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ORIGINAL RESEARCH

How the evaluability bias shapes transformative decisions

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Abstract
Our paper contributes to the rapidly expanding body of experimental research on transformative decision making, and in the process, marks out a novel empirical interpretation for assessments of subjective value in transformative contexts. We start with a discussion of the role of subjective value in transformative decisions, and then critique extant experimental work that explores this role, with special attention to Reuter and Messerli (2018). We argue that current empirical treatments miss a crucial feature of practical deliberation manifesting across a variety of everyday decisions: often, people attach more weight to decision criteria that they can know—a phenomenon known as the "evaluability bias." In transformative contexts, if people cannot know the subjective value of an option, they are unlikely to attach it much weight. Despite this, people may care very much about such value. We then use this point to develop and present new empirical results that, in addition to supporting our concerns about evaluability bias, support the hypothesis that people care about subjective value. Our work enriches the current philosophical understanding of transformative decisions and helps to frame the emerging experimental paradigm for the empirical dimensions of the debate.

Keywords Transformative decision · Subjective value · Evaluability bias · Cognitive science

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1 Introduction

1.1 The decision-theoretic bind

A transformative experience is epistemically revelatory and life-changing. It brings about a profound epistemic shift that changes a person's core personal preferences.

Examples of transformative experiences include the gain or loss of sensory capacities, becoming a parent, emigrating to a country with a culture very different from one's own, or fighting in a war. For instance, a congenitally blind adult who gains vision through retinal surgery will have experiences of a type and character that he has never previously experienced. This will lead to changes in some of his core personal preferences. Similarly, a new recruit who goes off to war and has to kill enemy troops, a refugee emigrating from war-torn Syria, or a woman having her first child all face dramatically new types of experiences that can bring about deep changes in what they know and care about.

Crucially, for an experience to be transformative for a person, it must be new to them. It involves a type of experience they have not had before, and when they do have it, in virtue of discovering what it's like, they undergo an epistemic transformation. This gives them new abilities to represent and accurately simulate possible states of affairs involving it (Jackson, 1986; Lewis, 1990; Paul, 2014, 2015b). Knowing what the experience is like is a key that unlocks the door to a trove of additional important content: once the person can represent and simulate in the right way, they discover further information, including information that can lead to significant changes in their values, beliefs and preferences. Such discoveries can lead to personal transformation: for example, some of a person's core values change or are replaced. Transformative experiences are strictly defined as experiences that are both epistemically and personally transformative.

Special questions arise with these types of experiences in practical deliberation contexts. (Not all transformative experiences are chosen or deliberated about.) The difficulty is that a person must decide whether to undergo the transformative experience before having the epistemic and personal changes that it entails. Paul (2014) argues that, when people care about the subjective value of the consequences of undertaking a transformative experience, they can find themselves in a decision-theoretic bind.

> A natural way to make major life choices, such as whether to start a family or to pursue a particular career, is to assess our options by imaginatively projecting ourselves forward into different possible futures. But for choices involving dramatically new, life-changing experiences, we are often confronted by the brute fact that before we undergo the experience, we know very little about what these future outcomes will be like from our own first-personal perspective. Our imaginative and other epistemic capacities are correspondingly limited, with serious implications for decision-making. If we are to make life choices in a way we naturally and intuitively want to—by considering what we care about, and imagining the results of our choice for our future selves and future lived experiences—we

> only learn what we really need to know after we have already committed ourselves. If we try to escape the dilemma by avoiding the new experience, we have still made a choice. Paul (2015a, pp. 761–762).

The decision-theoretic bind arises in contexts where people must choose without a fully defined subjective value function, and it is this type of context we will focus on.

Subjective values are experientially grounded values attaching to lived experiences: values that attach to the contentful features of rich, developed experiences embedded in a range of mental states such as beliefs, emotions, and desires. As such, they attach to "what it's like" to have that experience. But do not be misled by the "what it's like" terminology: "what it's like" concerns the nature, content, and character of the lived experience as a whole, not merely its phenomenal character or its "feel." That is, "what it's like" encompasses *both* the phenomenal character of the experience, *and* how other aspects of the lived experience are colored by that phenomenal character. While phenomenal character may be conceptually distinct from the other, more contentful elements of a lived experience, in practice, it is not psychologically distinct. Thus, in practical deliberation contexts, subjective values of lived experiences are not defined merely by the phenomenal characters of the internal characteristics of one's inner life. They are richer values, values that include an assessment of the nature of what it's like to live "in this," as Campbell (2015) puts it.

Although subjective value is not defined merely by phenomenal character, Paul (2014) argues that our grasp of phenomenal character plays a key role in our subjective value assessment. This is because, in real-world contexts, subjective value is not psychologically accessible to a person unless they have come into contact with the relevant phenomenal character. Phenomenal characters constitutively shape and define the nature of lived experiences, and one must grasp the relevant phenomenal character in order to know the (relevant) nature of that kind of lived experience, viz., to know what that experience is like. Since knowing what an experience is like is necessary for an assessment of its subjective value, a person must have the experience in order to assess its subjective value.

If a person cares about the subjective value of the outcomes they are considering, then when they deliberate, they will want to assess the expected subjective value of each act that is available to them. For example, if a woman who is deciding whether to become a parent cares (to a significant extent) about *what it will be like* for her to be a parent, the subjective value of what it will be like for her to be a parent (and the subjective value of remaining childless) should play a significant role in her decision.

The problem with partially defined subjective value functions arises when people lack the relevant life experience required for determining the values to hand. For example, a natural way for a prospective parent to try to determine their subjective values is to simulate themselves in the different proposed parenting and child-free scenario(s) to see how they would respond, and reverse engineer their preferences accordingly (Barron et al., 2013; McCoy et al. 2020; Kappes and Morewedge 2016; Williamson 2016). Without the right experiential background, they may not be able to perform the simulation needed to accurately represent and grasp the subjective value of the possible (transformative) experience. If people cannot anticipate their future subjective values, they cannot straightforwardly factor these subjective values into

their utility estimation process. As a result, their value function goes undefined at this point. As a consequence, they lack defined preferences and cannot determine how to maximize their expected value, and thus cannot rationally decide between their options.

But, with respect to real-life decision making, are these really problems that confront a decision maker? The debate over transformative experience spans the normative as well as the descriptive. As a result, one could make objections to Paul's theory, but, unusually for philosophical arguments concerning issues of practical deliberation and formal epistemology, one can also raise empirical objections. That is, there is a dimension to Paul's thesis that falls under the scope of the experimental: part of the puzzle that transformative experience seems to raise for practical reasoning and rational deliberation concerns suppositions that are empirically evaluable. In particular, Paul claims that, in real life, assessments of subjective value are important to us when we make big life decisions. If this is so, the philosophical issues raised by transformative decision making have important, real life consequences.

Experimental philosophers and cognitive scientists have begun to explore the empirical dimensions of transformative experience. Hoerl and McCormack (2016) explore the way that the ability to anticipate regret might be adaptive in transformative choice-making. Reuter and Messerli (2018) attack the presupposition that people care about subjective value. McCoy et al (2019) take the opposite tack, and find that most people think they can discover something about their preferences by thinking through transformative scenarios. Molouki et al. (2020) look at how a person's intuitive theory of the self is influenced by beliefs about personally transformative experience. Zimmerman and Ullman (2020) develop a normative hierarchical model for decision-making over novel objects and argue that it captures the commonsense intuition that we can rationally decide to try a new experience, but also that such decisions can be graded in difficulty. McCoy and Ullman (2020) discuss, in the context of current empirical research on decision making, the way we imagine potentially agonizing transformative experiences. They suggest that, in such contexts, the mind may only consider decisions as cordoning off futures. Yudkin et al. (2022) explores the possibility that the prosocial qualities of transformative experience at secular mass gatherings create lasting changes in moral orientation, and shows that people who undergo such experiences report that their moral values changed in ways they could not have anticipated before having the experience.

Our paper contributes to the rapidly expanding body of experimental research on transformative experiences, and in the process, marks out a novel empirical interpretation for assessments of subjective value. We start by critiquing Reuter and Messerli (2018), arguing that, often, people attach more weight to decision criteria that they can know—a phenomenon known as the "evaluability bias". We then use this point to develop and present new empirical results that, in addition to supporting our concerns about evaluability bias, support the hypothesis that people do in fact care very much about subjective value. If so, the inaccessibility of such value is indeed a threat for practical decision making in transformative contexts. Our work enriches the current philosophical understanding of transformative decision making and helps to frame the emerging experimental paradigm for the empirical dimensions of the debate.

1.2 The evaluability of subjective value in transformative decisions

Reuter and Messerli (2018) claim to dissolve the argument for the decision-theoretic bind by arguing that empirical results show that people do not, in fact, care much about subjective value. If so, they argue, people can make rational decisions in transformative contexts based on other, more accessible, values.

As part of their empirical approach, Reuter and Messerli (2018) develop a choice model for making rational transformative decisions that specifies "weights" on decision criteria. In the case of deciding whether to have a child, for example, these criteria include the preferences of one's partner, the costs of having a child, and the subjective value of having a child. The overall utility of the decision to have a child is determined by multiplying the extent to which each criterion favors having a child by the weight placed on that criterion, and summing across these weighted values. Their model indicates that as long as the weight on subjective value ($w_{\text{whatitslike}}$) is less than the sum of the weights on all other decision criteria (w_{partner}, w_{costs}, and so on) then transformative decisions can be rational. That is, if $w_{\text{whatitslike}} < 0.5$, then subjective value is not "the central" decision criterion and can be safely cast aside in the decision, if, as they claim, it is "not important enough to influence the decision process" (p. 11).

To get to this claim, they conducted empirical studies in an attempt to discover the actual weights people attach to various decision criteria, including subjective value, when making transformative decisions. Participants were asked to consider three different types of transformative experience—having a child, becoming a vampire, and living on Earth under alien rule—and to indicate how much they would weigh each of six different decision criteria in order to arrive at a decision. Participants did not weight subjective value higher than they weighted other decision criteria. Based on these findings, Reuter and Messerli conclude that "…the importance of the subjective value is often much lower than has so far been assumed by Laurie Paul [sic] and other scholars working on this topic" (p. 24).

We disagree with this conclusion and suggest there is a more interesting phenomenon in play. To see our reasoning, start by taking Reuter and Messerli's data at face value. If it is indeed the case that people report they do not weight subjective value more strongly than other criteria in transformative decisions, does it follow that they think subjective value is not an *important* criterion in those decisions?

It does not follow. Participants in these studies were asked "How would you arrive at a decision?", which is fundamentally a question about how people think they would assign weight to different criteria in their decision process. Research on decision-making shows that people weight decision criteria in proportion to how easy they are to evaluate (Bazerman et al., 1992; Hsee, 1996a, 1996b; Hsee & Zhang, 2004, 2010; Caviola et al., 2014). This phenomenon, known as the "evaluability bias," shows that people place a low weight on certain decision criteria not because they consider such criteria unimportant, but because they are difficult to evaluate. Subjective value may well be important to people, but when contemplating a transformative decision it may not be a criterion that they are able to evaluate. Thus, they may not weight it heavily when they make a decision.

Consider two diamond shoppers: an expert gem trader and a naive shopper who knows very little about gemstones. The expert is likely to heavily weight several criteria when deciding which stone to buy and how much to pay for it, including cut, color, clarity, and carat (size). The more knowledge the expert has about these criteria (e.g., how to evaluate the clarity of a stone), the more sensitive she will be to variations in these criteria when determining how much a stone is worth to her (e.g., decreases in clarity among stones will track more closely with decreases in value).

The naive shopper, in contrast, lacks the ability to evaluate some of these criteria. As a consequence, he will be insensitive to variations among stones on those criteria he is unable to evaluate, and base his decision only on those criteria that are easy to evaluate (e.g., carat size). If he does not know how to evaluate clarity, for instance, he will not demand a lower price for a stone with poor clarity. But that doesn't mean he does not care about clarity and would not value clarity if he were taught how to evaluate it; it just means that he lacks the knowledge necessary to evaluate clarity, and therefore cannot weight clarity in his decision process. When he decides which diamond to buy, he will not assign a significant role to judgments of clarity. He may even make a suboptimal decision: an unscrupulous seller, detecting the naive shopper's lack of knowledge, could charge him a higher price for a large stone with poor clarity than he could charge the expert gem trader.

The naive shopper's over-reliance on carat size in his decision process is an instance of the evaluability bias. Classic work by Kahneman and colleagues demonstrated that what people predict will make them happy (predicted utility) and the values people base their decisions on (decision utility) often substantially differ from what actually makes them happy (experienced utility; Kahneman, 2000; Kahneman & Snell, 1990, 1992; Kahneman et al., 1997; c.f. Hsee & Zhang, 2004). That is, there is extensive empirical evidence showing that when people are asked to evaluate multiple decision criteria and predict which ones will make them happy in the future, they are notoriously bad at doing this.

Hsee and Zhang (2010) comprehensively review studies showing that when deciding between two options that differ on criteria that are easy and difficult to evaluate, decision-makers inappropriately over-weight criteria that are easy to evaluate. For example, when deciding between an interesting job that pays $60,000/year and a tedious job that pays $70,000/year, people overestimate the impact that the $10k difference in salary will have on their future happiness, because salary differences are easy to evaluate (whereas the distinction between an "interesting" and a "tedious" job is less easy to evaluate). This can lead to suboptimal choices, such as choosing the tedious $70,000 job over the interesting $60,000 job, even if the latter would bring them more happiness (Hsee & Zhang, 2004).

Another manifestation of the evaluability bias in the literature emerges in the form of preference reversals that depend on whether options are evaluated in isolation or in conjunction (List, 2002; Zikmund-Fisher et al., 2004; Hsee, 1996a, 1996b). Jointly comparing options can enhance the evaluability of decision attributes, implying that the strength of this bias can vary across mode and context of decision-making (Hsee & Zhang, 2010).

To summarize: there is a wealth of evidence for the evaluability bias, with dozens of studies empirically demonstrating it across different choice settings, including gambling decisions (Goldstein & Einhorn, 1987; Lichtenstein & Slovic, 1971); purchasing decisions (Hsee, 1998, 2008; List, 2002); employment decisions (Bazerman et al., 1994; Hsee, 1996a, 1996b); health care decisions (Zikmund-Fisher et al., 2004); interpersonal comparisons (Bazerman et al., 1992); and altruistic decisions (Caviola et al., 2014; Kogut & Ritov, 2005).[1]

Here we examine the evaluability bias in the context of transformative decisions. A natural and consistent inference, consistent with Paul's argument that people care about subjective value, is that, if people in fact knew the subjective value of an option, they would assign it a high weight in their decision model. For this reason, the assessment of such subjective values, were they available, would play an important role in transformative decision making.

If subjective values (were they available) would play a significant role in the decision process, yet are in fact not available, Paul's decision-theoretic bind arises: in real life cases, we cannot assess the subjective value of certain future options. Therefore, we cannot make life choices in a way we naturally and intuitively want to (viz., by assessing their subjective value). We can only discover what we need to know after the transformative experience occurs.

To draw out this idea, consider the fictional vampire case from Paul (2014): imagine that you have a one-time only chance to become a vampire. By definition, as a mere human, you know that you can't understand what it's like to be a vampire until you become one. If you care very much about what it would be like to be a vampire and think it should play a major role in your decision, how are you to make your choice? (Modern vampires drink artificial blood, so assume any major ethical concerns can be set aside.)

Contemporary research on decision making and the evaluability bias suggests that, when making your decision, you are likely to place a low weight on the subjective value of life as a vampire in your decision process—simply because you know you can't know this ahead of time. That is, because you know you can't properly consider the subjective value in your decision making process, you don't actually consider it. Instead, given the practical constraints, you focus on what you *can* know. Perhaps, as you decide, you accord significant weight to criteria such as whether friends and relatives have also become vampires, or to other factors that you can assess, such as the value of sunning yourself on a beach or looking fabulous in black. Despite the fact that the subjective value of being a vampire is very important to you, since you can't assess it, when contemplating your transformative decision, you don't weight it heavily.

The implication should be obvious: even if, when considering whether to become a vampire, people *do not* weight subjective value higher than they weight other decision criteria, this does not not mean they *would not* consider subjective value to be an important or even a central criterion.

[1] Further research is needed to determine the pervasiveness and strength of the bias. The absence of a standardized definition of evaluability bias in the literature and the use of different terminology, sometimes overlapping with other constructs such as the affective heuristic, complicates a holistic assessment of the extent to which the evaluability bias pervades everyday decisions (Caviola et al., 2014).

This is a way that participants in these experiments may suffer from the evaluability bias. They may report that subjective value is not central in their transformative decisions, but not because subjective value is not an important criterion in transformative decisions; rather, because subjective value is difficult to evaluate. Reuter and Messerli's interpretation of their results fails to take into account this well-confirmed possibility, the possibility of evaluability bias that manifests across all kinds of decision contexts, including, as we propose, in transformative decision contexts. In fact, across the literature on transformative experience, even in the non-empirical literature, this possibility has neither been raised nor discussed. We think the idea should be explored.

With this in mind, our reasoning leads to a straightforward prediction: if subjective value is not central in the decision process because it is difficult to evaluate (as opposed to being unimportant), then people should value the opportunity to gain information about it. Moreover, we predict that the importance people place on subjective value should be correlated with the amount of information they feel they have about it. We tested these predictions in two studies.

In Study 1, we ran a replication of Reuter and Messerli's study, with some additional, key questions: if people could have an opportunity to gain information about subjective value, would they take it? Would they even be willing to pay for it? We tested whether our prediction is supported by the empirical results: Individuals considering a transformative decision will value the opportunity to gain information relevant to assessing subjective value.

In Study 2, which we pre-registered, we replicated the findings from Study 1. Additionally, we sought more direct evidence of evaluability bias by asking whether people who feel they have more information about subjective value place more importance on subjective value in considering a transformative decision.

2 Study 1

2.1 Methods

We recruited 100 adults (mean age: 27; 51 females, 49 males) from the crowdsourcing website Prolific Academic. Because our survey concerned the decision of whether to have a child, we recruited only participants aged 18–40 and who did not already have children. This sampling procedure ensured that our dataset only included participants for whom the decision to have a child was (a) transformative (as it may not be for those who already have children), and (b) most likely to be one they were actively contemplating (as people outside this age range are less likely to be considering having a child). The procedure was approved by Yale University Institutional Review Board (protocol #2,000,022,385). Participants were paid at a rate of $7.65/hour for completing the survey.

After providing informed consent, participants were presented with the same parenthood scenario and questions as in Reuter and Messerli (full survey text is available online at [https://osf.io/af2k6/?view_only=591fd40a50344c6ea6f6befeffe9dd60]).

Imagine considering becoming a parent and having to decide whether or not to have a child. How would you arrive at a decision?

Participants rated six decision criteria, including discussing the decision with one's partner ("partner"), financial costs ("cost"), whether becoming a parent is consistent with life goals ("consistent"), what it will feel like to have the experiences and emotions of being a parent ("subjective value"), whether they are happy to undergo changes to personality ("openness"), and reading about the pros and cons of having a baby ("reading").

Then we presented participants with the following scenario:

> Next, imagine that you have the opportunity to be transported into a possible future where you have your child. You would get to spend 24 hours experiencing what it is like for YOU to be a parent. When you come back from being transported, no time will have passed in the present, but you will have perfectly vivid memories of this daylong experience of your life as a parent.

We asked participants several questions regarding this scenario. First, we asked them if they would take this opportunity. Second, we asked them to explain, in their own words, why or why not. Third, we asked them how much money they would be willing to pay for this opportunity. Following this, we asked a number of additional demographic questions, including whether or not they wanted to have children, and how certain they were about this preference.

The explanation data and coding for this study is available at https://osf.io/af2k6/?view_only=591fd40a50344c6ea6f6befeffe9dd60.

2.2 Results

Table 1 summarizes how participants rated six different criteria in parenthood decisions in the original study by Reuter and Messerli, our direct replication of Reuter and Messerli (Study 1), and our follow-up study focusing just on the financial costs and subjective value criteria (Study 2). Study 1 replicated the findings of Reuter and

Table 1 How people weight the importance of different criteria in parenthood decisions

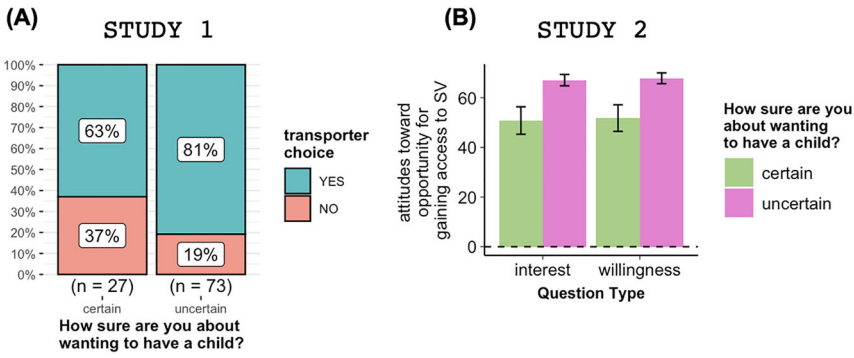
Criterion	R&M original	Study 1	Study 2
Partner	8.66 (2.52)	9.27 (1.56)	
Financial costs	8.26 (2.24)	8.95 (1.55)	8.94 (1.57)
Consistency	7.85 (2.69)	8.7 (1.62)	
Subjective value	7.68 (2.26)	8.01 (2.09)	8.22 (2.32)
Openness	6.43 (3.04)	7.51 (2.38)	
Reading	5.45 (3.34)	6.96 (2.93)	

The table displays the mean rating and standard deviation for each criterion in Reuter and Messerli (2018), Study 1, and Study 2. In Study 2, we focused exclusively on the decision criteria of "financial costs" and "subjective value", for reasons explained in Sect. 2.3

Messerli in terms of the rank ordering of the decision criteria, suggesting that our participant samples are equivalent and the conclusions we draw from our dataset are likely to apply to Reuter and Messerli's dataset as well.

A key prediction is that participants will value the opportunity to gain information relevant to subjective value. In line with this prediction, 76% of our participants indicated they would (hypothetically) take a transporter to the future that would enable them to experience what it is like to be a parent, thus gaining information about subjective value. Of these participants, 91% indicated they would be willing to pay for the opportunity. Willingness to pay was highly skewed (mean $137,450; median $150), with some participants indicating they would be willing to pay very high amounts (up to $10 million).

Next we ask how willingness to take the transporter varied as a function of whether participants indicated they wanted children, and how certain they felt about this (Fig. 1). This provides an indirect test of whether the evaluability bias might manifest in transformative decisions: to the extent that people find subjective value important for a transformative decision, but lack access to information about subjective value, they



	ratio of response taking the opportunity to gain access to SV	N
Certain no	0.5	16
Uncertain no	0.75	20
Not sure	0.72	29
Certain yes	0.82	11
Uncertain yes	0.96	24

	ratio of response taking the opportunity to gain access to SV	N
Certain no	0.11	38
Uncertain no	0.18	61
Not sure	0.23	70
Certain yes	0.52	61
Uncertain yes	0.26	23

Fig. 1 Willingness to gain access to information about subjective value varied as a function of uncertainty about parenthood decision. **A** The percentage of participants who would take a transporter to have a daylong experience of their life as a parent, conditioned on whether they were certain or uncertain about their preference about wanting to have a child. **B** In study 2, using continuous measure, we found those uncertain about their preference towards parenthood, in comparison to those certain about their stance, indicated both a greater willingness and interest in taking the opportunity to gain access to information about what it would be like to be a parent (Bottom Tables) The percentage of participants willing to take the opportunity to gain access to subjective value, conditioned on wanting to have a child and uncertainty around that preference. For Study 2, where we asked participants to rate their willingness on a scale from 0 to 100, participants who rated their willingness to access SV as 100 on a 0-to-100 scale were categorized as 'yes', while those who indicated any value less than 100 (ranging from 0 to 99) were all classified as 'no'

might be more uncertain about their decision, and therefore find it more valuable to gain access to information about subjective value. Our findings were somewhat consistent with this prediction. Of those participants who reported a preference for having children one way or another, being uncertain about that preference significantly increased the likelihood of wanting to take the transporter (X^2 $(1, N = 71) = 3.99, p = 0.046$), controlling for preference. That is, regardless of whether participants leaned toward wanting children or not, being uncertain about that preference significantly increased the likelihood of wanting to take the transporter. As a robustness check, we additionally examined willingness to take the transporter in all participants (including those who expressed no preference for having children) as a function of their reported uncertainty about their preference. In this analysis, the effect of uncertainty on willingness to take the transporter failed to reach significance (X^2 $(1, N = 100) = 2.54$, $p = 0.111$). Thus, Study 1 provided mixed support for our hypothesis that people are particularly interested in seeking out information relevant for assessing what it's like to be a parent when they are uncertain about this transformative decision.

Finally, we examined participants' explanations for why (or why not) they would take the transporter to test our additional hypothesis that, in particular, gaining information *relevant to assessing subjective value* is valuable to them. Of those participants who reported they would take the transporter, most of them explicitly mentioned they would take it to see what it is like to be a parent, i.e., to gain information relevant to subjective value. In addition, many of the participants who reported they would take the transporter explicitly mentioned they thought the experience would help them make a better decision about whether to have a child. Meanwhile, those participants who reported they would not take the transporter gave rather different explanations, for example mentioning concerns that the experience would be negative, or explicitly mentioning that they are certain they don't want kids and therefore have nothing to gain from the experience. Many of our participants reported they sought further information about how they'd evaluate many other changes in their life that would flow from becoming a parent, including (but not limited to) changes in other relationships, career goals, and so on. Overall, these data reinforce the claim that people think that having a child leads to new experiences that can't be anticipated. They further support the claim that having these new experiences could profoundly change the assessment of many other aspects of one's life.

Raw explanation data and coding are provided online at https://osf.io/af2k6/?view_only=591fd40a50344c6ea6f6befeffe9dd60

2.3 Interim discussion

Study 1 sought to directly replicate and extend findings from Reuter and Messerli (2018). To this end, Study 1 used identically worded survey questions as in the original study by Reuter and Messerli. However, these survey questions have several methodological issues. Below, we describe these issues in detail. We then go on to explain how Study 2 addresses those issues.

2.3.1 Subjective value is more than a feeling

Reuter and Messerli's survey questions misrepresent subjective value as "mere feel." Paul (2015b) discusses the distinction between phenomenal character and subjective value, clearly stating that the subjective value of future lived experience is not determined merely by the purely qualitative character of the experience. Subjective value is not simply determined by how an experience "feels." First, phenomenal character may extend past how an experience "feels" in the ordinary sense, which is relevant to Reuter and Messerli's operationalization of subjective value. Second, subjective values are determined by more than phenomenal character. This is why grasping the phenomenal character of an outcome is not sufficient for grasping its subjective value.

To recap: Paul's argument relies on the claim that grasping the phenomenal character of an outcome is *psychologically necessary* for grasping its subjective value. Grasping the phenomenal character allows one to imagine, discover, and understand the nature and content of the lived experience, that is, it gives one the capacity to grasp and thus assess the subjective value of that lived experience.

The misrepresentation of subjective value affects the interpretation of Reuter and Messerli's results. We will focus on the survey question for the case of having a child, since this is the example of primary interest. The problem is immediately obvious from the operationalization of subjective value in their study:

> I imagine what it will feel like to have the experiences and emotions when being a parent.

But again, and as Paul (2014, 2015b) makes clear, imagining what it will be like to be a parent is not merely imagining the phenomenal feel of the experiences and emotions of parenting. So, survey participants who answered this question were not rating the importance of the subjective value of becoming a parent.

We suspect Reuter and Messerli's survey question captures something partial: it captures some of the phenomenal elements relevant to subjective value. (It seems likely that, for many, explicitly imagining what it will "feel like" to be a parent is part of the task of assessing the value of the lived experience of what it is like to be a parent.)

2.3.2 Failure of independence

There is a further problem. Imagining what it is like to be a parent may include an assessment of some of the decision criteria that Reuter & Messerli assume are independent of subjective value. For example, it includes the experience of having one's career affected, of reassessing one's identity, of a changed relationship with one's partner, of possible financial instability, and so on. Indeed, several of the five other decision criteria included in Reuter and Messerli's survey, which are treated as independent from subjective value, nevertheless seem to be highly relevant to assessing subjective value.

Reuter and Messerli address this potential objection by arguing that their data indicate the six decision criteria are independent from one another. Specifically, they report that most of the pairwise correlations between criteria are not statistically significant,

Table 2 Non-independence of decision criteria

	Partner	Cost	Consistency	SV	Openness	Reading
Partner	1.00	0.44***	0.46***	0.24**	0.25**	0.18*
Cost	0.44***	1.00	0.34***	0.17*	0.35***	0.27***
Consistency	0.46***	0.34***	1.00	0.47***	0.34***	0.41***
SV	0.24**	0.17*	0.47***	1.00	0.32***	0.20**
Openness	0.25**	0.35***	0.34***	0.32***	1.00	0.29***
Reading	0.18*	0.27***	0.41***	0.20**	0.29***	1.00

Table shows pairwise correlations (Spearman's rho) between weights on decision criteria in Study 1
*p < 0.10; **p < 0.05; ***p < 0.01

and that the significant correlations between criteria that they do observe are "relatively weak". Based on these null findings, they conclude that "at least in the parent case the majority of the criteria… have little to no bearing on the subjective value of the outcomes".

However, absence of evidence is not evidence of absence. Our replication data suggests a rather different conclusion. Table 2 displays the pairwise correlations between each decision criterion in our replication of Reuter and Messerli's survey. As can be seen in the Table, the majority of the criteria considered are significantly correlated with one another, and subjective value is significantly correlated with all criteria except for financial costs (which trends toward significance). That is, the more weight a given participant places on subjective value, the more weight they also place on the other criteria considered. Some of these correlations between weights are quite high, for example the correlation between the weight on subjective value and the weight on whether becoming a parent is consistent with one's goals in life ($r = 0.47$).

In order to make meaningful comparisons between the weights people place on different criteria for transformative decisions, it is necessary for these criteria to capture aspects of the decision that are independent from one another. Our data suggest the decision criteria considered by the participants in Reuter and Messerli's surveys are not independent, which means they cannot be meaningfully compared.

2.3.3 Motivating the design of Study 2

Although Study 1 provided some preliminary support for our claim that the evaluability bias manifests in transformative decisions, our tests were indirect and our results were not robust to multiple analyses. To address these limitations, we designed a new study in a larger sample and pre-registered our main hypotheses (https://aspredicted.org/x2dg4.pdf). We also added more direct tests of the evaluability bias, which we describe in the next section.

In addition, we sought to address the limitations of the Reuter & Messerli survey questions as described above. To do this, we made two changes to the survey questions in Study 2.

To avoid characterizing subjective value as "mere feel", we re-worded the description of the subjective value decision criterion as "I imagine what it will be like to be a parent." Our aim with this wording was to capture a broader understanding of subjective value, encompassing the various dimensions of the lived experience of parenthood. Through this more inclusive phrasing, we sought to encourage participants to consider the overall nature of the lived experience, moving beyond a narrow focus on its "mere feel."

To address the problem of non-independence of decision criteria, in Study 2 we focused exclusively on the criteria of "financial costs" and "subjective value". The low correlation we observed between these two decision criteria in Study 1 suggests they are reasonably independent, and thus can be meaningfully compared to one another. In Study 2, we sought to directly compare how people weigh these criteria in the decision to become a parent, as a function of their evaluability.

3 Study 2

3.1 Methods

We recruited 253 adults (mean age: 29.36; 122 females, 124 males, 7 non-binary) from Prolific. As in Study 1, we recruited participants aged 18–40 who did not already have children. The procedure of the Study 2 was approved by Princeton University Institutional Review Board (protocol #14873). Participants provided informed consent at the beginning of the survey and were paid at a rate of $12/hour for completion.

We had several goals in designing Study 2. First, we aimed to replicate the main findings of Study 1. Second, we aimed to provide several more direct tests of the evaluability bias in transformative decisions. Study 2 proceeded in three parts.

The first part of the survey was similar to Study 1, asking participants to rate the importance of various criteria for arriving at the decision of becoming a parent. The question was the same as Study 1: *Imagine considering becoming a parent and having to decide whether or not to have a child. How would you arrive at a decision?* However, in Study 2, we focused exclusively on the decision criteria of "financial costs" and "subjective value", for reasons explained in Sect. 2.3. above.

To provide a more direct test of the evaluability bias in transformative decisions, in addition to asking participants to rate the importance of the subjective value and financial cost criteria, we also asked them to rate the extent to which they felt they had adequate information to evaluate each criterion. We predicted that the importance placed on subjective value would be correlated with the amount of information available to evaluate it. We also expected that, on average, participants would report having more information available to evaluate financial costs (relative to subjective value) and would place more importance on financial costs (relative to subjective value), again consistent with the idea of the evaluability bias.

In the second part of the survey, we presented participants with two hypothetical scenarios involving the opportunity to gain information about a possible future where they have a child (as in Study 1). However, in Study 2, participants responded to two scenarios in randomized order, each described as gaining access to either (i) "subjective

value" of what it is like to become a parent or (ii) "financial costs" incurred when they become a parent. The wording of these scenarios were as follows:

i. subjective value scenario: Next, imagine that you have the opportunity to gain information about a possible future where you have your child. Although you cannot find out the financial cost of becoming a parent, you would get to experience what it is like for YOU to be a parent. When you come back from this experience, no time will have passed in the present, but you will have perfectly vivid memories of this experience of your life as a parent.
ii. cost scenario: Next, imagine that you have the opportunity to gain information about a possible future where you have your child. Although you cannot find out what it is like to be a parent, you would have access to precise information about the financial costs incurred when YOU become a parent. When you come back from this experience, no time will have passed in the present, but you will have perfectly vivid memories of how much it will cost to be a parent.

To conceptually replicate the findings of Study 1, we asked participants' the following questions about each scenario:

(1) Whether they would take the opportunity or not
(2) How interested they are in taking the opportunity
(3) The reasons behind their decision to accept or decline the opportunity and their interest in taking the opportunity or not
(4) The amount of money they would be willing to pay for the opportunity

In addition, we asked participants a series of questions to provide a more direct test of the evaluability bias in transformative decisions. First, we asked them to report how gaining information about subjective value or financial costs, respectively, would affect how they weigh subjective value or financial costs in their decision: would gaining the relevant information make them consider each criterion as less or more important, or experience no change in their significance? We predicted that gaining the relevant information (about subjective value or financial costs) would increase the importance of that criterion. Finally, we asked participants to imagine discovering that the subjective value or financial cost is significantly different from what they initially expected. We then asked them to report how influential this newfound information would be in potentially causing a reversal of their decision. We predicted that discovering unexpected information related to either subjective value or financial costs would influence the reversal of a decision, suggesting that even if individuals may assign low importance to subjective value (compared to cost) due to its inherent difficulty in evaluation, such information plays an important role in transformative decisions.

In the third and final part of the survey, we asked participants questions related to their desire to have children including their certainty about this preference and demographic questions, as in Study 1. The full text of the survey is available at [https://osf.io/af2k6/?view_only=591fd40a50344c6ea6f6befeffe9dd60].

3.2 Results

First, we replicated the key finding from Study 1 that people value the opportunity to gain information relevant to subjective value. When asked about their willingness to take the opportunity to gain information about a possible future where they have a child and experience what it is like for them to be a parent, on a scale from 0 (definitely no) to 100 (definitely yes), participants gave an average willingness score of 63.95 (sd = 33.96). Further, when asked about their level of interest in such an opportunity, on a scale from 0 (not interested at all) to 100 (very interested), they averaged a score of 63.16 (sd = 35.39). On average, participants indicated willingness to pay $275.97 for access to information related to subjective value, which was higher than the average of $116.13 they were willing to pay for information regarding costs. We note there were large variations in the average amount participants were willing to pay for the opportunity between Study 1 and Study 2 due to differing response formats: in Study 1, participants provided open-ended responses, whereas in Study 2, they chose from a log-scaled set of options, with the highest value at $10,000+.

We next turned to the question of whether people are especially interested in gaining information about subjective value when they are uncertain about a transformative decision. In contrast to Study 1, which used a binary (yes/no) measure of willingness to take a hypothetical transporter to the future to gain this information, Study 2 employed more sensitive continuous measures of willingness and interest in gaining this information. Consistent with the result from Study 1, we found that those uncertain about their preference towards parenthood, in comparison to those certain about their stance, indicated both a greater willingness ($t(80.80) = 2.77, p = 0.007$) and interest ($t(81.45) = 2.72, p = 0.008$) in taking the opportunity to gain access to what it is like for them to be a parent. This seems to reflect that, driven by the epistemic challenges incurred by transformative decisions—where existing knowledge falls short in anticipating new life outcomes—individuals seek information to better gauge the subjective value of such choice, especially in the face of uncertainty.

In addition to the replication of previous findings, the results from Study 2 provided more direct support that the evaluability bias manifests in transformative decisions. Consistent with the observations in Study 1, as well as the original Reuter and Messerli study (see Table 1), we found that participants placed greater importance on financial cost criteria relative to subjective value criteria when considering the decision to have a child ($t(252) = 4.77, p < 0.001$). If such difference in importance is at least partly attributable to the evaluability bias, we should also observe that participants report having more information relevant to assessing financial costs than subjective value. This was indeed the case ($t(252) = 2.83, p = 0.005$). Additionally, we found a positive correlation between the degree to which individuals believed they had adequate information for evaluating subjective value and the importance they attributed to it ($r = 0.15, p = 0.018$). Finally, the extent to which participants found it easier to evaluate financial costs versus subjective value predicted the extent to which participants placed more importance on financial costs versus subjective value ($r = 0.34, p < 0.001$). Taken together, these findings (summarized in Fig. 2) provide compelling evidence for the

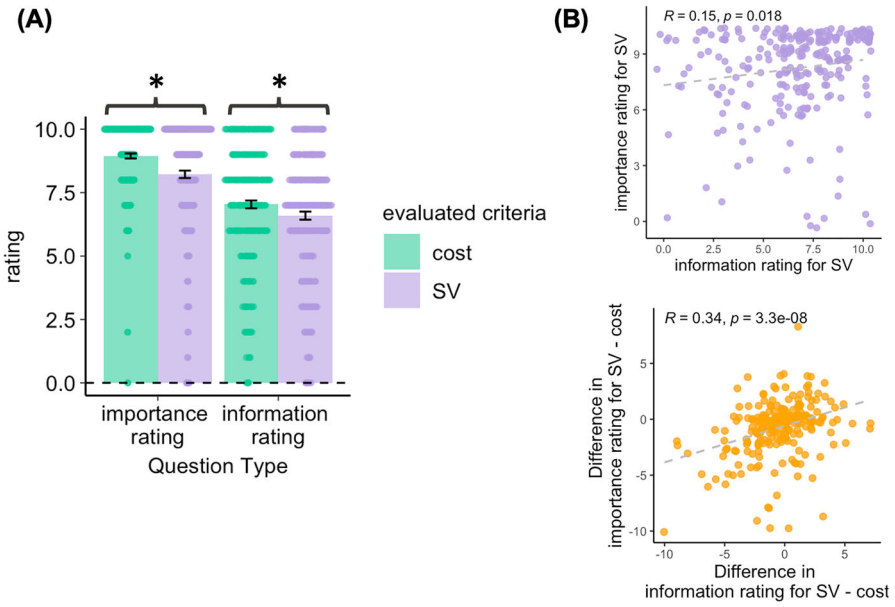


Fig. 2 Evaluation of the 'financial cost' and 'subjective value' decision criteria in terms of their importance and the adequacy of information for evaluation. **A** We empirically assessed the importance and evaluability of two dimensions of the decision to become a parent: subjective value and financial costs. Participants placed greater importance on financial cost criteria relative to subjective value criteria, and felt they had more information available to assess financial costs compared to subjective value. **B** The importance an individual assigns to subjective value and the extent to which they believe they have adequate information to assess it were positively correlated. Moreover, the difference in the importance individuals assigned to subjective value versus financial costs was positively correlated with the difference in information available for subjective value versus financial costs

presence of evaluability bias in transformative decisions, where the assessment of subjective value is contingent upon the sufficiency of available information an individual possesses for its evaluation. That is, the lower importance that participants placed on subjective value relative to financial cost can be explained by the fact that participants found subjective value more difficult to evaluate than financial cost. And to the extent participants found subjective value easier to evaluate, the more importance they placed on this attribute when considering the decision overall.[2]

Next we investigated whether participants would place more importance on a given decision criteria if they were (hypothetically) given access to more information about it. We predicted that if transformative decisions suffer from evaluability bias—where individuals tend to give more importance to criteria that are easier to evaluate—then after imagining gaining access to information about a certain decision criterion, participants would rate its importance higher. We measured participants' shift in importance

[2] We also observed a trend towards a significant correlation between the extent to which individuals felt they had sufficient information to assess the financial cost criteria and the importance they placed on it ($r = 0.10$, $p = 0.102$). Together, our results align with our hypothesis that, although evaluability bias might influence any decision criteria, it is probably more marked for subjective value criteria because of the inherent difficulties in its evaluation.

rating on a scale from − 10 to 10 where − 10 corresponds to 'less important', 10 corresponds to 'more important' and 0 corresponds to 'no change'.

Supporting our prediction, we found that participants' importance ratings of a decision criteria increased after they imagined an experience providing the relevant information (interaction between scenario type and evaluated criteria; $F(252) = 28.20$, $p < 0.001$). That is, participants indicated that, given hypothetical access to information about the subjective value of parenthood, they would consider the subjective value criteria to be more important in their decision ($t(252) = 2.38, p = 0.018$). Similarly, given hypothetical access to financial cost information about becoming a parent, they would weigh the cost criteria more heavily in their decision ($t(252) = 5.43, p < 0.001$). This highlights that the evaluability bias in transformative decisions is not limited solely to subjective value but pervades decision criteria in general. However, since subjective value is particularly challenging to gauge without first-hand experience, individuals may initially assign a lower weight in evaluating this criteria.

As a robustness check, we repeated the above analysis focusing only on the first scenario presented to participants. This approach ensured our results were robust against potential order effects and were free from any carry-over effects from the preceding scenario. In this analysis, we again found a significant interaction between scenario type and evaluated criteria ($F(251) = 5.99, p = 0.015$). We also found again that imagining receiving information about subjective value (relative to financial cost) increased the importance of subjective value, supporting an evaluability bias ($t(247.62) = 2.23, p = 0.026$). However, imagining receiving information about financial cost (relative to subjective value) did not increase the importance of financial cost ($t(236.85) = 0.60, p = 0.550$). These observations are consistent with our earlier observations that participants reported initially having less information about subjective value than financial cost (and placed less importance on subjective value than financial cost). Therefore, there is more information to be gained regarding subjective value than financial cost, and likewise, more room for increasing the importance of subjective value upon receiving that information (Fig. 3).

Finally, we asked whether discovering that the subjective value or financial cost is significantly different from what one initially expected, how influential this newfound information would be in potentially causing a reversal of the decision to become a parent. We asked participants to rate the importance of the unexpected new information in influencing their decision reversal on a scale of 0 to 10, with 0 being 'not at all important' and 10 being 'extremely important'.

We hypothesized that discovering unexpected information regarding either subjective value or financial costs would influence the reversal of a decision, suggesting that even if individuals may assign low importance to subjective value (compared to cost) due to its inherent difficulty in evaluation, such information remains important in transformative decisions. Consistent with this prediction, participants indicated that both subjective value and financial cost information gained from the hypothetical opportunity, if substantially different from their initial expectations, is likely to cause reversal in their decision (SV: $t(252) = 40.13$, $p < 0.001$, financial cost: $t(252) = 39.37$, $p < 0.001$). The effect size for SV and financial cost were both large (Cohen's d; SV: 2.52, financial cost: 2.48) and not significantly different ($z = 0.78, p = 0.433$). This supports

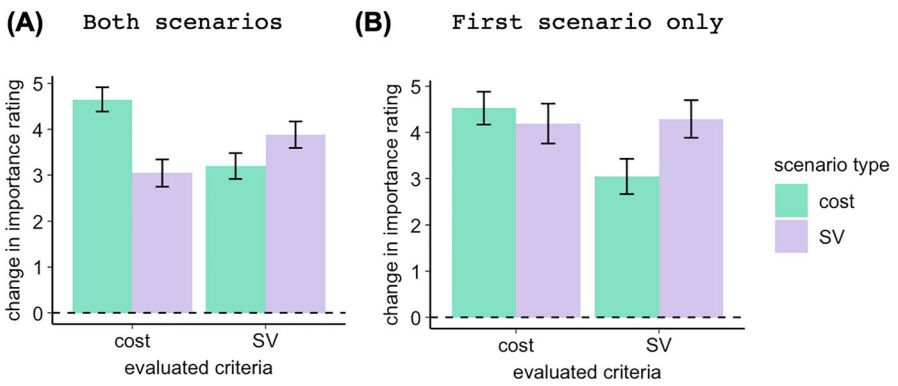


Fig. 3 Importance of a decision criteria increased after imagining an experience providing relevant information. **A** Participants assigned a higher importance to a decision criterion after they imagined gaining relevant information about that criterion. **B** When analyzing only the first scenario participants encountered, this effect was more pronounced for subjective value than financial costs

our claim that people indeed value information relevant to assessing subjective value, and it can even prompt a reversal in a transformative decision.

Let us now step back and evaluate where we are. Our results call into question Reuter and Messerli (2018)'s claim to have shown that, for many transformative decisions, the subjective value of the outcome, or "what it's like," is largely unimportant for the decision making process. What are the implications for their subsequent conclusion (which relies on this premise), that most transformative decisions can be made rationally?

In a nutshell, their argument is unsound, for their premise is false, as shown by the methodological reasons we developed here. We have shown that when considering a transformative decision, participants assigned importance to subjective value proportionally to their belief in having sufficient information to assess it. Moreover, participants attributed greater importance to a decision criterion after they imagined gaining relevant information about it. This empirical demonstration of evaluability bias in the context of transformative decision-making complicates the interpretation of self-reports about the importance of decision criteria. While Reuter and Messerli interpret low importance ratings for subjective value as evidence that participants do not care about subjective value, our data reveal an alternative interpretation: that low importance ratings for subjective value in transformative decisions arise from the challenge in evaluating subjective value. Our empirical demonstration of evaluability bias in transformative decision-making contexts therefore shows that self-reports are not reliable indicators of the true importance individuals assign to subjective value. This is because people downplay the importance they attribute to attributes that are difficult to evaluate. This also implies that it is problematic to compare the importance of subjective value to that of other choice attributes, and drawing conclusions about decision rationality from this comparison. If the importance of subjective value for a decision maker cannot be straightforwardly inferred from self-reports of importance, Reuter and Messerli cannot claim to have shown that most people have a "great chance"

of making transformative decisions rationally. Any possibility of rigorously examining the question of whether transformative decisions can be made rationally from an empirical standpoint must address the methodological challenges we raised above.

4 Discussion

We've shown that the evaluability bias manifests when people contemplate the transformative decision to become a parent, and that people value the opportunity to gain information relevant to subjective value in this decision context. Across two studies, we found the vast majority of participants valued the opportunity to learn information relevant to subjective value. That is, they valued the opportunity to learn information about what it would be like to be a parent, especially when they were uncertain about the decision. Our second study also provided more direct evidence that the evaluability bias affects transformative decisions. Specifically, we found a positive correlation between the importance an individual assigns to subjective value and the extent to which they believe they have adequate information to assess it. Moreover, we found that after imagining gaining access to information about subjective value, participants rated its importance higher. Notably, both of these effects were more pronounced in the assessment of subjective value relative to financial cost, providing support for our hypothesis that subjective value is particularly difficult to evaluate in the context of transformative decisions. Together, our results are consistent with previous empirical work while providing robust evidence that some people may place a low weight on subjective value in transformative decisions because they lack knowledge about subjective value.

Given our findings, it is apparent that participants do not place a low weight on subjective value because they do not think it is important. Instead, because it is difficult to evaluate, participants place a low weight on subjective value when they are deliberating.

Our results are important for at least three reasons. First, the role and importance of subjective value is much discussed in the philosophical literature surrounding transformative experience, for example, in Paul (2015b), Campbell (2015), Kauppinen (2015), Kind (2020), and Arpaly (2020). Our work highlights the significance of these theoretical discussions.

Second, the work raises major questions for prior theoretical interpretations of this type of data (Reuter and Messerli 2018), with implications for related discussions of the role of subjective value judgments in transformative decision-making (e.g., Villiger, 2021, 2022).

Third, our ideas about evaluability bias and its relation to transformative decision making develop new connections between philosophy, behavioral economics and social psychology, potentially opening up new avenues for interesting interdisciplinary research (see also Paul and Healy (2018)).

We hope that future empirical research will continue to explore paths between practical deliberation, formal epistemology, and social psychology, and in particular that the expanding interest in conducting empirical investigations of transformative

decision making will continue to shed light on the philosophical questions about self and value at the heart of practical deliberation and rational choice.

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Declarations

Conflict of interest The authors declare no conflicts of interest.

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