are cognitively limited creatures. Maintaining and manipulating large numbers of credences would overload our capacities [...]. [A]ll-out beliefs [...] allow us to reduce an unmanageable amount of information to a manageable amount by excluding certain possibilities from our practical reasoning. (36-37)

Similarly, Wedgwood (2008) holds that ‘reasoning with partial beliefs is clearly enormously more complicated than reasoning with full outright beliefs’; according to him,

[i]f one has a full outright belief in a proposition p , one will simply take p for granted, and treat p as a starting point for further reasoning. [...] By contrast, when one has a mere partial belief in a proposition q , one will not take q for granted in this way [...]. (4)

In the same vein, Smithies (2012) writes:

Given our cognitive limitations [...] it may be simply too demanding for us to reason in a way that keeps track of the changing strengths of all our credences and preferences over time. By forming intentions and beliefs, we make deliberation tractable by narrowing down the space of options that need to be considered. (278)

And finally, Ross and Schroeder (2012) write:

[Reasoning] in an ideal Bayesian manner on the basis of our credences and preferences alone [...] isn't feasible for cognitively limited agents like us, and so we need an attitude of outright belief or of settling on the truth of propositions, so as to limit what we consider in our reasoning to possibilities consistent with what we have settled on. (28)

But using Ross and Schroeder (2012) as my stalking horse, I'll argue, *pace* the authors above, that their appeal to binary beliefs fails to explain how we cope with our cognitive limitations in reasoning. I'll begin by saying more about why our being cognitively limited is supposed to raise a problem for an account of reasoning that invokes only credences and preferences. I'll also explain how, according to Ross and Schroeder, beliefs are supposed to help solve the problem. I'll then argue that their account of belief, as well as other similar accounts, does *not* offer us a good solution. In fact, these accounts face a serious worry independent of whether they are intended to solve the problem in question. Finally, I'll consider an alternative solution that avoids the worry.

2 An Argument for Why We Need Beliefs

A decision problem can be represented by a matrix specifying certain potential outcomes that depend on the action we choose to perform, as well as on the state of affairs that obtains. To use Ross and Schroeder (2012)'s example, suppose Renzo wants to go to Canal St. to return a DVD and is considering whether to take the Broadway train or the Canal St. Express (6-7).¹ The DVD is due before the store closes in twenty minutes, and the late fine is \$5. Tickets for the Broadway train and the Canal St. Express cost \$2 and \$3 respectively. But Renzo isn't sure whether the Broadway train stops at Canal St. or not. He reasons that if he takes the Broadway train and it does, then he'll avoid the fine, but if it doesn't, then he won't. He also reasons that if he takes the Canal St. Express, it will stop at Canal St., and he won't have to pay a fine. It seems reasonable to represent Renzo's decision problem as follows:

	Broadway train stops at Canal St.	Broadway train doesn't stop at Canal St.
Take the Broadway train	Pay \$2 and avoid fine; out \$2	Pay \$2 and incur fine; out \$7
Take the Canal St. Express	Pay \$3 and avoid fine; out \$3	Pay \$3 and avoid fine; out \$3

Suppose Renzo makes his decision in accordance to the decision matrix above. Then, according to Ross and Schroeder (2012), he is '*treating it as true* that performing the action in question in the state of nature

¹Ross and Schroeder (2012) think that we need beliefs to guide us not only in practical reasoning, but in theoretical reasoning as well (8). For simplicity, I'll focus on practical reasoning. Nothing of importance will hinge on this.

in question would result in the outcome specified in the table' (7; Ross and Schroeder's emphasis). For example, Renzo is treating it as true the following proposition:

TWO: Taking the Broadway train when it stops at Canal St. will result in a net loss of \$2 for Renzo.

However, if Renzo is reasonable, he will *not* be certain that TWO. Instead, he'll assign some credence to various other possibilities, such as 'the possibility that the Broadway train is running too late to get him to the store on time even if it stops at Canal St.' and 'the possibility that if he takes the Broadway train he'll be mugged and lose all his money' (Ross and Schroeder 2012, 7). But Ross and Schroeder (2012) hold that it is normally reasonable for Renzo to ignore such possibilities and treat various propositions of which he is not absolutely certain as true (for instance, the proposition that he will not get mugged and the proposition that the Broadway train isn't running late). Otherwise, his decision problem will become intractable—his decision matrix will have to include vastly many more columns to represent all those possibilities to which he assigns a small but positive credence.

Ross and Schroeder (2012) hold that, generally, 'in virtue of our limited cognitive resources, we cannot avoid the heuristic of treating as true propositions about which we are uncertain' (9). In fact, they maintain that an agent like us must have *automatic* or *default* dispositions to employ such a heuristic—on pain of an infinite regress, she cannot always reason about whether to treat a proposition as true before doing so.² Furthermore, Ross

²For reasoning about whether to treat a proposition as true is itself a decision problem and will involve treating other propositions as true (Ross and Schroeder 2012, 9).

and Schroeder (2012) think that such dispositions should be *defeasible*. For example, suppose that Renzo has to go to Canal St. because he has a very important meeting to attend. In such a case, the possibility that the Broadway train is running late even though it stops at Canal St. may become a possibility that Renzo should consider. When the costs of mistakenly treating a proposition as true becomes salient, what one should treat as true may change (*ibid.*).

So far, it still hasn't been shown how beliefs are supposed to help us cope with our cognitive limitations. After all, treating a proposition as true is *not* the same as believing it. There are propositions we do not believe are literally true but may be automatically disposed to treat as true. For example, an engineer may not believe that Newton's Second Law is literally true (because she thinks it has been superseded by relativistic physics, for instance). However, given that appealing to the law allows her to make predictions with a high enough degree of accuracy for her purposes, she may employ the law in her calculations routinely and automatically without having to think twice about it.³

But given that we have automatic and defeasible dispositions to treat

³Cohen (1989) distinguishes between belief and acceptance, and holds that the latter 'implies commitment to a policy of premissing that p ' (368). He also offers arguments for why acceptance does not entail belief. For instance, he thinks that one can't choose to believe at will, but one may choose to accept a proposition and employ it as a premise in one's reasoning (369-370). Now, there's a question whether having an automatic disposition to treat p as true in one's reasoning is the same as being committed to employing p as a premise. But Cohen's point can be used to support the claim that the former isn't sufficient for belief. Our engineer may have an automatic disposition to treat Newton's Second Law as true in her reasoning. But she may choose to stop treating it as true, in which case she'll lose her automatic disposition to treat it as true. However, if she *believes* that Newton's Second Law is true, she can't simply choose to stop believing it.

At any rate, while Ross and Schroeder hold that having an automatic disposition to treat p as true is *necessary* for believing that p , they don't hold that it is *sufficient*. (See the comments section at <http://tar.weatherson.org/2011/03/31/ross-and-schroeder-on-belief>.)

propositions as true, Ross and Schroeder (2012) think it's natural to put forward what they call the 'reasoning disposition account of belief', namely, the hypothesis that believing that p 'essentially involves' an automatic and defeasible disposition to treat p as true in one's reasoning (9-10; 12-13). The move they make seems to be an abductive one, the idea being that the reasoning disposition account—or *RDA* for short—provides a good explanation of why we have certain automatic dispositions to treat propositions as true—dispositions that help us cope with our cognitive limitations when we reason. For example, suppose Renzo has an automatic and defeasible disposition to treat it as true that he won't get mugged. Why does he have such a disposition? Well, given RDA, a good explanation is as follows: Renzo *believes* that he won't get mugged, and such a disposition is necessary for (or entailed by) the belief in question.⁴

3 Why RDA and Similar Accounts Don't Help

Unfortunately, RDA faces a serious worry. Let's grant that we have automatic and defeasible dispositions to treat propositions as true and that such dispositions help us keep decision making and reasoning tractable. I'll argue that, nonetheless, RDA—as well as other similar accounts—fails to

⁴It's worth noting that Ross and Schroeder (2012) argue explicitly that, given RDA, binary beliefs are *irreducible* to one's credences or to one's credences and preferences. For they hold that a belief that p essentially involves a defeasible disposition to treat p as true, but for any credence less than 1, an agent may have that credence in p , together with whatever preferences she may have, and yet *not* be disposed to treat p as true—at most, she may be disposed to treat p as very highly probable (12-13). And if believing that p requires having a credence of 1 in p , then an agent who believes that p will have an *indefeasible*, rather than a defeasible, disposition to treat p as true.

I'll not attempt to evaluate whether RDA really entails that binary beliefs are irreducible to credences and preferences. But it's clear that Ross and Schroeder lose a reason for subscribing to the latter view if they lose support for RDA.

explain how we cope with our cognitive limitations when we reason.⁵

Ross and Schroeder hold that if we believe p , we'll have an automatic and defeasible disposition to treat p as true. But note: when we believe p , such a (binary) belief will often be accompanied by the (binary) belief that there's some non-zero chance—no matter how slight—that not- p (where 'probability' or 'chance' may be understood as some sort of physical or epistemic probability). Ross and Schroeder (2012) shouldn't have a problem with the preceding claim, since they think that 'reasonable human being[s]' are often not completely certain about the propositions they believe or treat as true (7). And insofar as we're engaged in belief-talk, it's natural to hold that we're often not certain about a proposition we believe, because we also believe there's a small chance it's false.

But now a problem arises. A binary belief with probabilistic content is no less a belief for that. So, *by the very lights of RDA*, if we believe there's a small chance that not- p , we'll have an automatic and defeasible disposition to treat 'There's a small chance that not- p ' as true in reasoning. But if we also believe p outright, then there'll be a *different* disposition competing to be manifested—the disposition to treat p as true in reasoning. In such a case, it's not clear in what sense either disposition counts as *automatic* (or *default*, as Ross and Schroeder sometimes say).

I'll elaborate. First, why are the dispositions competing dispositions? Well, typically, if one is disposed to treat 'There's a small chance that not- p ' as true, then one isn't disposed to treat p as true, and vice versa. For treating p as true and employing it as a premise in reasoning may give us a different conclusion from treating 'There's a small chance that

⁵This is neither to argue that there are no binary beliefs nor to take a stand on whether binary beliefs are reducible to credences.

not- p ' as true and employing it as a premise in reasoning—we get different decision matrices depending on which disposition is manifested. Compare, for example, the claim 'My lottery ticket isn't the winning ticket' with the claim 'There's a small chance that my lottery ticket is the winning ticket'. Employing the first claim as a premise will presumably lead me to conclude that it's fine for me to throw the ticket away. But employing the second claim as a premise need not yield such a conclusion. In the first case, I'm disposed to ignore the possibility that I've got a winning ticket. In the second case, I'm not; in fact, I'm disposed *not* to ignore such a possibility.

Second, why does the above pose a problem for someone who appeals to RDA to explain how we cope with our cognitive limitations when reasoning? Suppose Renzo believes TWO. Given that he's not certain of it, it's likely that he also believes that there's a small chance that not-TWO. But now it's not clear how beliefs are supposed to help Renzo lighten his cognitive load when he reasons. If his belief that TWO guides his decision making, then everything else being equal, the matrix representing his decision problem will be the same as before. But if Renzo's belief that there's a small chance that not-TWO guides his decision making, then the matrix representing his decision problem will have to be expanded. For example, the column 'Broadway train stops at Canal St.' may have to be split into two new columns: 'Broadway train stops at Canal St. and is running on time' and 'Broadway train stops at Canal St. and is running late'. But which belief guides Renzo's decision making? Given that he has both beliefs and given RDA, he has automatic and defeasible dispositions to treat TWO as true and to treat 'There's a small chance that not-TWO' as true. Given that both dispositions are competing dispositions, one disposition will have to

be defeated for the other to be manifested. But then, it's no longer clear in what sense either disposition is supposed to be automatic or default. And *pace* Ross and Schroeder, it seems that for Renzo to make a decision, he has to first consider or reason about what to treat as true after all. Or at least, we'll need some other way to explain why Renzo has an automatic or default disposition to treat one proposition rather than the other as true.

Perhaps we may tweak RDA and hold that a belief that p essentially involves an automatic or default disposition to treat p as true only if p is a non-probabilistic proposition. But such a move would be *ad hoc*. Furthermore, we may sometimes be automatically disposed to treat as true premises of a probabilistic nature. For example, sometimes we may reasonably move from the premise that the chance of rain is 80% to the conclusion that we ought to carry an umbrella (assuming, among other things, that we've a strong desire not to get wet). And typically, in such a case, it seems reasonable for us to be automatically disposed to treat the premise as true—to automatically ignore various possibilities in which the chance of rain isn't 80%. RDA won't be able to explain how we keep such reasoning tractable if we restrict its scope to non-probabilistic propositions.

Another suggestion may be to restrict the scope of RDA to *occurrent* beliefs—beliefs at the forefront of one's consciousness.⁶ It may then be claimed that, often, an occurrent belief that p isn't accompanied by an occurrent belief that there's a small chance that not- p . Now, suppose Renzo has an occurrent belief that TWO but a mere standing belief that there's a small chance that not-TWO. One may suggest that since only the first belief is occurrent, Renzo has an automatic and defeasible disposition to

⁶Ross and Schroeder (2012) distinguish between occurrent and non-occurrent beliefs but give no indication that RDA applies only to the former (13).

treat TWO but not ‘There’s a small chance that not-TWO’ as true.

The suggestion isn’t satisfactory if a substantial amount of reasoning and decision making takes place at a non-deliberative or non-reflective level. For we would still want to explain how a cognitively limited agent may engage in such reasoning and decision making, and RDA won’t be able to provide the required explanation if its scope is restricted to occurrent beliefs. And indeed, it seems that we make a fair number of decisions without consciously considering our options or the various states of affairs that might obtain. While engrossed in a book, I may decide to go to the kitchen to get a glass of water to quench my thirst. I may make and carry out my decision without at any point consciously thinking, ‘Drinking a glass of water will quench my thirst’, or consciously thinking, ‘If I go to the kitchen, I’ll be able to get myself a glass of water’. Now, even in such cases, we may ask what the decision matrices representing our decision problems should look like. Should they represent all the relevant possibilities to which we assign positive credence? One may think that they shouldn’t, for even at the non-reflective level, a finite agent won’t be able to keep track of too vast a number of possibilities. How then may finite agents cope with such cognitive limitations? RDA is not going to help us answer the question if its scope is restricted to occurrent beliefs.

Moreover, the restriction doesn’t lay the worry to rest. Put yourself in the shoes of Renzo. Suppose you’ve an occurrent belief that TWO and are disposed to treat it as true. Suppose also that you have a standing belief that there’s a small chance that not-TWO. Provided that the stakes remain the same, it doesn’t seem that merely making the latter belief occurrent (perhaps by asking you about the chance of not-TWO being true) will lead

to a competing disposition not to treat TWO as true. In particular, even while consciously admitting to yourself that there's a small chance that not-TWO, you may—without further deliberation—continue to ignore not-TWO possibilities when reasoning about what to do. But on the version of RDA under consideration, it'll be all too easy to throw a wrench in your decision making process. According to it, merely inducing in you the occurrent belief in question will yield a competing disposition to treat 'There's a small chance that not-TWO' as true. The question of which disposition gets to be manifested resurfaces. And again, it's not clear how the proponent of RDA may answer this question.

The worry I raise for Ross and Schroeder is not just a worry for them. Several philosophers who hold that we need binary beliefs to help us cope with our cognitive limitations maintain an account of belief similar to the former's. Holton (2008) suggests that if one believes p , then one will accept p as given and employ it as a premise in either practical or theoretical deliberation (36-37). Smithies (2012) writes, 'if I believe that P, then I have settled the question of whether or not P is true and I am disposed to take it for granted that P as a starting point for any future reasoning' (278). And Wedgwood (2008) holds that when 'one has a full outright belief in a proposition p , one will simply take p for granted, and treat p as a starting point for further reasoning' (4).⁷

⁷In a later paper, Wedgwood posits two kinds of credences—theoretical credences, which 'represent the way in which the agent registers, or keeps track of, the amount of justification that she has in favour of the relevant propositions', and practical credences, 'on the basis of which the agent maintains and revises her intentions about how to act' (Wedgwood 2012, 319). And he maintains that to have a binary belief that p is to be in a 'state of being *stably disposed* to have a practical credence of 1 in p , for at least all *normal* practical purposes' (*ibid.*, 321; Wedgwood's emphases). Now, Wedgwood seems to think that to be disposed to have a practical credence of 1 in p is to be disposed to take p for granted or to treat it as true. In fact, he continues to hold in the later paper that if we believe p , then we're disposed to take p for granted in reasoning (*ibid.*, 313).

But suppose a binary belief that p is often accompanied by a binary belief that there's some non-zero chance—no matter how slight—that not- p . By the lights of the preceding accounts, the first belief will dispose us to take p for granted or treat it as a starting point. By the same lights, the second belief will dispose us to take 'There's a small chance that not- p ' for granted or treat it as a starting point. But it's not clear that both propositions can be taken for granted or treated as starting points at the same time. Whereas we'll be disposed to ignore not- p possibilities in the first case, we won't be disposed to do so in the second. And as argued earlier, employing 'There's a small chance that not- p ' as a premise in one's reasoning may lead to a different conclusion from employing p as a premise in one's reasoning.

The worry above arises for any account according to which a necessary condition for believing a proposition is a disposition to treat it as true, whether such an account is meant to solve the problem of how cognitively limited agents reason. But of course, given the worry, we should look to other accounts to help solve the problem. When it comes to lightening our cognitive loads, employing 'There's a small chance that not- p ' as a premise will usually be less helpful than employing p as a premise. For if we employ the former as a premise, we'll have to consider and give some weight to not- p possibilities. But then, instead of having too many credences to keep track of, we may have too many chances (or too many beliefs about chances) to keep track of. We may have to keep in mind that there's some chance that not- p and q_1 , some chance that not- p and q_2 , some chance that not- p and q_3 , and so on. To avoid this result, one may claim that we are often disposed

But then, the worry I'll raise for the above accounts of belief will pose a problem for Wedgwood's later account too.

to employ p and not ‘There’s a small chance that not- p ’ as a premise in reasoning even when we believe that both are true. But nothing in the foregoing accounts of belief gives us reason to uphold such a claim.

4 A Different Strategy: The Cournotian Heuristic

There’s a problem with appealing to RDA, as well as to similar accounts of belief, to explain how we cope with our cognitive limitations in reasoning. I’ll now propose a different account that avoids this problem.

Let’s grant that treating as true propositions about which we are uncertain is a *heuristic* that helps us deal with our cognitive limitations. In fact, it may be one out of various heuristics that, according to psychologists, we are automatically disposed to employ in reasoning.⁸ But one may maintain, without appealing to RDA, that we are simply hardwired to be disposed to treat various propositions as true. Here’s a proposal: when certain probability values are close to 1 (or 0), we’re disposed to employ the heuristic of reasoning as if the values are 1 (or 0), whether the probabilities concerned are subjective probabilities (i.e., credences) or chances. More precisely, the proposal says that when our credence is close enough to 1 (or 0), we’re disposed to reason as if it equals 1 (or 0); furthermore, if its content has the form ‘The chance of p is x ’, where x is sufficiently high (or sufficiently low), we’re disposed to round up x to 1 (or round it down to 0).

Call the heuristic the *Cournotian Heuristic*. It’s reminiscent of *Cournot’s Principle*, according to which whatever has a very high probability of hap-

⁸Examples of some heuristics include the *availability heuristic* and the *representativeness heuristic*. See, for instance, Schwarz and Vaughn (2002) and Kahneman and Frederick (2002).

pening *will* happen.⁹ Granted, we may have misgivings about Cournot’s Principle *qua* principle. An event with a very high probability of happening might not happen if such a probability falls short of 1.¹⁰ But the principle’s incarnation as a heuristic seems fine. After all, heuristics are supposed to be employed in a fast and ready manner, and occasional mistakes are to be expected when they are employed. When our credence in p or when what we take to be the chance of p is close to 1 (or 0), it may often be harmless to reason as if our credence in p or as if the chance of p is 1 (or 0). In fact, given our cognitive limitations, doing so may often save us time and effort.

To illustrate the heuristic further, suppose our credence in a particular proposition is close to 1. And suppose the proposition does not have the form ‘The chance of p is x ’. If we apply the heuristic, we’ll reason as if our credence in the proposition equals 1. That is, we’ll treat the proposition as true (given that someone who has a credence of 1 in a proposition is disposed to treat it as true). Now suppose the proposition in question has the form ‘The chance of p is x ’, where x falls just short of 1. If we apply the heuristic, we’ll round up x to 1 and reason as if we’ve a credence of 1 in ‘The chance of p is 1’.¹¹ In such a case, we’ll also be treating p as true.

Although my proposal may strike you as being rather similar to RDA (and other like accounts), there are important differences between them. First, as we’ve just seen, the Cournotian Heuristic is meant to apply not just to our credal *attitudes* but also to the probabilistic *contents* of those attitudes. And this is as it should be. After all, reasoning with chances is

⁹Shafer (2007) discusses Cournot’s Principle in some detail.

¹⁰For a discussion on why Cournot’s Principle seems false, see Hájek (ms).

¹¹How close to 1 or 0 must a probability value be for us to reason as if it’s 1 or 0? There may be no precise threshold—what counts as close may be vague and vary with different agents.

often not easy unless their values are either 0 or 1. Suppose we've a ticket that pays us 56 dollars if p and nothing otherwise. What is the expected monetary value of the ticket if the chance of p is 0.99? And what if the chance of p is 1? The second question is much easier for us to answer than the first. And when it's not important to give an exact answer to the first question, we can easily give an approximate answer to it: by rounding up 0.99 to 1, it's easy to see that the expected monetary value of the ticket is approximately 56 dollars. Now, when our credence in p is high enough, ignoring not- p possibilities will help us simplify our reasoning. But so will rounding up chances to 1 when their values are close enough to 1.

Second, unlike RDA, my proposal does not invoke beliefs to explain how finite agents reason. Admittedly, you may think that it still appeals to beliefs implicitly if having a very high credence in a proposition—perhaps plus some kind of disposition to treat the proposition as true—is sufficient for believing it.¹² But this brings us to the third difference between my proposal and RDA.

Pace RDA, my proposal specifically avoids appealing to the claim that, in general, believing a proposition yields a disposition to treat it as true—that, in general, the latter is *necessary* for the former. This helps us dodge the problem raised for RDA in the previous section. Recall that, given RDA, a belief that p yields a disposition to treat p as true while a belief that there's a small chance that not- p yields a competing disposition to treat

¹²According to the threshold view of belief, binary beliefs are reducible to credences that meet a sufficiently high threshold. Though it'll take me beyond the scope of this paper to discuss the view in depth, it's worth noting (as I did in footnote 4) that Ross and Schroeder (2012) maintain that binary beliefs are not reducible to credences and hence, not reducible to credences that meet a certain threshold (12-13). Furthermore, Holton (2008), Wedgwood (2008) and Smithies (2012) also find the threshold view of belief problematic and reject it explicitly (34; 3-4; 279).

‘There’s a small chance that not- p ’ as true. (The respective dispositions are necessary for the respective beliefs). In such a case, it’s not clear in what sense either disposition is supposed to be automatic. But the appeal to the Cournotian Heuristic avoids this problem. Granted, someone with a very high credence in p may also have a very high credence in ‘There’s a very small chance that not- p ’. But as we’ll see, employing the Cournotian Heuristic in each case yields the *same* disposition, namely, the disposition to treat p as true. This allows my proposal to avoid the problem that RDA faces.

To elaborate, note that while RDA tells us that when we believe a proposition, we’re disposed to treat it as true, it is silent about the content of the belief itself. But as mentioned, the Cournotian Heuristic may be applied to the content of one’s credence, and this both distinguishes my proposal from RDA and helps it avoid the problem that RDA faces. Suppose we’ve a credence close to 1 in p and employ the Cournotian Heuristic (where p stands for some non-probabilistic proposition). Then we’ll reason like someone with a credence of 1 in p . That is, we’ll treat p as true. Now suppose we also have a credence close to 1 in ‘There’s a very small (non-zero) chance that not- p ’, and we employ the Cournotian Heuristic. This, on my proposal, will involve two steps. First, we’ll apply the Cournotian Heuristic to the content of the credence, rounding down the very small chance that not- p to 0. Second, we’ll apply the Cournotian Heuristic to the credal attitude itself and reason as if the relevant credence has a value of 1. As a result of applying the Cournotian Heuristic in such a manner, we’ll end up reasoning as if we’ve a credence of 1 in ‘There’s no chance that not- p ’. But in such a case, we’ll also be treating p as true. Thus, we

avoid the worry that we have a competing disposition to treat the proposition that there's a very small chance that not- p as true. Having a very high credence in the proposition doesn't yield such a disposition, precisely because the Cournotian Heuristic is applied, not just to the credal attitude itself, but also to its content.

Now, one might raise the following worry for my proposal. According to it, being highly confident that p and being highly confident that the chance of p is 0.99 will both dispose us to treat p as true (assuming that the relevant probabilities are high enough for us to apply the Cournotian Heuristic). But in that case, what distinguishes between the two different doxastic states? After all, different doxastic states are associated with different sets of dispositions.¹³

To answer the question, let's first note that a disposition to employ the Cournotian Heuristic, like dispositions to employ other heuristics in reasoning, may be overridden or defeated.¹⁴ Suppose our credence in p is just short of 1 and we're disposed to treat p as true. Following Ross and Schroeder (2012), we may hold that when the costs of mistakenly treating p as true are salient, such a disposition gets defeated. Or suppose we learn that the chance of p is some value very close to 1, say, 0.99. Normally, on my proposal, we'll be disposed in our reasoning to round up 0.99 to 1. But this disposition may be defeated if, say, we're betting on whether the chance of p is 0.99 or 1, and it's important that we get the exact value correct.

¹³Thanks to an anonymous reviewer for raising this worry.

¹⁴Heuristics may be employed at a reflective or non-reflective level. Those employed automatically or at a non-reflective level may sometimes be overridden by cognitive processes that take place at the reflective and deliberative level (Kahneman and Frederick 2002, 51-60).

Returning to the question above, my proposal *does* allow us to distinguish between high confidence that p and high confidence that the chance of p is 0.99. True, given the proposal, both doxastic states will dispose us to treat p as true in situations in which we're disposed to employ the Cournotian Heuristic (assuming that the relevant probabilities are high enough). But they are still two different states. For there will be other situations in which the disposition to round up probabilities that are close to 1 is defeated. Suppose that, in one such situation, we're considering a bet on the proposition 'The chance of p is 0.99'. How much we're willing to bet will depend on our credence in such a proposition and *not* on our credence in p . For instance, the stakes may be such that being highly confident that the chance of p is 0.99 will lead us to accept the bet whereas merely being highly confident that p —while being unsure what the exact chance of p is—will not do so. In short, whenever the disposition to apply the Cournotian Heuristic is undefeated, high confidence in p and high confidence in 'The chance of p is 0.99' will both lead to a disposition to treat p as true. But this is compatible with the two doxastic states having different sets of dispositions associated with them, as may be seen in situations in which the disposition to apply the Cournotian Heuristic is defeated.

Notice that we may also distinguish between a credence of 0.98 in p and a credence of 0.99 in p even if both credences are high enough to dispose us to treat p as true. For there will be situations in which the costs of making a mistake are salient enough for the disposition in question to be defeated, whether our credence in p is 0.98 or 0.99. How we're disposed to act may then depend on our exact credence in p .

In sum, in trying to explain how finite agents cope with their cognitive

limitations in reasoning, RDA and other similar accounts appeal to the claim that being disposed to treat a proposition as true is necessary for believing it. This, however, leads to a problem in cases in which one both believes that p and believes that there is a very small chance that not- p . My proposal avoids making such an appeal. Instead, it holds that we're simply hardwired to be such that when certain probabilities are close to 1 or 0, we're disposed to act as if they are probabilities of 1 or 0. This helps us avoid the problem faced by RDA and like accounts.¹⁵

¹⁵Many thanks to Jens Christian Bjerring, Ben Blumson, Mark D'Cruz, Ole Koksvik, and an anonymous reviewer for valuable comments. I'm especially indebted to Mark D'Cruz for providing very useful feedback on more than one draft of the paper.

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