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Rationality Meets Facts

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# Rationality Meets Facts

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## Abstract

In this paper, we confront two prevailing views of rationality—reason- and coherence-based theories—with empirical facts. While the experimental resolution of the debate between both theories is challenging, we examine two cases in which these theories make distinct predictions regarding whether an agent is deemed rational or not. By directly pitting reason-based against coherence-based theories, our findings indicate that reasons play a more influential role in shaping people's attributions of rationality than coherence.

**Keywords:** Rationality; Ordinary Concept of Rationality; Reasons; Coherence; Empirical Studies.

## Introduction

What is rationality? The two most prominent views of rationality within philosophy—reason-based and coherence-based approaches—take different stances on this question. Reason-based theorists state that rationality is a matter of responding correctly to reasons. For example, if someone believes that it's going to rain because they see dark clouds, reason-based theorists will argue that their belief is rational because it is supported by a good reason. Coherence-based theorists claim that rationality can broadly be understood as having coherent attitudes. For instance, a person's belief that it is going to rain is rational because it's consistent with other information a person has about the weather in this area.

The starting point for most advocates of coherence- and reason-based theories of rationality is our common-sense notion of rationality. For example, Broome (2016, p. 6) claims that “most philosophers who write about rationality intend to write about it as it is commonly understood”. According to Broome (2021, pp. 92-93), theories of rationality should align with our ordinary concept of rationality (see also Kolodny 2005). While most theorists agree with Broome, others, such as Wedgwood (2017, p. 23), consider his theorizing about rationality to be more in the line of “constructive theory building” than an analysis of everyday thought. However, the ordinary notion of rationality may be relevant for a theory of rationality even if one refrains from conducting a conceptual analysis (Svavarsdóttir 2008).

Whether theorists analyze, explicate or engineer the concept *rationality*, we need to know what people think

rationality is. This can only be done by knowing the empirical facts about “our” concept of rationality. Thus, it is surprising that there are very few empirical studies of the folk notion of rationality. Baron & Hershey (1988), Gergely et al. (2003), Tobia (2018), Grossmann et al. (2020), Messerli, Fink & Reuter (2022), Kneer (2022), Baumgartner & Kneer (forthcoming), Grüning & Beisbart (ms), as well as Reuter et al. (ms) provide some exceptions, but do not address the question we are interested in: Does the reason- or coherence-based theory better match the ordinary concept of rationality?

This paper aims to present empirical facts, at least in the sense of establishing an initial empirical foundation for the philosophical debate. It is structured as follows: First, we provide an overview of the theoretical background. Specifically, we argue that it is feasible to resolve the dispute between reason- and coherence-based theorists on empirical grounds. The second part outlines three experiments that suggest a prevailing belief among individuals that the accurate response to reason holds greater significance in defining rationality than maintaining coherence. Finally, we conclude by discussing the broader implications derived from our findings.

## Reasons versus Coherence

We begin our discussion by introducing the debate about reason- versus coherence-based rationality. The first part focuses on the core of the theories. In the second part, we argue that it is challenging but possible to decide the debate experimentally.

## The Core of the Theories

At the heart of coherence-based rationality lies the concept of coherence. Worsnip (2018a) has claimed that incoherence has to be understood as being constitutively disposed to giving up one of the attitudes under full transparency. Fink (2023) has interpreted incoherence as the impossibility for certain combinations of attitudes to be jointly successful. According to these characterizations, rationality is disentangled from the external world. This position became known mainly via Broome's pioneering work in the field; as he stated, “it seems to be a conceptual feature of rationality that it depends only on the mind” (Broome 2013, p. 89). Thus, only the co-

herence of internal states matters: If an agent believes  $p$  and  $\neg p$ , she is incoherent, and thus fails to be rational. The agent can then re-establish rationality by eliminating one of these beliefs.

At the heart of reason-based rationality lies the concept of a reason, as the following views nicely illustrate: Lord (2017) argues that an agent is rational if she correctly responds to reasons (p. 1130), and Kiesewetter (2017, p. 160) believes that all requirements of rationality are requirements of reason. In a simplified vein, advocates of reason-based rationality state that a person is rational if and only if she chooses an action that she has an (all-things considered) reason to perform and if she bases her intentions or beliefs on good reasons. If an agent has decisive reason to believe that  $p$ , then she is rational if and only if she maintains this belief.

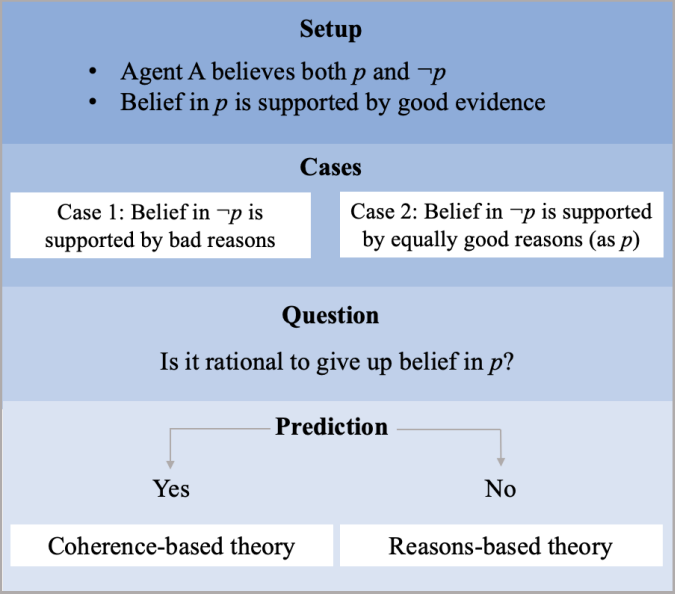
In summary, the reason- and coherence-based conceptions of rationality have been one of the main fault lines in contemporary discussions about rationality. While reason-based views are typically concerned with the content of individual attitudes, coherence-based views focus on combinations of attitudes (see Kiesewetter & Worsnip 2023, Section 1.2, for a more detailed analysis).

### Do the Theories Make Different Predictions?

At first glance, it appears that both theories are appealing from an intuitive point of view. It would not be particularly surprising to find that people think that both an incoherent agent and an agent who has dubious beliefs or intends something for which she has no reasons, would be irrational. Therefore, not only coherent reasoning but also normative reasons might play important roles for the application of the ordinary concept of rationality. One direct approach for testing which of these positions reflects the empirical facts more accurately (that is, how people understand the concept of rationality) is to investigate what happens when these concepts are in conflict with each other, which is precisely what we do in this paper.

Admittedly, it is challenging to settle the dispute between the reason-based view and coherence-based view experimentally. Consider the following case: If Tom believes  $p$  and  $\neg p$ , at the same time, one of these two beliefs will—at least in most cases—not be sufficiently supported by reasons. Thus, in general, having incoherent beliefs implies that one of the beliefs is not supported by reason. Of course, coherence theorists and reason theorists will disagree on *why* the agent is considered to be irrational, but not *that* the agent is irrational.

Nevertheless, we contend that instances exist where coherence and reason theorists diverge in their predictions. Specifically, we have identified two cases where these theories appear to offer distinct forecasts regarding an agent's rationality. The foundational structure of our case studies involves an agent who simultaneously



**Figure 1** Comparative Schema of the two cases and experiments.

believes in  $p$  and  $\neg p$  (see e.g. Wood et al. 2012). Such a contradiction is inherently problematic for coherence theorists, who argue that this form of belief incoherence must be resolved by dropping one of the conflicting beliefs. Consequently, dropping belief  $p$  would be a rational choice. In contrast, reason-based theorists emphasize that the decision to give up a belief should hinge on its evidential support. In both of our case studies, the belief  $p$ , which is ultimately abandoned, is substantiated by robust evidence. Therefore, from the perspective of the reason-based theorist, dropping belief  $p$  would be an irrational choice. The general structure of the two cases are depicted in Figure 1.

As depicted in Figure 1, the key distinction between the two cases centers on the quality of evidence supporting the belief in  $\neg p$ . In Case 1, the belief in  $\neg p$  is underpinned by weaker reasons compared to those for  $p$ . The basic idea is that in Case 1 scenarios, dropping the more strongly justified belief appears to render an agent less rational in accordance with the reason-based view, but not in line with the coherence-based view. Coherence-based theorists are likely to object that the strength of a reason will have down-stream effects on how globally coherent the agent is. We therefore present the results of two Case 1 studies, the second of which directly addresses this objection. In Case 2, both contradictory beliefs draw on evidence of equal strength. Again, if participants deem it rational to discard one of the contradictory beliefs, this would provide empirical support for the coherence-based view. Conversely, if participants consider it rational to maintain both beliefs despite their incoherence, this would provide strong support for the reason-based account.

## Study 1: Beliefs with differing evidential support

In the preceding section, we established that there exist, minimally, two distinct scenarios wherein coherence and reason-based perspectives on rationality diverge in their predictions regarding an individual’s rational behavior. This section, along with the subsequent one, is dedicated to empirically evaluating these theories by closely examining the specified cases.

### Methods & Hypotheses of Study 1a

In this preregistered experiment, participants were presented with one of four vignettes. In all the vignettes, an agent has two contradictory beliefs,  $p$  and  $\neg p$ , about a topic  $T$  (either about the harmfulness of the flu or about the scientific status of astrology). The participants were also told that the agent had reasons for holding these beliefs. However, whereas  $p$  was supported by a good reason,  $\neg p$  was supported by an inferior reason.

When realizing their contradictory beliefs, the agent gives up one of the beliefs. In the two “bad reasons” conditions, the agent sticks to the belief that is supported by a bad reason (and gives up the belief supported by a good reason), while the agent sticks to the belief that is supported by a good reason in the two “good reasons” conditions (and gives up the belief supported by a bad reason). The following vignette was one of two different vignettes we used (see also online material):

#### The Flu Case

*Anne is a 70-year-old woman. Anne believes that the current flu can be harmful to her because this is what her doctor told her. Anne also believes that the current flu cannot be harmful to her because this is what her neighbor told her.*

#### Good Reasons Condition

*Considering these two beliefs, Anne realizes that both beliefs cannot be true; thus, she decides to give up the belief that the current flu cannot be harmful to her. She also now thinks that her neighbor’s claim was not a good reason to think that the flu would not be harmful to her.*

#### Bad Reasons Condition

*Considering these two beliefs, Anne realizes that both beliefs cannot be true; thus, she decides to give up the belief that the current flu can be harmful to her. She also now thinks that the doctor’s claim was not a good reason to think that the flu could be harmful to her.*

The participants were then asked three questions: 1a: Do you think that [agent] holds contradictory beliefs about [topic  $T$ ], once [agent] gives up the belief that [ $p$ ]? 1b: Do you think that [agent] has good reasons for believing that [ $\neg p$ ]? 2: Do you think that [agent] is ratio-

nal in giving up the belief that [ $p$ ] given the inconsistency with [agent]’s other belief?

The first two questions (1a & 1b) served as control questions. We excluded participants who responded incorrectly to at least one of them. These somewhat strict exclusion criteria were established to ensure that (a) our participants understood that the agent (Anne/Chris) was entertaining coherent beliefs about topic  $T$  after giving up one of the beliefs, and (b) that the participants correctly identified the quality of the reasons.

People’s answers to question 2 (our main question) were measured on a 7-point Likert scale ranging from “-3 = Not at all rational” to “3 = “Completely rational”. The 401 participants were recruited on Prolific, and 218 participants had to be excluded because they did not pass our control questions. The remaining sample consisted of 84 females, 98 males, and one person who identified as non-binary. The mean age was  $M_{age} = 36.83$  years ( $SD = 12.68$  years).<sup>1</sup>

Coherence-based theorists should predict that people will think it was rational to give up one of the two beliefs independently of which belief the agent chose to abandon. By contrast, advocates of the reason-based view will predict that people’s responses will depend on which of the two beliefs the agent gives up.

## Results

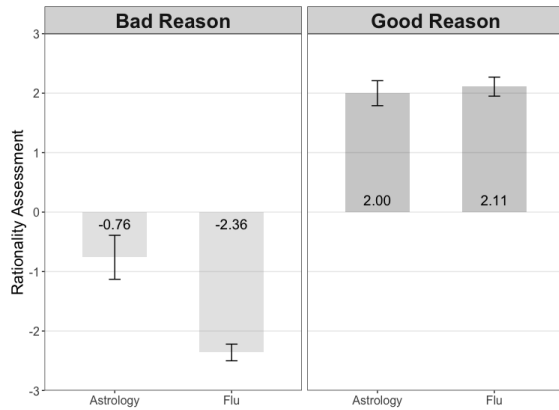
The average responses for all four conditions are presented in Figure 2.<sup>2</sup> We collapsed the data from both the astrology and the flu cases (as preregistered). In the good reasons scenarios, the mean rating ( $M_{av} = 2.06$ ,  $SD = 1.32$ ) was significantly above the midpoint,  $t(108) = 16.31$ ,  $p < 0.001$ . In the bad reasons conditions, the average rating ( $M_{av} = -1.73$ ,  $SD = 1.62$ ) was significantly below the midpoint of ‘0’,  $t(73) = -9.16$ ,  $p < 0.001$ .

## Discussion of the Results

If the folk concept of rationality pertains to having good reasons, an agent should be judged as being rational if she gives up a belief that is not supported by good reasons. The results in the bad reasons conditions are in favor of reasons being central to rationality. By contrast, if the folk concept of rationality pertains to coherence, an agent will be judged as being rational if she gives up a belief that is inconsistent with another belief. The results in the bad reasons condition argue *against* coherence being central to rationality.

<sup>1</sup>The more detailed hypotheses, as well as other aspects of the study, were preregistered on the Open Science Framework; <https://osf.io/fdphb/>

<sup>2</sup>We conducted a 2X2 ANOVA with the dependent variable *Rationality* and the independent variables *Reasons* and *Scenario*. Both *Reasons*,  $F(3, 179) = 292.10$ ,  $p < 0.001$ ,  $\eta^2 = 0.62$  and *Scenario*,  $F(3, 179) = 12.45$ ,  $p < 0.001$ ,  $\eta^2 = 0.06$  were significant factors. There was also a significant interaction between *Reasons* and *Scenario*,  $F(3, 179) = 16.25$ ,  $p < 0.001$ ,  $\eta^2 = 0.08$ .

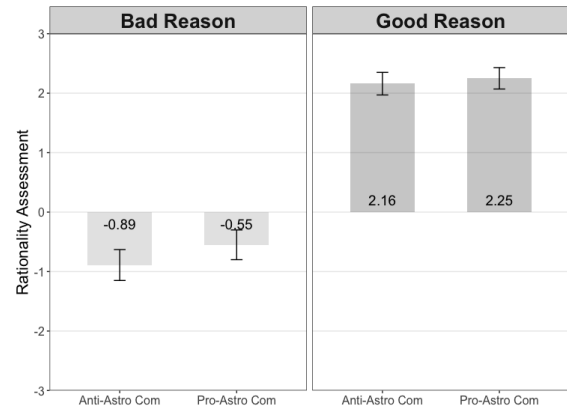


**Figure 2** Mean responses to the rationality question in four different conditions. Error bars indicate the standard error around the mean.

### Study 1b: Local versus Global Coherence

At this point, one might object that there is an important difference between local coherence and global coherence. Our control condition only ensured that people believed Anne to be locally coherent about a specific topic. Our approach did not guarantee that the participants also believed Anne to be globally coherent in a relevant sense. To see how this might have affected our results, consider the possibility that Anne actually believes that being educated in a specific field makes people more expert about that field. When this is applied to doctors, she believes that doctors have more expertise about diseases than do people who have not had a medical education. Thus, when Anne disregards her belief about the doctor's claim about the flu, her beliefs do indeed become locally coherent, but a more global incoherence arises between her belief that the doctor is wrong and her neighbor is right, and the belief that doctors in general know more about the flu than do neighbors without a medical education.

We decided to empirically investigate the effect of local versus global incoherence in a follow-up experiment. Given the difficulties of describing a plausible story while avoiding global incoherence in the flu case, we focused on the astrology case, and randomly assigned participants to four different vignettes. In each of the four vignettes, it was stated that "Chris believes that astrology is scientific, because astrology has often predicted some events happening in his life correctly". However, in the first two conditions, the community in which Chris lives is a pro-astrology community and, in the latter two conditions, it is an anti-astrology community.



**Figure 3** Mean responses to the rationality question in four different conditions.

#### Pro-Astrology Community

*Chris is a 20-year-old man who lives in a small remote village. In that small village, all his friends, relatives, and neighbors believe that astrology is scientific because they believe that astrology often makes correct predictions about how things will turn out in the future.*

#### Anti-Astrology Community

*Chris is a 20-year-old man who lives in a small remote village. In that small village, all his friends, relatives, and neighbors believe that astrology is unscientific because they believe that astrology often makes incorrect predictions about how things will turn out in the future.*

The participants were then assigned to either the bad reasons condition or to the good reasons condition. The complete vignettes that were given to participants in the conditions are available here: <https://osf.io/u86xh/>.

After they were presented with the vignettes, the participants were then asked the same three questions about contradictory beliefs, about good reasons, and about rationality as in Study 1a. If people do indeed consider the global incoherence of Chris's beliefs, we should find an effect of community on people's response ratings. However, as Figure 3 shows, no such effect was found. We ran a 2X2 ANOVA with a dependent variable *Rationality* and the independent variables *Community* and *Reasons*. While *Reasons* was revealed to be a significant factor,  $F(3, 54) = 72.08$ ,  $p < 0.001$ , *Community*,  $F(3, 54) = 0.19$ ,  $p = 0.661$ , was not significant.<sup>3</sup>

The results of the experiment suggest that people's rationality ratings are not affected by the beliefs of the community in which the agent is embedded. Thus, possible tensions between an explicit belief that an agent entertains, such as astrology is scientific, and the implicit beliefs of that agent given their upbringing, such as astrology is unscientific, did not appear to play any

<sup>3</sup>There was also no significant interaction between *Reasons* and *Community*,  $F(3, 54) = 0.028$ ,  $p = 0.868$ .

significant role in how laypeople evaluate an agent’s rationality.<sup>4</sup>

## Study 2: Beliefs with equal evidential support

In the theoretical part, we identified two cases in which reasons-based and coherence-based theories make different predictions about the rationality of a person. In this section, we empirically investigate the second of such cases.

### Methods & Stimuli

In pre-registered Study 2, we examine participants’ reactions to two scenarios. Each scenario features a protagonist who has compelling reasons to believe in a proposition  $p$ , and also has compelling reasons to disbelieve it ( $\neg p$ ).<sup>5</sup>

Participants were randomly assigned to either the stock condition or the history condition. The main purpose of having two different stories is to ensure the robustness of the results, i.e., that the story itself is not confounding people’s responses. The history story read:

*Laura is studying the causes of a historical war and seeks to understand its primary triggers. Historian Dr. Martinez tells her that economic factors were the main cause. Dr. Martinez’s view is supported by a detailed analysis of economic conditions and policies leading up to the war. Laura thus believes that economic factors were the primary cause. Dr. Huang, another historian, argues that economic factors were not the main cause. Dr. Huang’s view is backed by extensive documentation and political analysis of that era. Consequently, Laura believes that economic factors were not the primary cause. Considering her two beliefs, Laura realizes that both beliefs are contradictory and cannot be true at the same time.*

The participants were then asked the main test question: Is it more rational for [protagonist] to give up one of the two beliefs or to stick with both beliefs? The answer options were (a) It is more rational to give up one of the two beliefs; and (b) It is more rational to stick with both beliefs.

After they were given a chance to explain their response, participants were asked: Do you think that [protagonist] has reasons to think that one of the contradic-

tory beliefs is supported by better evidence? [Answer options were “Yes.” and “No.”]

When participants perceive no difference in the quality of evidence supporting the two contradictory beliefs, the coherence theory predicts that it is more rational for the protagonist to abandon one belief. In contrast, the reasons-based theory posits that it is more rational for the protagonist to maintain both beliefs. Conversely, if participants deem one of the contradictory beliefs as better supported by evidence, the reasons-based theory then predicts that it is more rational for the protagonist to relinquish the less supported belief.

221 participants were recruited on Prolific, 108 people identified as “woman”, 111 as “man”, and two people identified as “Other”. The mean age was  $M_{age} = 40.25$  years ( $SD = 12.83$  years).<sup>6</sup>

### Results

Figure 4 presents the average ratings for each condition individually. However, since the outcomes for both conditions did not show significant differences, we combined the data for a consolidated analysis. In the condition in which participants indicated that one option was supported by better reasons, i.e., in the “One Option Better”-condition, “Stick-with-belief” constituted only 20.24% (95% CI [13.04%, 30.04%]) of the responses. In contrast, the condition in which participants state that the agent has equally good evidence for both option, exhibited a more balanced response distribution, with “Stick-with-belief” responses at 54.01% (95% CI [45.67%, 62.14%]).

When comparing responses to a 50-50 distribution using a  $\chi^2$ -squared test, the One Option Better-condition showed a significant deviation,  $\chi^2 = 15.05, p < 0.001$ . The Equally Good Evidence-condition did not show a significant deviation, with  $\chi^2 = 0.30, p = 0.586$ . Furthermore, a direct comparison of the One Option Better-condition and the Equally Good Evidence-condition yielded  $\chi^2 = 23.15, p < 0.001$ , indicating a significant difference between the two conditions.

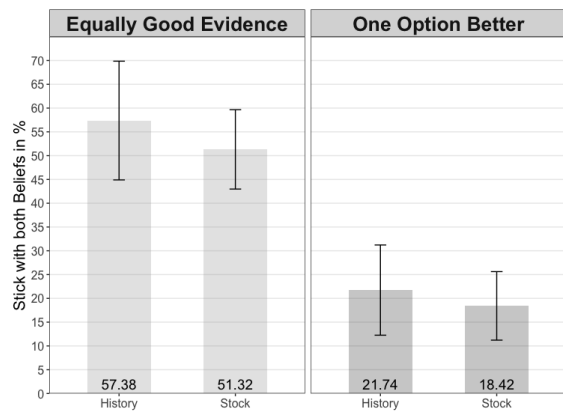
### Discussion

Most participants who deemed one option as more strongly supported by evidence believed that the agent (John/Laura) was justified in giving up one belief. This aligns with both coherence and reason-based theories, offering no surprise. The pivotal condition involved participants perceiving both options as equally viable. In this case, a non-significant majority regarded the agent’s adherence to both beliefs as rational, mildly endorsing the reason-based perspective. Nevertheless, coherence proponents can find solace in that a substantial minor-

<sup>4</sup>We plan to extend our research to examine how participants evaluate reasoning when reporting beliefs in social contexts while incentivized with rewards.

<sup>5</sup>We developed two new scenarios and refrained from modifying the two vignettes of study 1a and 1b, because we wanted to avoid large disagreement with our claim that both experts have equally good evidence. In the flu case, it is likely that many participants would have judged that one doctor must have better evidence for his assessment than the other.

<sup>6</sup>The hypotheses, as well as other aspects of the study, were preregistered on the Open Science Framework; <https://osf.io/82m75>



**Figure 4** Mean responses to the rationality question in Study 2.

ity found it rational to give up one of the beliefs, even though both were well substantiated.

### Broader Implications of Our Findings

In this paper, we have made a theoretical and an empirical contribution. The theoretical focus of our contribution centers on identifying instances where coherence and reason theorists offer distinct predictions—an aspect that, to the best of our knowledge, has been overlooked until now. On the one hand, there are diverse views on whether these theories can come into conflict (an elaboration on this goes beyond the scope of the paper). On the other hand, for those asserting the presence of potential conflicts, the available literature providing cases is limited (exceptions include Christensen (2013), Easwaran & Fitelson (2015), Worsnip (2018b), and Worsnip (forthcoming)). Moreover, it is important to note that most of the existing cases are highly abstract. This paper highlights two straightforward and concrete contexts where these theories seem to yield different forecasts concerning an agent's rationality. The empirical contribution involves an investigation into whether coherence-based or reason-based theories align more closely with people's conceptions of rationality. The results favor the reason-based approach. If we accept laypeople's understanding of rationality at face value, the initial question receives the following answer: Our folk understanding of rationality is more strongly associated with being responsive to reasons than with being coherent. That said, our studies are certainly limited in their scope and further empirical studies are needed to draw more robust conclusions. In future studies, we aim to adopt a Bayesian framework which emphasizes the importance of degrees of belief.

Which broader implications can be derived from our research? This depends significantly on one's perspective: Are we engaged in *conceptual analysis* or in *constructive theory-building*? In conceptual analysis, the norm is to dissect a concept using the method of cases.

This involves crafting thought experiments where either experts (traditional approach) or a representative group of individuals (XPhi approach) assess the applicability of a specific concept in various scenarios. In our study, we introduced two such thought experiments and submitted them to a representative sample. It must be acknowledged that our findings do not point to a definitive conclusion. While the reason-based perspective seems to prevail in our experiments, the importance of coherence is evident, as it significantly influences judgments regarding rational behavior in agents.

The situation looks markedly different, when we are concerned with constructing a theory of rationality where the notion of rationality is supposed to be very similar to the ordinary concept, but considerable differences are permitted. It is worth noting that many philosophers specializing in rationality are willing to deviate from the ordinary concept if it enhances attributes such as fruitfulness and simplicity. This leads us to ponder what implications this has for the conceptual engineering of *rationality*, and the key takeaways for theorists from our discoveries. If the goal is to develop a (unified) theory that prioritizes either reason-responsiveness or coherence, the evidence strongly suggests favoring a focus on reasons over coherence. While coherence may still play a role in evaluating a person's rationality or actions, our findings indicate that reasons are a more crucial element in our understanding of rationality. Therefore, in constructing a unified theory of rationality, it would be more effective to center it around reasons. Conversely, limiting the definition of 'rationality' strictly to meeting coherence criteria becomes contentious, diverging from the perspective of many scholars in practical rationality, such as Worsnip (2018b, p. 29). Although it is possible to define 'rationality' in such a restricted manner, as Worsnip (2018b), Broome (2013), Fink (2023), and many other philosophers do, this approach significantly diverges from the general public's understanding of the term.

### Conclusion

To date, no one has systematically investigated whether proponents of reason or coherence theories align more closely with our everyday conception of rationality. This paper addresses this gap. Our findings pose a challenge for coherence-based theorists as they are confronted with data indicating only a weak alignment between the everyday understanding of rationality and the coherence theory.

## Acknowledgements

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