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Do credences model guesses?

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Abstract
What are credences? Where do the numbers come from? Some have argued that they are brute and primitive; others, that they model our dispositions to bet, our comparative confidence judgments, or our all-out beliefs. This paper explores a new answer to this question: credences model our dispositions to guess. I argue that we can think of credences this way, and then consider: should we?

What are degrees of belief? What does it take to have, for example, 0.7 credence that it will rain tomorrow? Some epistemologists find it puzzling to assign numbers to our doxastic states without further justification. A few different types of justification have been defended in the literature, according to which numerical credences are a model of some other feature of our psychology or behavior. The traditional approach, following Ramsey and others, is to say that credences reduce to dispositions or preferences over bets. A less prominent view, "comparativism", suggests that credences can be reduced to non-numerical comparative confidence judgments. Finally, Easwaran (2016) suggests that credences can be reduced to on/off beliefs (understood in a particular way): beliefs can justify numerical assignments, he argues, and also help explain the sense in which credences aim at the truth.

This paper will introduce a new possible answer. That answer is: *credences represent an agent's dispositions to guess, when offered a forced choice between two propositions, under the (idealized) assumption that she is only trying to get the right answer.* Borrowing mathematical results from the comparativist view, I will argue that we can use guesses to justify numerical credences, and under certain circumstances, your guessing dispositions will be representable by a unique probability function.

After arguing that we *can* understand credences in this way, I will assess the merits of this view. I will argue that this new account faces some real challenges. However, it also has some advantages over its rivals. Unlike the view that takes credences to be fundamental and unanalyzable, the guessing account can explain why it sometimes makes sense to characterize people's doxastic states with numbers. Like the betting view, the guessing view gives us a connection between our credences and (a particular type of) behavior; yet unlike the betting view, it shows how credences aim at truth rather than money or utility. Like comparativism, the guessing view builds credences

out of representational states; yet unlike comparativism, the guessing view has a clear answer as to how credences get things right or wrong. And unlike Easwaran's view, which also aims at truth, the guessing view does not commit us to a controversial account of full belief.

Finally, this view fits nicely with some other recent work on guessing: it is most closely tied with recent proposals to use guessing to assess the accuracy of credences,[1] but it is also compatible with recent arguments that tie guessing to belief, assertion, and deliberation.[2] If these recent arguments are right, guessing is more important than has been previously appreciated. The view I introduce in this paper would give guessing an even more central role in our mental life.

The upshot of this discussion will be that the guessing account deserves serious consideration. It is a new and viable option for epistemologists who seek to reduce numerical credences to some underlying, non-numerical psychological phenomenon. Guessing gives us a new possibility for answering the question of what credences are, what the numbers mean, and how – most importantly – they aim at the truth.

1 | GUESSING

Guessing has been the subject of several recent papers in epistemology, philosophy of mind, and philosophy of language. The way I will understand it here is broadly in line with those recent discussions.

Two recent papers use guesses to assess accuracy. My (2019) argues that your credences "license" guesses in response to different questions: when asked to guess between two propositions A and B, you are licensed to guess A iff your credence in A is at least as high as your credence in B. (For example, when asked to guess one of {Rain, ∼Rain}, you are licensed to guess Rain if your credence that it's raining is at least as high as your credence that it's not raining.) Guesses are then assessed for truth and falsity, and the accuracy of your credences can be found by looking at the extent to which the guesses licensed by your credences are true or false. Builes et al. (2022), building on Horowitz (2019), employs the same notion of guessing. We characterize licensing as follows: "A doxastic state S licenses a guess G so long as it is compatible with maximal rationality that, for the purpose of doing well on the relevant guessing question, an agent in state S guesses G."[3] Builes et all. (2022) uses guesses to assess the accuracy of imprecise, as well as precise, credences.

Another group of recent papers connects guessing to different aspects of our psychology and behavior. Holguín (2022) argues that to *think* that P – which he also suggests is equivalent to *believing* that P – is to guess that P given a set of options.[4] The notion of guessing here is very similar to those discussed in Horowitz (2019) and Builes et al. (2022), though Holguín focuses on a slightly different range of cases. Holguín and Goodman (forthcoming) further argue that thinking, in this sense, has important connections with deliberative action. Dorst and Mandelkern ((2021) and (2022)) develop a similar view, arguing that guessing can explain certain aspects of belief and reasoning, and that thinking or believing in this weak sense can also legitimize assertion.

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[1] See Horowitz (2019) and Builes et al (2022).

[2] See Holguín (2022), Holguín and Goodman (2022), Dorst and Mandelkern (2021), and Dorst and Mandelkern (2022).

[3] Builes et al. (2022), p. 15, fn 12.

[4] See Hawthorne et al. (2016) for a related view of belief.

In all of these accounts, underlying doxastic states play an important role in *determining* how we guess. My (2019) argues that credences license guesses, and Builes et al. write that guesses elicit comparative confidence judgments. Holguín's arguments, similarly, take an agent's credences to be fixed, working out her guesses afterwards and taking credences to rationally constrain guesses in certain respects. Dorst and Mandelkern (2021) write that rational guessing is determined by one's credence and one's utilities, just like any other rational action. They argue that certain interests (in particular, "informativeness", or specificity) are especially relevant in the case of guessing. What these papers have in common is the assumption that our doxastic states (credences in most cases; comparative confidences, in the case of Builes, et al.) are somehow – explanatorily, metaphysically, or conceptually – prior to guesses.

In this paper I will ask what happens if we take a "guess-first", rather than "credence-first", approach. That is, I will look at an agent's dispositions to guess in order to construct her comparative confidences and her credences. Here is a small taste of what this approach will look like. What is it for someone to have *higher credence* in P than in Q? With some caveats, I'll argue: it is for her to be disposed to guess that P, and not disposed to guess that Q, when given the options {P, Q}.

The caveats are necessary for familiar reasons. If someone puts a gun to your head and orders you to guess Q, you're probably disposed to guess Q. But it's fair to say that this disposition to guess is not one that we'd want modeled by a credence function. The same goes for guesses in situations where the truth is hurtful, or we're late for the bus, or we don't want to ruin someone's birthday surprise. Similarly, we may want to abstract away from other contextual factors: for instance, cases in which the very fact that someone is asking you a question gives you some information about the possible answers. So for present purposes I will adopt the restricted approach to guessing favored by Horowitz (2019) and by Builes et al. (2022): I will only consider cases in which the agent is presented with exactly two options, where the guessing scenario does not give her extra information about which option might be true, and in which her only aim in guessing is to say something true. The cases in which these authors argue that guesses can assess *accuracy* of credences are the ones I will focus on to *construct* an agent's credences.

Here is how the rest of the paper will go. In section 2 I will review the argument for comparativism, which understands credences as a model of comparative confidence. In section 3, I will argue that we can understand comparative confidence in terms of guessing. I will then argue in section 4 that we can bypass this middle step, and hold that credences represent guesses. In section 5, I will consider possible objections and replies, and compare the guessing account to its rivals. And finally, in section 6, I will consider how this account might be compatible with some of the recent work by Holguín, by Dorst and Mandelkern, and others.

2 | COMPARATIVE CONFIDENCE AND REPRESENTABILITY

One of the advantages of comparative confidence, as opposed to credence, is that it is non-numerical. So if you are skeptical about assigning numbers to our doxastic states, you might prefer talking about comparative confidence instead.[5] However, under certain circumstances, it is possible to represent someone's comparative confidence judgments numerically. Under the strictest such conditions, we can represent comparative confidence judgments with a single probability

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[5] See Stefánsson (2017) for a defense of comparative confidence as primitive.

function. (Less strict conditions yield weaker results. I will focus on the strongest conditions as a kind of "best-case scenario" for numerical representation.)

Kraft, Pratt, and Seidenberg (1959) and Scott (1964), building on previous work by de Finetti, showed that a comparative confidence ordering can be modeled by a probability function just in case it satisfies certain conditions (given below with the subscript "CC" for "comparative confidence", because we will later discuss analogous conditions for guessing). These are:

1. **Non-Triviality$_{CC}$**: $\top \succ \bot$.
2. **Non-Negativity$_{CC}$**: For any proposition A, $A \succeq \bot$.
3. **Totality$_{CC}$**: For any propositions A and B, $A \succeq B$ or $B \succeq A$.
4. **Transitivity$_{CC}$**: If $A \succeq B$ and $B \succeq C$, then $A \succeq C$.
5. **Quasi-Additivity$_{CC}$**: If A and B are incompatible, and C and B are also incompatible, then: $A \succeq C$ iff $A \lor B \succeq C \lor B$.
6. **Isovalence$_{CC}$**. For any two sets of propositions, $(A_1, \ldots A_n)$ and $(B_1, \ldots B_n)$ which contain the same number of truths, come what may, if $A_i \succeq B_i$ for all $i \leq n$, then $A_i \preceq B_i$ for all $i \leq n$ as well.[6]

Kraft, Pratt, and Seidenberg (1959) showed that meeting the conditions above is both necessary and sufficient for full probabilistic representability: that is, there is a probability function such that you agree with all of its comparative judgments. But there may be more than one such probability function if your opinions are too sparse. You will be representable by a *unique* probability function if you meet a further richness condition, specifying that you have opinions about "enough" propositions. There are a few ways of ensuring uniqueness.[7] Here is one:

7. **Savage Continuity$_{CC}$**: If $A \succ B$, then the possibilities about which you are opinionated can be partitioned into propositions $C_1 \ldots C_m$, such that for all $C_i \in \{C_1 \ldots C_m\}$, $A \succ B \cup C_i$.

Savage Continuity$_{CC}$, which originally comes from Savage (1954), requires that your comparative confidence ordering be defined over an infinite algebra.[8] Savage defends this condition,

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[6] This final condition is a bit hard to interpret. Essentially, Isovalence rules out comparative confidences which treat the As and the Bs asymmetrically in a certain respect, when by construction, the As and the Bs are in an important sense equivalent. A person who is at least as confident of each of the As as she is of the Bs, and also strictly more confident of at least one of the As, violates Isovalence. (She is "uniformly more confident" of the As, as Konek (2019) puts it.) Fishburn ((1986), p. 338) illustrates the axiom with a betting scenario: a person who violates Isovalence will "presumably be willing to pay some positive amount" to play a game in which they receive $1 for every truth in the As, and lose $1 for every truth in the Bs. But by design, the game will net $0, so this person will be out the amount of money they paid to play. Though Fishburn does not rely on this as an argument for Isovalence, the illustration provides an intuitive way to understand the sort of incoherence involved in violating it. See Konek (2019) (to which my exposition here is indebted) and also Wilhelm (2018) for further discussion.

[7] See Fishburn (1986) for discussion of different ways to obtain uniqueness. Stefánsson (2017) defends Suppes Continuity, mentioned below; see also Stefánsson (2018) for further discussion of both conditions.

[8] It is also possible to obtain uniqueness with a finite algebra, but this requires that you satisfy the following indifference principle:

> **Suppes Continuity**: For any two propositions E and F in one's comparative confidence ordering, if one is at least as confident of F as of E, then there exists a proposition G such that one is equally confident of E $\cup$ G as of F.

See Stefánsson (2017) for further discussion.

arguing that whenever you are more confident of A than of B, we can always find some very unlikely coin toss outcome – a sequence of heads and tails of whatever length necessary – such that you'll still be more confident of A than of the union of B and that coin toss outcome. In other words, whenever there is a gap between A and B, we can find another proposition to squeeze inside it.

The conditions above give us a kind of "best-case scenario" for probabilistic representability: it is under these conditions that your comparative confidences will agree with a unique probability function, and so we can use that probability function to accurately represent your doxastic state.

3 | GUESSING AND COMPARATIVE CONFIDENCE

The next step is to show that we can understand comparative confidence in terms of guessing. One natural thought – indeed, the one defended by Builes et al. – is that if an agent faces a forced choice between {A, B}, she is licensed to guess A *unless* she is strictly more confident of A than she is of B. Though Builes et al. take comparative confidence to explain guessing, our proposal is compatible with going the other way: we can explain our comparative confidence attribution – our judgment that the agent is more confident of A than she is of B, say – by appealing to her guesses. If we offer someone the choice between A and B, and she is disposed to guess A rather than B, we can accurately describe her as having higher confidence in A.[9]

I propose that we understand facts about comparative confidence in terms of guesses, as follows.

- A ≻ B iff, given the question {A, B}, you're disposed to guess A rather than B.
- If A ⪰ B, then given {A, B}, you are disposed to guess A (and maybe also disposed to guess B).
- If A ∼ B, then given {A, B}, you are equally disposed to guess A and to guess B.
- A ∼ B iff, for any proposition C:
  a. if you are disposed to guess A in response to {A, C}, you are also disposed to guess B than C in response to {B, C}; and
  b. if you are disposed to guess C in response to {A, C}, you are also disposed to guess C in response to {B, C}.[10]

Is there independent reason to think about comparative confidences this way? Although it is admittedly not obvious that guesses are more fundamental than comparative confidence, it also seems to me that the idea is, on its face, not too much of a stretch. To my ear, saying that someone is

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[9] I will *not* assume that if a person is disposed to guess both A and B in response to {A, B} that she has equal confidence in A and B. This is to leave room for the possibility that someone's guesses are only representable by imprecise credences, or something even weaker. See Builes et al. (2022) for further discussion of imprecise credences.

[10] What does it mean to be disposed to guess both answers? There are at least two ways we could spell this out. First, someone could be disposed to pick based on some random or irrelevant factor, such as which option is presented first (which would then change their guess, had the options been reversed). Second, they could have a probabilistic disposition, such that given {A, B}, they pick A with 50% probability and B with 50% probability. I will remain neutral on whether one of these understandings is better. I will also remain neutral on how we should extend the account to other cases of probabilistic dispositions (such as a person who, in response to {A, B}, is disposed to pick A with 80% probability and B with 20% probability), though this question points to interesting avenues for future research. Thanks to an anonymous referee for raising this complication.

more confident of P than of Q sounds more or less equivalent to saying that, if she is trying to pick which is true, she'll pick P. (Your mileage may vary.) And although formal epistemologists often just write about "comparative confidences", or skip straight to the mathematical representation of a comparative confidence function, they will sometimes make remarks that suggest taking guesses (or something similar) as fundamental. Stefánsson (2017), for example, suggests as an aside that we might interpret the comparative belief relation as judgment, or (alternatively) as a disposition to affirm.[11] Although Stefánsson does not go into detail, it is natural to think that the relevant judgments would be comparative – in other words, guesses. Wilhelm (2018) argues that we should understand full beliefs (interpreted in a very specific way) as "inducing" comparisons, so the full beliefs come first.[12] [13]

It also seems to me that taking guesses as fundamental has some explanatory advantages in more complicated cases. For example, consider intransitive comparative confidence judgments. It is puzzling how someone could be *more confident of A than of B, more confident of B than of C, and yet also more confident of C than of A*. But I do know what it would be for her to guess A when presented with {A, B}, guess B when presented with {B, C} and yet guess C when presented with {A, C}. Another example is so-called "insensitivity to evidential sweetening".[14] Such an agent supposedly starts off no more confident of A than of B, and no more confident of B than of A. Then she receives some evidence in favor of A. But after taking this evidence into account, and becoming *more* confident of A, she is still no more confident of A than of B. What could be going on in this person's head? I understand this scenario better when I imagine it in terms of guessing: the person has received some evidence in favor of A, but is still disposed to guess either A or B when presented with those two options.[15] If I am right, and guessing helps us understand what these comparative confidence judgments are like, this is some (defeasible) evidence that we should understand comparative confidence in terms of guessing, rather than the other way around.

4 | GUESSING AND REPRESENTABILITY

We have now seen how credences can be understood as a model of comparative confidence, and comparative confidence can be understood in terms of guessing. Putting these together, we can now state the conditions for probabilistic representability in terms of guessing. To be fully representable by a probability function, it is also necessary and sufficient that one's *dispositions to guess* meet the following conditions:

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[11] Stefánsson (2017), p. 577.

[12] Wilhelm (2018), p. 722. Wilhelm's argument is similar to mine, in that it borrows from the same mathematical results regarding how probabilities can represent comparative confidences, and also provides support for reducing probabilities to an on-off notion. He presents his argument as building on Easwaran (2016)'s project to reduce credence to full belief.

[13] On the other side, it has been suggested to me in conversation that when we guess, it seems introspectively like we are appealing to an underlying comparative judgment or even a numerical one: we say to ourselves, "I'm guessing A, because A is more likely than B" or something of that nature. This does seem plausible. However, it's not obvious to me that we should think of your saying "A is more likely than B" as an appeal to a different underlying doxastic state, rather than simply a way of expressing your guess and specifying that it is truth-directed.

[14] See Schoenfield (2012).

[15] I'm not claiming that either of these two examples can be *rational*: rather, I claim that if they're *possible*, they are easier to understand in terms of guessing than in terms of comparative confidence alone.

1. **Non-Triviality$_G$**: When presented with a forced choice between $\top$ and $\bot$, you must be disposed to guess $\top$.
2. **Non-Negativity$_G$**: When presented with a forced choice between $\bot$ and any other proposition A, you must be disposed to guess A.
3. **Totality$_G$**: For any propositions A and B, exactly one of the following must be the case.
    a. When presented with the forced choice {A, B}, you are disposed to guess A rather than B, or disposed to guess B rather than A; or
    b. For any proposition Q, if you are disposed to guess A in response to {A, Q}, you are also disposed to guess B in response to {B, Q}. If you are disposed to guess Q in response to {A, Q}, you are also disposed to guess Q in response to {B, Q}.
4. **Transitivity$_{CC}$**: If, given {A, B} you are disposed to guess A rather than B, and given {B, C} you are disposed to guess B rather than C, then given {A, C} you must be disposed to guess A rather than C.
5. **Quasi-Additivity$_{CC}$**: If A and B are incompatible, and C and B are also incompatible, then: you are disposed to guess A, given {A, C}, iff you are disposed to guess A v B, given {A v B, C v B}.
6. **Isovalence$_{CC}$**. For any two sets of propositions, $(A_1, \ldots A_n)$ and $(B_1, \ldots B_n)$ which contain the same number of truths, come what may, if you are disposed to guess A_i given {A_i, B_i} for all $i \leq n$, then you are disposed to guess B_i given {A_i, B_i} for all $i \leq n$ as well.
7. **Savage Continuity$_G$**: If, when presented with a forced choice between {A, B}, you are disposed to guess A rather than B, then the set of propositions about which you are disposed to guess can be partitioned into propositions $C_1 \ldots C_m$, such that for all $C_i \in \{C_1 \ldots C_m\}$, when faced with the question {A, (B v C_i)}, you are disposed to guess A rather than (B v C_i).

The guessing dispositions relevant for these conditions are the same as those discussed in section 1: we will only consider an agent's disposition to guess in situations in which the context provides two options, and she only trying to guess truly. An agent's credences represent her dispositions to guess under these conditions. And if her dispositions to guess meet the conditions above, we can represent her with a unique, probabilistic credence function.

My main aim in this paper has just been to introduce a new possibility for how to think of credences – one that has not been noticed before. That goal, I hope, has by now been met: I've argued that we can use guesses to justify numerical assignments for credences. But should we? I will turn to that question next.

5 | IS IT PLAUSIBLE?

Now that we have established the guessing view as a live option, we can assess its merits and drawbacks. In this section I will look at how this view handles some well-known objections that have come up elsewhere in the literature on representation theorems and the nature of belief. First: why single out guessing, when credences are closely connected with other parts of our psychology? Second: what if an agent's guessing behavior does not align with the rest of her psychology? And third: could there be an agent who has credences, but no dispositions to guess?

Then I will compare the guessing view to its most similar competitors: views on which credences reduce to bets, comparative confidences, or beliefs. As I will argue, the most important advantage of this view is that it provides a direct connection between credences and truth.

5.1 | Objection 1: Why single out guessing?

The guessing view of credences, like the traditional betting view, identifies credences with just one type of behavioral disposition.[16] But presumably credences have important ties to other dispositions – to assert, to bet, to act more generally – as well as non-behavioral aspects of our psychology and physiology. So one might object: what's so special about guessing?

Eric Schwitzgebel develops a version of this objection in defense of dispositionalism about belief: he argues that Juliet, who verbally expresses egalitarian views but nevertheless exhibits some racist behaviors, should not count as determinately holding either egalitarian or racist beliefs.[17] (On his view, this is because beliefs are determined by all of our dispositions – verbal, mental, and behavioral.) David Christensen raises another version, in objection to betting representation theorems for credences. Christensen argues that credences explain not only our behavior, but also our patterns of inference, our emotions, and even sometimes our physical health.[18] "The view that identifies the belief with just one of these dispositions leaves the other dispositions, and all the correlations among them, completely mysterious," he writes. "Why, for example, would the brute disposition to form preferences in a certain way correlate with feelings of fear?"[19]

To answer this objection, we need a reason to privilege the disposition to guess as essential to credences, while seeing other dispositions as peripheral. But at least at first pass, the guessing account has a straightforward reply. That is: guesses can be true or false. They are correct if they are true, and incorrect if they are false. But dispositions to bet (as well as feelings of fear, and susceptibility to placebo treatments) are related to truth only tangentially. Since credences aim at the truth, it makes sense that they would reduce (if at all) to something which can succeed or fail at that aim. The fact that guesses can be true or false sets them apart in a relevant way from other aspects of our behavior and psychology. Other attitudes, behaviors, and emotions may be partly explained by our credences, but the credences themselves are not determined by those downstream features of our psychology.

This story is plausible enough if we assume that the various features of our psychology are more or less aligned. But what if they come apart, as they do for Juliet? I consider that objection next.

5.2 | Objection 2: Isolated guesses

The first objection was about arbitrariness: why should beliefs model *only* guesses, when guesses are just one part of a person's rich behavioral and mental life? But the point becomes sharper if we imagine a case in which guesses aren't simply arbitrary, but actually fail to cohere with the rest of the potentially relevant phenomena. For example, suppose that Beth consistently guesses

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[16] In this respect the guessing view can be seen as a relative of "dispositionalism", the view of full belief defended by, e.g. Schwitzgebel (2002) and others (as contrasted with "representationalism", defended by, e.g., Fodor (1975) and more recently, Quilty-Dunn and Mandelbaum (2018)). However, since there is also a distinctively representational component to guessing – you are choosing between propositions – it is not clearly on one side or the other. The comparative confidence view, which does not involve any behavioral dispositions, might be understood as a version of representationalism.

[17] See, e.g. Schwitzgebel (2011).

[18] Christensen (2004) p. 131.

[19] Ibid., p. 134.

A rather than B. But when asked to bet, she bets on B rather than A. Does it really seem right, in this case, to say that Beth has higher credence in A than in B?[20]

This case, for the guessing view, is akin to Eric Schwitzgebel's notion of "mad belief": beliefs (or in this case, credences) that come completely apart from a person's behavior, and don't play their normal explanatory role.[21] Schwitzgebel argues that the idea of mad belief is conceptually impossible. But Declan Smithies disagrees: in the case of Juliet, for example, Smithies argues that "(i)nstead of denying that Juliet has egalitarian beliefs, we should recognize that her beliefs are *dysfunctional* in the sense that they don't play the causal role that they rationally should play."[22]

The guessing theorist could respond to this objection by following Smithies, arguing that Beth's credences are dysfunctional, but that they are still, nevertheless, her credences. For Smithies, what individuates beliefs is not their behavioral role, but the fact that they are subject to epistemic norms. The guessing theorist could adopt this reply as well. Beth's guesses seem criticizable on epistemic grounds, while her bets seem criticizable on practical grounds.

While I think this reply is promising, however, it's also worth emphasizing just how strange cases like Beth's would be, and how a person would have to behave in order for us to describe her guesses as isolated from the rest of her behavior. For example, consider the following dialogue:

> **Amy**: Do you think the Chiefs will make it to the Super Bowl again next year?
>
> **Beth (guessing)**: Yes, they'll make it.
>
> **Amy**: I disagree. In fact, I'll bet $10 that they'll be eliminated from the playoffs.
>
> **Beth (betting)**: Oh, no thanks. I won't take that bet. But I would take the other side: I'll give you $10 if they make it to the Super Bowl, and you give me $10 if they're eliminated.
>
> **Amy**: But wait… you'll only win that bet if it's true that they'll be eliminated. And in your opinion, as you just said, that's *false*! So, do you think you'll *win* this bet?
>
> **Beth (guessing)**: No.
>
> **Beth (betting)**: But you know what? I'll *bet* you that I'll win this bet.

I'm not sure any view could give us a satisfying explanation of this confused exchange. Any way you theorize it, something is wrong with Beth – whether it's that her beliefs are dysfunctional, incoherent, or (as Schwitzgebel would argue) indeterminate.

Moreover, in a case this confusing, it's not clear that Beth's apparent guesses really are her guesses, or that her apparent bets really are her bets. (Remember that guesses – just like bets, for the betting representation theorist – must be somewhat idealized, to avoid problems with threats, bribes, and other interfering contextual factors.) More plausibly, Beth herself is confused about some aspect of the situation: maybe she doesn't understand the meanings of "true", "false," and "do you think?", or maybe she doesn't understand what it is to accept a bet. While both the betting theorist and the guessing theorist are free to accommodate Beth as a case of mad belief, I think it is most plausible that in a case like this, we ought to reject the description of this sit-

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[20] Thanks to an anonymous referee for raising this objection.

[21] See Schwitzgebel (2011). The label "mad belief" is meant to evoke Lewis's "mad pain".

[22] Smithies (forthcoming), p. 22. For Smithies, beliefs are determined by occurrent "feelings of conviction": since these feelings can in principle come apart from other aspects of a person's psychology and behavior, his view faces the present objection as well.

uation that would force them to that conclusion. Since guesses are so closely connected with other aspects of our mental life, they cannot obviously be separated as cleanly as this objection suggests.

5.3 | Objection 3: The Zen monk

While the first two objections point out that credences are *connected* with much of our mental life, a third emphasizes the possibility of *separating* credences from their supposed reduction base. Any attempt to reduce credences to some other thing, X, faces an objection of this form: couldn't we imagine an agent who has credences, but lacks X? Eriksson and Hájek write, for instance:

> (C)redences and preferences are certainly separable in thought, and sometimes in practice. Imagine a Zen Buddhist monk who has credences but no preferences. Gazing peacefully at the scene before him, he believes that Mt. Everest stands at the other side of the valley, that K2 does not, and so on. But don't ask him to bet on these propositions, for he is indifferent among all things.[23]

Substitute "preferences" in the first sentence for any other supposed reduction; if we can separate these things in thought, the argument goes, we can't reduce one to the other. Galen Strawson's "Weather Watchers" are similar: they have beliefs, desires, and emotions, but cannot act. Since we can imagine them, Strawson argues, functionalism is false.[24]

This objection most obviously targets views that reduce credence to betting behavior or preferences. We can easily imagine an agent who has credences but does not place bets. With a little more difficulty, we can imagine an agent who has beliefs but no preferences, or no ability to act. What about guessing? Like betting, guessing is an action, but it could be entirely mental.[25] Even the Weather Watchers could guess. But would the Zen monk?

One could argue that he would not. To guess, in the relevant sense, one must be trying to get the right answer. And the Zen monk, without a desire in the world, would arguably not be inclined to *try* to do anything. Moreover, it would be hard to put the Zen monk in a forced-choice situation; he wouldn't exactly respond to threats or incentives! If the Zen monk could have credences, but no dispositions to guess, this would show that credences do not model guesses.[26]

We might be skeptical that this particular kind of Zen monk can exist. Perhaps what it takes to "try to get things right" is so minimal that it cannot be separated, in the end, from merely having opinions about the world.[27] It doesn't seem all that unreasonable to think that our having doxastic

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[23] Eriksson and Hájek (2007), p. 194. See also Christensen (2004), ch. 5.

[24] Strawson (1994).

[25] Both Holguín (2022) and Dorst and Mandelkern (2021) conceive of guessing as a mental action.

[26] Note that this objection also targets Holguín (2022)'s argument that *belief* (though not credence) can be explained in terms of guessing. If believing that P is just guessing that P, then an agent who does guess does not have beliefs.

[27] In that vein, Gibbard ((2008), p. 143) writes that beliefs can't literally aim at the truth; "it's *we* who aim." According to Gibbard, the *purpose* of beliefs is to help us achieve our goals, so the Zen monk poses a different sort of problem for his view.

states, and our trying to get things right, are really one and the same – which is exactly what the guessing reduction says.[28]

But perhaps a more effective reply to the Zen monk objection is dialectical. The Zen monk pushes us in the direction of the view that credences are fundamental and unanalyzable (which is indeed Eriksson and Hájek's conclusion). If that's right, then we cannot answer the question I posed at the outset: namely, what explains numerical credence assignments? Assuming that we do want an answer to that question, we should not be so quick to accept that this Zen monk, who has numerical credences, but no behavioral dispositions whatsoever, can exist.

The preceding objections face any view on which credences model, or reduce to, something else. The guessing view has a promising reply to the first two objections, regarding the primacy of guessing among other dispositions. And while the view is on shakier ground with the Zen monk, it is also not clear that someone really worried about the Zen monk would be interested in reducing credences in the first place.

The next three subsections compare the guessing view to its closest competitors: views that reduce credences to bets, to comparative confidence, and to beliefs.

5.4 | Comparison 1: Guessing vs Betting

The "classic" reductionist view, developed in various ways by Ramsey, Savage, and de Finetti, is that credences model betting behavior. Representation theorems aim to show that we can describe an agent as having (probabilistically coherent) credences and utilities, provided that her preferences have a certain richness and structure to them. Preferences are spelled out in terms of bets at different odds, on the assumption that our willingness to take a certain bet is closely connected with both the value and the perceived likelihood of winning. Those who take credences (and utilities) to *reduce* to betting behavior argue that to have a certain credence in P just is to be disposed to take certain bets on P and reject others.[29]

The betting view faces the same objections that I discussed above. Why single out bets, as opposed to a person's other behaviors of psychological characteristics? What if a person's bets seem to be influenced by irrelevant factors (like bribery, or like the diminishing marginal utility of money), or don't line up with her other behavior? What about the Puritans, or the Zen monk, who don't bet? In response to many of these questions, we can idealize. We can understand bets in terms of utility rather than money, and abstract away from situations of threats or bribery. In these respects, the guessing view fares similarly to the betting view.

The main difference between the two views is their aim. The betting view models credences in terms of what a person cares about, practically speaking; it aims to make sense of our *goal*-directed behavior. A bet, in this context, captures a judgment about practical values. A bet is also an idealized sort of action, making this view apt for explaining our outward behavior rather than something solely mental.

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[28] Alternatively, we might argue that the monk's credences represent the dispositions he *would* have, *were* he to become disposed to guess. But the farther we get from the monk's actual psychology, the less plausible it becomes that we are describing his credences (as opposed to the credences he *would* have, if he were different).

[29] I will not attempt to discuss the mathematical details of the betting representation theorems, but see Titelbaum (2022) for an overview (as well as discussion of the betting representation theorems' suitability in arguing for probabilism). See Eriksson and Hájek (2007) for further critical discussion of the view that credences reduce to bets.

The guessing view, on the other hand, aims to explain our *truth*-directed behavior. A guess just is a judgment about truth and falsity. If credences model guesses – which can themselves be true and false, and which we make with truth as our goal – then we vindicate the view that credences, like beliefs, aim at the truth. The guessing view thereby gives an answer to the popular objection that the betting view is too pragmatic, insufficiently epistemic, and the like.

5.5 | Comparison 2: Guessing vs. comparative confidence

Suppose you are convinced that the betting view is too pragmatic, and that credences should model something entirely mental. And suppose you are also concerned that the numbers attached to credences are superfluous or arbitrary. In that case, you might be attracted to comparativism, or the view that credences model comparative confidence.[30] The guessing view presented here borrows significantly from comparativism, in particular showing the conditions under which guesses can be modeled by a probability function. In light of these similarities, what is there to prefer one account over the other?

One advantage of comparativism, in contrast with the guessing account, is that it has an answer to the Zen monk objection. Comparative confidence, depending on how you understand it, does not obviously require any desire or disposition to act. It's very hard to imagine a Zen monk who has credences but no comparative confidences.

The main disadvantage of comparativism, however, is that comparative confidences cannot be true or false – and so if credences model comparative confidences, we are left with unanswered questions about how credences aim at truth, and how they can be accurate or inaccurate.

Of course, we can say some things about *when* comparative confidence is more or less accurate. If Anna holds A ≻ B, and A is true and B is false, then Anna's comparative confidence ordering is (in that respect) obviously more accurate than Ben's, who holds B ≻ A. This seems to me to be a data point which any view of accuracy for comparative confidence ought to accommodate. However, notice that we still need the theory to accommodate the data. Comparativism needs to be supplemented with something else in order to spell out the connection between credences and truth.

If we compare Anna's and Ben's *guesses*, on the other hand, it's immediately obvious *why* Anna's is more accurate than Ben's: Anna's guess that A is true, whereas Ben's guess that B is false. We don't need an additional theory of accuracy to explain why. The guessing account immediately gives us an answer to how credences can aim at truth (since they model something which itself aims at truth) and it fits naturally with the guessing account of accuracy defended in Horowitz (2019) and Builes et al. (2022). The connection to truth is a reason to prefer the guessing account over comparativism. Or perhaps more conservatively, it is a reason to adopt the guessing account as an interpretation of comparativism – either way, holding in the end that credences reduce to guesses.[31]

5.6 | Comparison 3: Guessing vs. Belief

Finally, how does this view compare with the view defended by Easwaran (2016)? Easwaran's proposal is to reduce credence to on-off mental attitudes which he calls "beliefs." These attitudes are

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[30] Comparativism is defended in Stefánsson (2017); see also Konek (2019) for further discussion.

[31] Thanks to an anonymous referee for pressing on this point.

held towards particular propositions, can be true or false, and must satisfy certain other minimal conditions. Easwaran argues that if we impose certain coherence requirements on these beliefs, we can recover something that looks a lot like Bayesian requirements on rational credence. So we can view credences, and Bayesian epistemology more generally, as a mathematical representation of a more fundamental mental reality: the agent's beliefs.

Easwaran's project is similar to the one I pursue here, in two important ways: both views aim to explain what justifies assigning numbers to credences, and both views aim to explain the connection between credences and truth.[32] Unlike comparativism, Easwaran's view reduces credences to states which can themselves be true or false. And this view also seems to have a good answer to the Zen monk objection: beliefs, in Easwaran's sense, do not depend on our wanting anything or on having any particular goals or preferences.

Is there any reason to prefer the guessing account over Easwaran's view? One reason is, again, that guessing reduction gives us an account of accuracy. Combining the argument here with the accuracy arguments from Horowitz (2019) and Builes et al. (2022), we have a picture according to which credences model something that can be true or false, and the very thing they model also gives us a story about how they can be accurate or inaccurate. (By contrast, Easwaran appeals to epistemic utility theory.)

Second, the guessing reduction allows us to stay neutral on the nature of belief. While Easwaran describes his proposal as "accepting the old-fashioned notion of belief,"[33] it ends up being fairly revisionary. Most surprisingly, beliefs (in Easwaran's sense) need not be consistent: one can rationally "believe" three jointly inconsistent propositions, or "believe" propositions A and B, but fail to believe a third proposition that A and B jointly entail.[34] The preface paradox, which is a major focus of Easwaran's paper, is often cited as an inspiration for thinking in terms of credence *instead of* full belief, precisely because rational incoherence among full beliefs seems like an intolerable result. There is something dialectically odd about replying to this worry by suggesting that our beliefs should be inconsistent after all.[35]

5.7 | Summing up

In responding to the objections above, one main theme emerges: the connection between guessing and truth. If credences model guesses, we have a straightforward story about how credences aim at truth; supplemented with the guessing account of accuracy from Horowitz (2019) and Builes et al. (2022), we also have a straightforward story about how credences can be accurate or inaccurate.

The truth connection sets guessing apart from other behaviors, dispositions, and other psychological phenomena such as emotions, fears, and regrets. It also gives us an advantage over the betting view, which is too pragmatic, and over comparativism, which leaves the role of truth unspecified. And unlike Easwaran's view, it does not require us to accept a revisionary notion of

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[32] See Easwaran (2016) and Easwaran and Fitelson (2015). See also Wilhelm (2018) for further extension. See Dorst (2019) for a similar view of belief; but Dorst argues for a credence-first view, while Easwaran's is belief-first.

[33] Easwaran (2016), p. 818.

[34] Easwaran (2016), p. 829-830; see also Easwaran and Fitelson (2015) for further discussion.

[35] On the other hand, Easwaran's view of belief is fairly minimal: setting aside some bells and whistles, the main point is that a belief is properly evaluated in terms of truth and falsity. With that in mind one might wonder how much would be lost if we gave up the label "belief". Could we call Easwaran's phenomenon something else (maybe "guessing"?) and explain all the same things without the controversial commitments?

belief – only a cleaned-up and idealized version of our ordinary notion of guessing. The upshot of this discussion is that the guessing view holds its own in comparison to its rivals.

6 | GUESSING IN CONVERSATION AND BEYOND

The possibility that credences model guesses is especially intriguing given the recently growing literature on guessing in philosophy of mind and language. Philosophers interested in this recent literature may be especially keen to see how far guessing can get us; for that reason, I will end by looking at how these views fit together.

The recent literature points to a number of important roles for guessing elsewhere in our psychology and behavior. Dorst (2019) argues that a belief is just one's "best guess". Holguín (2022) argues for a similar conclusion, drawing on observations about when we are willing to say that we "think" that P. Dorst and Mandelkern (2021) are also sympathetic to this view, and argue that it can help explain certain patterns of reasoning; in their (2022), they argue that good guessing is the norm of assertion. Goodman and Holguín (2022) argue that guessing plays an important role in deliberation. If guessing can do so much for us, one might think, perhaps it's guesses all the way down.

However, there is an important respect in which these views appear to be incompatible with the view that credences model guesses. The authors cited above all take guessing to be *downstream* from our credences (Dorst (2019) emphatically so). How could this be, if credences are themselves downstream from guesses? To answer that worry I will first look at the relationship between my notion of guessing and the one used by these other authors. Then I will turn to the different roles that guessing plays in each.

This recent spate of guessing papers address a slightly different range of cases from the ones I am considering here. It is wider, in that these authors consider questions with more than two answers, whereas I restrict attention to two-option cases.[36] And it is also narrower, in that these papers assume that the available answers form a partition. The account here considers *all* two-way comparisons, including those where the options are compatible.

It makes sense that Dorst and others focus on the cases that they do. They are building on a standard model of how questions function in conversation, and they are interested in how contextual factors can influence our goals and interests. By contrast, the account of guessing that is relevant here, as well as in the other accuracy-focused papers, builds on the notion of a forced choice, where the context is somewhat artificial and controlled. One notable effect of this difference is that the conversation-based approaches allow "good" guessing to vary with different goals, whereas the forced-choice-based approach ensures that the guesser's only goal is accuracy. Seen in that light, we can understand the forced-choice guesses as a special subset of the wider class – a subset that is purely truth-directed.

We are now in a position to answer the deeper question: how can credences model guesses (in the forced-choice sense) and also rationalize them (in the conversational sense)? I think we can reconcile to two views by understanding them as operating on different levels.

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[36] For instance, one of Dorst and Mandelkern (2022)'s central examples is "Where will Latif go to law school?" They stipulate that the available "complete" answers are {Yale, Harvard, Stanford, NYU}. Dorst and Mandelkern argue that we may prefer to answer "Yale" or "Harvard or Yale", for example, depending on how we balance our interests in accuracy and specificity (or "informativeness").

The basic picture I am suggesting here is that a certain class of truth-directed guesses – the two-way force choices – are theoretically important and interesting. These guesses allow us to construct a person's credences. But actual guessing behavior is more complicated, and sensitive to different contextual factors. As an analogy, consider traditional representation theorems which appeal to betting behavior – not just any betting behavior, but a particular class of clean cases. An extreme example, Ramsey's (1931) representation theorem, focuses on bets about "ethically neutral propositions", meaning propositions such that the agent does not care whether they are true or false.[37] More broadly, consider polls used by social scientists and psychologists to determine people's preferences among social policies, or to screen for mental health conditions. Typically these polls will be designed to minimize framing effects and other factors thought to be confounding.[38] One might look at these clean cases, free of confounders, to determine a person's preferences or other attitudes – and in the next breath, explain the confounders themselves in terms of the more basic preferences and attitudes.

My proposal is that we take the agent's truth-directed, forced-choice guesses as our "clean cases". Credences, which themselves aim at accuracy, model accuracy-oriented guesses. We can then use that model to explain more complicated phenomena, including more complicated instances of guessing. Seen in this light, there is a way forward for philosophers who want guessing to do it all.[39]

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[37] Ramsey (1931); see Titelbaum (2022), ch. 8 for a helpful overview.

[38] Of course, a political poll is designed to *elicit* opinions and preferences, rather than to construct them. It's less clear that the same is true of psychological assessments. The way some doctors discuss such assessments, to be depressed (for example) *just is* to answer a certain percentage of questions a certain way on a suitable questionnaire. However, I don't stake any of my claims here on this controversial view.

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