

Do People Prescribe Optimism, Overoptimism, or Neither?



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Abstract

Past work has suggested that people prescribe optimism—believing it is better to be optimistic, instead of accurate or pessimistic, about uncertain future events. Here, we identified and addressed an important ambiguity about whether those findings reflect an endorsement of biased beliefs—that is, whether people prescribe likelihood estimates that reflect overoptimism. In three studies, participants ($N = 663$ U.S. university students) read scenarios about protagonists facing uncertain events with a desired outcome. Results replicated prescriptions of optimism when we used the same solicitations as in past work. However, we found quite different prescriptions when using alternative solicitations that asked about potential bias in likelihood estimations and that did not involve vague terms such as “optimistic.” Participants generally prescribed being optimistic, feeling optimistic, and even thinking optimistically about the events, but they did not prescribe overestimating the likelihood of those events.

Keywords

optimism, estimation, bias, forecasting, prediction, accuracy, judgments, open data, open materials, preregistered

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When it comes to predictions about the future, accuracy is widely valued by professionals and scientists (W. Chang et al., 2016; Moore et al., 2017; Soll et al., 2016; Tetlock & Gardner, 2015). For events across many domains (e.g., weather, markets, and politics), establishing well-calibrated forecasts allows for optimal planning and resource allocation. Despite the value of accuracy, one does not need to look far in the media and scientific literature to find advocates for having an optimistic bent about the future (Leedham et al., 1995; Scheier & Carver, 1993; Seligman, 2006; Willard & Gramzow, 2009).

To examine whether prescriptions of optimism are something that most people would endorse, Armor et al. (2008) asked participants how protagonists in various scenarios should view their chances of success for an upcoming event. The results favored prescriptions of optimism. Two direct replications have supported those findings (Open Science Collaboration, 2015; Tenney et al., 2015). Armor et al. concluded that “In contrast to . . . unbiased predictions, people’s prescriptions suggest that they believe optimistically biased predictions are ideal” (p. 330). This article is often cited

as evidence that people think it is better to be optimistic than accurate or pessimistic (e.g., Hoorens et al., 2017; Shepperd et al., 2015; Zhang & Fischbach, 2010). The present work, however, provides a crucial clarification to this conclusion by addressing whether prescribing optimism also means that people prescribe biased estimations of likelihood.

What Does It Mean to Prescribe Optimism?

For the four scenarios used in Armor et al. (2008), participants were asked, “would it be best for [protagonist] to be optimistic or pessimistic about [the desired outcome]?” Responses were made on scales that had *extremely pessimistic* and *extremely optimistic* as end-point anchors (the midpoint was labeled “accurate”).

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Armor et al. also tested moderators—specifically, whether the protagonist had agency over the upcoming decision, whether the decision was already made, and whether they had control over the outcome. These moderators had some influence, but the tendency to prescribe optimism was significant regardless of the moderators.

Although the findings from Armor et al. (2008) show that people value being optimistic, the meaning and limits of this conclusion require more examination. The definitions of psychological and emotion constructs can be vague, and this can be consequential for drawing conclusions from studies that rely on lay interpretations of those constructs (e.g., Barrett, 2006; Lucas, 2018; Moore & Schatz, 2017). *Optimistic* could have various interpretations. Depending on circumstances, being optimistic might refer to believing one's chances of experiencing a desired event are above some baseline (e.g., better than a 50-50 chance, better than before, or better than other people's chances). Being optimistic could also refer to a feeling or intuition about how an event will turn out rather than about one's estimate of an event's chances (e.g., Carver et al., 2010), or it could refer to one's demeanor or general directional orientation (Hazlett et al., 2011; Peterson, 2000). Telling someone to be optimistic might be similar to saying "it's a good possibility" or "focus on the positive."

Given the potential interpretations of the terms *optimistic* and *pessimistic*, and given Armor et al.'s (2008) reliance on those terms, we thought it was important to test prescriptions without using those particular terms. Our specific interest was in the possibility that the findings from Armor et al. did not necessarily mean that people would also prescribe being biased in overestimating likelihoods for desired outcomes. Armor et al. did not specifically ask how people should estimate likelihoods. In the next section, we briefly discuss how theories and prior research point in conflicting directions on whether people would prescribe such bias in likelihood estimates.

Conflicting Perspectives

One could argue that because people generally associate optimism with positive outcomes, they would endorse overestimating the likelihood of a desired outcome (i.e., misestimating in an optimistic direction). They might have some awareness that optimism can be important for motivating behavior that influences outcomes (Tenney et al., 2015; Zhang & Fishbach, 2010), and they might overgeneralize this to prescriptions about likelihood estimates—even for uncontrollable outcomes. People might also associate positive characteristics (e.g., enjoying experiences more, being more socially accepted) with people who are optimistic or confident (e.g., Armor & Taylor, 2002; Helweg-Larsen et al., 2002; Klaaren et al., 1994;

Statement of Relevance

Psychological research has shown that people tend to be optimistic about uncertain desirable events and that people think others should be optimistic, too, even when given the choice of being accurate. This is puzzling, given that accurate predictions are widely valued in science and across professional domains as an important step toward making sound decisions and policies. We suspected that people's endorsements of optimism did not equate to endorsements of optimistically biased estimations of likelihoods. In the present studies, we determined that how people are asked about their recommended levels of optimism can have a dramatic influence on whether people seem to support having optimistically biased expectations. We found that people do not generally recommend being overly optimistic, meaning that they do not recommend that others overestimate the likelihood of desirable events. The more nuanced understanding of this issue is ultimately important for improving decisions about, and preparations for, important life events.

Shepperd et al., 2018). They might then believe that being optimistically biased will bring about those characteristics. Finally, believing there is a high likelihood of a positive outcome might be viewed as a pleasurable anticipation (itself a source of experienced utility; Morewedge, 2016).

However, underestimation also has appeal. *Defensive pessimism* describes people who purposely make pessimistic predictions about performance outcomes to motivate themselves to achieve a desired outcome (Gasper et al., 2009; Norem & Cantor, 1986; Shepperd et al., 2018). Pessimistic predictions can also be a way of bracing oneself against feeling upset or disappointed when a desirable outcome does not occur (Carroll et al., 2006; Sweeny & Krizan, 2013). It is possible, then, that people might recognize the benefits of being pessimistic, and they might widely prescribe the underestimation of likelihoods for desired outcomes.

Of course, prescriptions of no bias are also possible if people value accuracy and objectivity or if countervailing biases even out.

The Current Research

Our research addressed this empirical uncertainty about whether prescriptions of optimism also mean that people prescribe biased estimations of likelihood. In three preregistered studies involving the scenarios from Armor et al. (2008), we examined how altering the

Table 1. Overview of Studies and Properties of the Prescription Measures Used in Each Study

Study and condition (prescription measure)	Properties of the measures			Prescription results (relative to scale midpoint)
	Question terms and scale anchors	Referred to feelings?	Included “best”?	
Study 1				
Original wording	Pessimistic/optimistic	?	Yes	Above
Estimation wording	Under/overestimation	No	No	Below
Study 2				
Feeling wording	Pessimistic/optimistic	Yes	No	Above
Thinking wording	Pessimistic/optimistic	No	No	Above
Study 3				
Feeling wording	Pessimistic/optimistic	Yes	No	Above
Estimation wording	Under/overestimation	No	No	Below

Note: The three columns in the middle show the potentially important features of the wording used to solicit prescriptions. Some wordings were about pessimism and optimism, and some were about under- and overestimation of likelihood. The far-right column characterizes the overall, significant findings for each wording or condition. “Above” and “below” mean that the responses tended to fall significantly above or below the relevant scale’s midpoint. For example, in Study 1, people prescribed optimism in the original-wording condition but underestimations of likelihoods in the estimation-wording condition. In Studies 2 and 3, we varied properties of the prescription measures to disambiguate which properties accounted for the empirical difference in Study 1.

solicitations of prescriptions changed the level of optimism (or pessimism) that was prescribed.

Study 1 had two conditions: one that used the original prescription measure from Armor et al. (2008) and one that used a new prescription measure that focused on likelihood estimation and omitted some potentially biasing features of the original measure. The results were quite different between those conditions. In Studies 2 and 3, we varied features of the prescription measures to disambiguate which properties produced the different results. These properties and their subsequent influence on results are summarized in Table 1 and discussed in detail later. Across all studies, we also tested two of the moderators (commitment and agency of the protagonist) that were examined by Armor et al.

Study 1

Study 1 tested two types of wording for prescription measures—the original Armor et al. (2008) wording and a new wording that we will call *estimation wording*. The estimation wording was more narrowly focused on prescriptions for likelihood estimations and excluded some potentially biasing features of the original wording. We predicted that results for the original wording would replicate Armor et al.’s results (i.e., favoring prescriptions of optimism) but that the estimation wording would reveal less optimistic prescriptions.

Method

Our study was not intended to be a direct replication of Armor et al.’s (2008) study, given previous direct

replications (i.e., Open Science Collaboration, 2015; Tenney et al., 2015). We made a series of changes to their original design, primarily to reduce participant fatigue. For a full overview of these changes, see the Reviewed Supplemental Online Material (SOM-R) on OSF at <https://osf.io/vqm3d/>.

Design, participants, and statistical power. Aside from a counterbalancing factor, the study had a 2 (wording: original, estimation) $\times$ 3 (scenario: winning an award, having a successful surgery, experiencing a business success) mixed design with wording as the between-subjects factor. We preregistered our intention to recruit a sample size of 324 participants on OSF (<https://osf.io/r2muz>), which far exceeded 95% power to detect a medium-sized difference in prescriptions between the two wording conditions. The target sample size was based on the minimum sample size needed for another study in the same data-collection session as this study. After completion of all posted sessions, our final sample size was 331 (all University of Iowa undergraduates; 230 women, 100 men, 1 unreported; mean age = 18.75 years, $SD = 0.96$).

Scenarios and version descriptions. We used three scenarios from the study by Armor et al. (2008), each of which described a protagonist facing an event with an uncertain outcome (winning an award, having a successful surgery, experiencing a business success). Whereas Armor et al. created eight versions for each scenario (to test moderators), we used only three versions of each scenario, to be described shortly. Every participant saw each of the three scenarios, but we counterbalanced

which of the three version types went with each scenario. For a full overview of each of the counterbalancing conditions, see the SOM-R at <https://osf.io/vqm3d/>.

Across all three types of versions of a scenario, the protagonist had little or no future control over how the event would turn out. The versions varied in whether a decision relevant to the event had already been made (commitment) and who did or would make that decision (agency). For example, in the award scenario, the protagonist, Lisa, was notified that her paper, which could not be modified, might win an award if entered into a competition. In the *internal-agency/precommitment* version of this scenario, passages indicated that the decision to apply for the competition is hers, and she has not yet decided. In the *internal-agency/postcommitment* version, the decision was hers, and she had already applied. In the *external-agency/postcommitment* version, the decision was her advisor's, who had already submitted Lisa's paper for the award.

Prescription measures. Each participant was randomly assigned to one of the two wording conditions. Half of the participants always saw prescription questions that used the original wording from Armor et al. (2008):

Under the circumstances described in this story, would it be best for [Lisa] to be optimistic or pessimistic about the likelihood of [winning the award]? In other words, what is the ideal prediction for [Lisa] to make? In the light of the situation that she is in, it would be best to be:

The five response options were “extremely pessimistic,” “moderately pessimistic,” “accurate,” “moderately optimistic,” and “extremely optimistic.” This is a small modification from the 9-point scale used by Armor et al. (2008). However, their scale had only five anchors, and thus our scale retained the same anchor wording. The question was the same for each scenario except for the bracketed parts, which was specific to the scenario.

The other half of the participants saw prescription questions that used the new estimation wording, which focused more on likelihood estimates:

Under the circumstances described in this story, how should [Lisa] estimate the likelihood of [winning the award]? In other words, what way of thinking would be advisable? In light of the situation that she is in, [Lisa] should ____ her likelihood of [winning the award].

The five response options were “greatly underestimate,” “slightly underestimate,” “accurately estimate,” “slightly overestimate,” and “greatly overestimate.”

In addition to shifting the focus to how the protagonist should estimate the likelihood of the outcome, the new estimation wording omitted the positively valenced terms “best” and “ideal” that were in the original wording (both here and in Armor et al.'s study). We consider those to be potentially biasing features of the question—perhaps priming a positive valence or creating a misinterpretation that the question was asking how a protagonist would feel if the protagonist's situation were ideal.

Procedure. Participants took the study at individual computer terminals. After providing informed consent, they first completed a different, unrelated study before reading the first scenario. Participants always saw the scenarios in a fixed order, starting with the award scenario and ending with the financial-investment scenario. Each participant was randomly assigned to answer one of the two dependent variables and answered the same one for each of the three scenarios. After completing all of the main dependent variables, participants answered 11 exploratory measures for each scenario. These exploratory measures assessed perceptions of the sensibility of different reasons for prescribing optimism, realism, or pessimism. (For the measures, see the Unreviewed Supplemental Online Material [SOM-U] at <https://osf.io/3e8m5/>.) Participants then answered basic demographic questions before being debriefed for both studies and dismissed.

Results

All prescriptions were coded from -2 to $+2$. For both the original-wording and estimation-wording conditions, the scale midpoint was 0 and reflected a prescription of accuracy. Means above 0 would reflect optimism in both conditions; more precisely, they would reflect prescriptions of optimism in the original-wording condition and prescriptions of overly optimistic estimations in the estimation-wording condition. Means for prescriptions across all factors can be found in Table 2. The counterbalancing factor was included in preliminary analyses but is omitted here. Those results do not materially impact any conclusions reported below, but see the SOM-R (<https://osf.io/vqm3d/>) for those analyses.

Prescriptions were submitted to a 2 (wording: original, estimation) $\times$ 3 (version: internal agency/precommitment, internal agency/postcommitment, external agency/postcommitment) repeated measures analysis of variance (ANOVA). Figure 1 shows the pattern of results. In support of our main hypothesis, results showed that participants gave different prescriptions as a function of the prescription measure's wording, $F(1, 324) = 99.10$, $p < .001$, $\eta_p^2 = .234$. With the original wording,

Table 2. Mean Prescription for Each Scenario, Version, and Prescription Wording in Study 1

Scenario and prescription wording	Scenario moderators			Average (collapsed across versions)
	Internal agency/precommitment	Internal agency/postcommitment	External agency/postcommitment	
Scenario 1 (award)				
Original wording	0.55 (0.87)	0.31 (0.90)	0.58 (0.85)	0.48
Estimation wording	−0.44 (0.72)	−0.55 (0.63)	−0.49 (0.74)	−0.49
Scenario 2 (surgery)				
Original wording	0.65 (0.95)	0.67 (1.07)	0.47 (1.14)	0.60
Estimation wording	−0.24 (0.99)	−0.04 (1.03)	0.16 (1.07)	−0.04
Scenario 3 (investment)				
Original wording	−0.15 (0.83)	0.04 (1.01)	0.21 (1.06)	0.04
Estimation wording	−0.07 (0.79)	−0.24 (0.97)	−0.19 (0.91)	−0.17

Note: Numbers in parentheses are standard deviations. The scale for the prescription question in the original-wording condition ranged from -2 (*extremely pessimistic*) to +2 (*extremely optimistic*); the midpoint was labeled "accurate." The scale in the estimation-wording condition ranged from -2 (*greatly underestimate*) to +2 (*greatly overestimate*); the midpoint was labeled "accurately estimate."

participants generally prescribed optimism ($M = 0.37$, $SD = 0.60$), as indicated by the mean being significantly above the scale midpoint of "accurate," $t(165) = 7.94$, $p < .001$, $d = 1.23$, 95% confidence interval (CI) for the mean difference = [0.28, 0.47]. This replicated Armor et al.'s results (2008). However, in the estimation-wording condition, participants generally prescribed

underestimation ($M = -0.23$, $SD = 0.48$); the mean was significantly below the midpoint of "accurately estimate," $t(164) = -6.25$, $p < .001$, $d = -0.97$, 95% CI for the mean difference = [-0.31, -0.16]. In other words, participants generally prescribed a pessimistic estimation of likelihood.

A secondary interest was whether the scenario versions would influence prescriptions. Because Armor et al. (2008) found that moderators such as agency and commitment influenced prescriptions, we expected that prescriptions might be different across the three version types that we used, at least in the original-wording condition. However, the effect of version was not significant in the full 2 (wording) $\times$ 3 (version) ANOVA, $F(2, 648) = 0.84$, $p = .433$, $\eta_p^2 = .003$. The effect was also nonsignificant within just the original-wording condition ($p = .630$). Moreover, the Wording $\times$ Version interaction was not significant, $F(2, 648) = 0.005$, $p = .995$, $\eta_p^2 = .000$.

The ANOVA reported above treated version as the repeated variable, but we can also treat scenario (i.e., award, surgery, investment) as the repeated variable. In a 2 (wording: original, estimation) $\times$ 3 (scenario) mixed ANOVA, the effect of wording was necessarily the same as already reported. The effect of scenario was significant, simply reflecting the fact that more optimism was prescribed for some scenarios or protagonists than others, $F(2, 648) = 13.49$, $p < .001$, $\eta_p^2 = .040$. A significant Wording $\times$ Scenario interaction revealed that the impact of wording varied by scenario, $F(2, 648) = 14.40$, $p < .001$, $\eta_p^2 = .043$.

Although the effect of wording varied by scenario, we note that the effects of wording were still widespread. Five of the six simple-effects tests of wording within each scenario and within each version were significant and in the same direction ($ps < .05$), and the

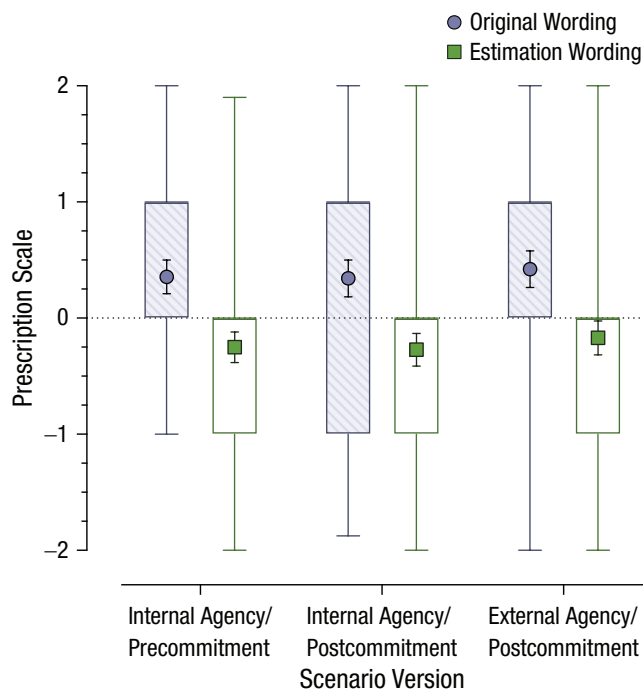


Fig. 1. Mean prescription for each scenario version and prescription wording in Study 1. In each plot, the symbol indicates the estimated mean, the shaded box indicates the distribution of the data from the 25th to the 75th percentile, and both sets of error bars indicate 95% confidence intervals.

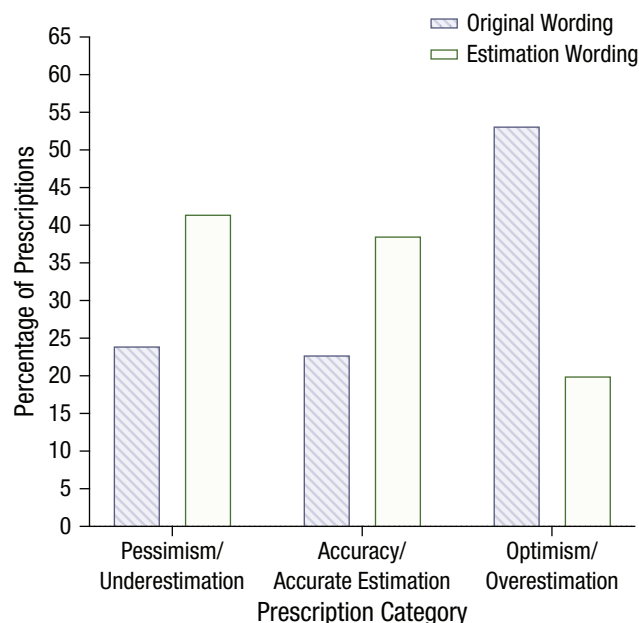


Fig. 2. Percentage of prescription responses (total responses = 988) per prescription wording for pessimism, accuracy, and optimism in Study 1. The category of pessimism/underestimation reflects responses of either -2 (*extremely pessimistic/greatly underestimate*) or -1 (*moderately pessimistic/slightly underestimate*). The category of optimism/overestimation reflects responses of either $+1$ (*moderately optimistic/slightly overestimate*) or $+2$ (*extremely optimistic/greatly overestimate*). The category of accuracy/accurate estimation reflects a response of 0.

sixth simple-effects test on the business-investment scenario was marginally significant ($p = .051$). Figure 2 displays information about the percentage of participants who gave various prescriptions as a function of wording. Clearly, there are individual differences in the sorts of prescriptions people make, but it is just as clear that how one asks for a prescription has a substantial effect on answers. When asked for prescriptions using the original wording from Armor et al. (2008), participants' modal response was optimism (53% of responses), but when asked with the new wording that focused on likelihood estimation, their answers reflecting optimism were relatively rare (20% of responses). The answers reflected accuracy or pessimism about equally often.

Study 2

Study 1 demonstrated that the way people's prescriptions are solicited has a big influence on them. Study 2 addressed why the wording of the prescription questions in Study 1 had such a strong impact. Table 1 lists three potentially crucial differences between the two wording conditions (see Columns 2–4). The first was that the key terms and anchor labels on the original wording referred to being optimistic and pessimistic,

whereas the new wording referred to underestimating and overestimating. We have already discussed why this might matter—the former terms are open to a variety of interpretations.

A second, related difference was that in the new estimation-wording condition, we focused people on thoughts rather than feelings. Not only did we ask about estimates, which presumably reflect cognitive beliefs, but we also explicitly asked “what way of thinking would be advisable?” The original wording used by Armor et al. (2008) did not overtly favor thinking or feeling, but we thought it was at least possible that it connoted an interest in feelings. It asked how the protagonist should “be” rather than how they might “think.”

A third difference was that the original wording included “would it be best for” and “what is the ideal prediction?” As noted earlier, we thought “best” and “ideal” were potentially biasing in an optimistic direction. The new wording used alternative phrases (“how should?”).

Study 2 took a step toward determining which of these differences was the crucial distinction by using two prescription measures—one about how the protagonists should feel and one about how they should think. Critically, we kept the key terms and anchors consistent for both scales. We also removed a potential confound regarding the words “best” and “ideal.” If the crucial distinction between the conditions in Study 1 was that the original wording solicited prescriptions for feelings but the new wording asked about thoughts, then we expected to see a significant difference between prescriptions for feelings and for thoughts in Study 2.

Method

Study 2 mimicked Study 1 by using the same scenarios, versions, counterbalancing, and procedure, but it had two key changes. First, we still used a wording manipulation for our prescription questions, but this time one question asked how the protagonist should feel and one asked how the protagonist should think. Second, a given participant answered both prescription questions for each scenario. In the design of Study 1, it was unclear whether a given person would simultaneously advocate for both optimism and underestimation. Although we did not ask an estimation prescription in Study 2, we were interested in whether individuals would simultaneously endorse two different prescriptions for the same situation.

Design, participants, and statistical power. Study 2 used a 2 (wording: thinking, feeling) $\times$ 3 (version) $\times$ 2 (order) mixed design in which order was the only between-subjects variable (in addition to the same

counterbalancing as in Study 1, which is discussed in the SOM-R at <https://osf.io/vqm3d/>). Because the study was conducted at the end of a school year, we preregistered our intention to recruit both a target sample size and a date range for our data collection, indicating that data would be collected for 3 weeks (i.e., until the end of the semester) or until we reached 180 participants, whichever came first. This resulted in a final sample size of 124 (all University of Iowa undergraduates; 69 women, 54 men, 1 unreported; mean age = 18.72 years, $SD = 0.93$). This sample size provided 97% power to detect a medium to small difference ($d = 0.35$) in prescriptions between the two wording conditions. The preregistration can be found on OSF (<https://osf.io/3azj6>).

Prescription measures and counterbalancing of measures. For each scenario, participants answered two prescription questions, both of which appeared on the same page. Half the participants saw a feeling-prescription question followed by a thinking-prescription question, and the other half saw them in reverse order. The introductory wording of the second question was made slightly different from the first in order to reduce participant confusion. For example, the wording of the first question about the Lisa scenario was as follows (differences between the feeling and thinking versions are in brackets):

Under the circumstances described in this story, how should Lisa [feel/think] about the likelihood of winning the award? In other words, what way of [feeling/thinking] would be advisable? In light of the situation that she is in, Lisa should [feel/think] _____ about her likelihood of winning the award.

For the second question about the Lisa scenario, the wording was as follows:

You've told us how you think Lisa should [feel/think] about the likelihood of winning the award. Now we'd like to know how you think Lisa should [think/feel] about the likelihood of winning the award. Your answer to this question might or might not be similar to your other answer. In light of the situation that she is in, Lisa should [think/feel] _____ about her likelihood of winning the award.

The response options for both prescriptions were always "extremely pessimistic," "moderately pessimistic," "realistic," "moderately optimistic," and "extremely optimistic."

Results

As in Study 1, all prescriptions were coded from -2 to $+2$. Means for prescriptions across all factors can be found in Table 3. Prescriptions were submitted to a 2 (wording: feeling/thinking) $\times$ 3 (scenario version) $\times$ 2 (order) mixed ANOVA. The most important results—regarding the nonsignificant main effect of wording—are displayed in Figure 3 and reported in the next paragraph, but first we will cover other results. No interactions were significant (all $ps > .12$). The main effect of order was not significant ($p = .727$), but there was a main effect of version, $F(2, 240) = 3.89$, $p = .022$, $\eta_p^2 = .031$. Unexpectedly, participants prescribed more optimism in the internal-agency/postcommitment scenario version ($M = 0.49$, $SD = 0.67$) than in the internal-agency/precommitment scenario version ($M = 0.27$, $SD = 0.62$), $p = .017$, 95% CI for the mean difference = $[-0.40, -0.03]$. This finding is like that of Armor et al.'s (2008) original finding, but it was not replicated in Studies 1 or 3, so we do not discuss it further.

Again, the primary issue in this study was whether there was a main effect of wording. Participants did not give significantly different prescriptions as a function of the manipulation (feeling vs. thinking), $F(1, 120) = 3.14$, $p = .079$, $\eta_p^2 = .025$. Prescriptions for both tended to favor optimism. For the feeling question, a one-sample t test showed that prescriptions ($M = 0.43$, $SD = 0.60$) were significantly above the scale midpoint of "realistic," $t(122) = 7.95$, $p < .001$, $d = 1.43$, 95% CI = $[0.32, 0.53]$. For the thinking question, prescriptions ($M = 0.31$, $SD = 0.59$) were also significantly above the midpoint, $t(122) = 5.82$, $p < .001$, $d = 1.05$, 95% CI = $[0.20, 0.41]$.

The fact that prescriptions in the two wording conditions did not significantly differ and were both significantly greater than zero reveals that emphasizing thinking as opposed to feeling does not substantially matter for prescriptions of optimism and pessimism. Moreover, we can rule out thinking as opposed to feeling as the crucial reason why the original and new estimation wordings used in Study 1 produced different prescriptions.

Study 3

Method

Study 3 was similar to Study 2 but addressed the impact of estimation wording (vs. optimism/pessimism wording).¹ See Table 1 again for an overview of differences between studies. In Study 3, we again had two wording conditions for which there was no best or ideal confound and for which there was a feeling-versus-thinking distinction. Unlike in Study 2, the condition that asked about

Table 3. Mean Prescription for Each Scenario, Version, and Prescription Wording in Study 2

Scenario and prescription wording	Scenario moderators			Average (collapsed across versions)
	Internal agency/precommitment	Internal agency/postcommitment	External agency/postcommitment	
Scenario 1 (award)				
Feeling wording	0.33 (0.76)	0.26 (0.92)	0.18 (0.86)	0.26
Thinking wording	0.35 (0.86)	0.37 (0.75)	0.20 (0.84)	0.31
Scenario 2 (surgery)				
Feeling wording	0.27 (0.84)	0.71 (0.89)	0.65 (0.83)	0.54
Thinking wording	0.29 (0.81)	0.50 (0.77)	0.58 (0.93)	0.46
Scenario 3 (investment)				
Feeling wording	0.48 (0.89)	0.74 (0.88)	0.16 (0.99)	0.46
Thinking wording	−0.10 (0.82)	0.30 (0.89)	0.30 (0.88)	0.17

Note: Numbers in parentheses are standard deviations. The feeling-wording prescription ranged from -2 (*extremely pessimistic*) to +2 (*extremely optimistic*); the midpoint was labeled “accurate.” The thinking-wording prescription scale also ranged from -2 (*extremely pessimistic*) to +2 (*extremely optimistic*); the midpoint was labeled “accurate.”

thinking used the same estimation wording from Study 1 and included response options that again referred to estimations of likelihood rather than to optimism and pessimism. If this change was crucial, then we expected to see a significant effect of the wording manipulation.

Design, participants, and statistical power. Study 3 had a 2 (wording: estimation, feeling) $\times$ 3 (version) $\times$ 2

(order) mixed design in which order was the only between-subjects variable (in addition to the same counterbalancing as in Studies 1 and 2, which will not be discussed further). We preregistered our intention to recruit a sample size of 180 participants. The preregistration can be found on OSF (<https://osf.io/zq8xj>). After all posted sessions were completed, the final sample size was 208 (all University of Iowa undergraduates; 144 women, 64 men; mean age = 18.70 years, $SD = 1.06$). This sample size provided 99.9% power to detect a medium to small difference ($d = 0.35$) in prescriptions between the two wording conditions.

Prescription measures and counterbalancing of measures. In the same fashion as in Study 2, participants answered both prescription questions, presented on the same page, for each of the three scenarios. Half of the participants saw the feelings prescription first followed by the estimation prescription, and the other half saw the prescriptions in the reverse order. As in Study 2, the introductory wording of the second measure was altered slightly to reduce participant confusion. For example, for the first question about the Lisa scenario, the wording was as follows (differences between the feeling and estimation prescriptions are in brackets):

Under the circumstances described in this story, how should Lisa [feel about/estimate] the likelihood of winning the award? In other words, what way of [feeling/thinking] would be advisable? In light of the situation that she is in, Lisa should [feel] _____ [about] her likelihood of winning the award.

For the second question, the wording was as follows:

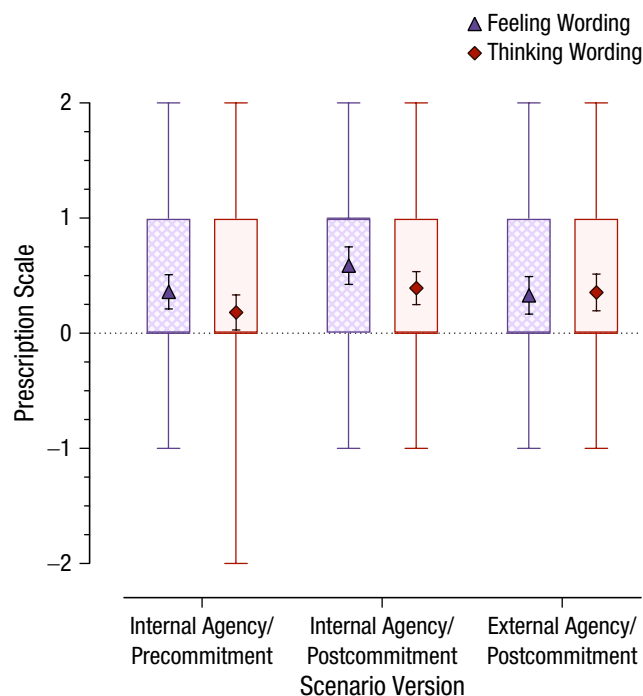


Fig. 3. Mean prescription for each scenario version and prescription wording in Study 2. In each plot, the symbol indicates the estimated mean, the shaded box indicates the distribution of the data from the 25th to the 75th percentile, and both sets of error bars indicate 95% confidence intervals.

Table 4. Mean Prescription for Each Scenario, Version, and Prescription Wording in Study 3

Scenario and prescription wording	Scenario moderators			Average (collapsed across versions)
	Internal agency/precommitment	Internal agency/postcommitment	External agency/postcommitment	
Scenario 1 (award)				
Feeling wording	0.25 (0.82)	0.18 (0.81)	0.24 (0.79)	0.22
Estimation wording	−0.33 (0.69)	−0.38 (0.71)	−0.47 (0.61)	−0.39
Scenario 2 (surgery)				
Feeling wording	0.34 (0.95)	0.72 (0.91)	0.51 (0.91)	0.52
Estimation wording	−0.01 (0.73)	0.04 (0.85)	0.01 (0.77)	0.01
Scenario 3 (investment)				
Feeling wording	0.17 (0.87)	0.40 (0.94)	0.26 (0.77)	0.28
Estimation wording	−0.44 (0.81)	−0.40 (0.75)	−0.21 (0.85)	−0.35

Note: Numbers in parentheses are standard deviations. The feeling-wording prescription ranged from -2 (*extremely pessimistic*) to +2 (*extremely optimistic*); the midpoint was labeled “accurate.” The estimation-wording prescription scale went from -2 (*greatly underestimate*) to +2 (*greatly overestimate*); the midpoint was labeled “accurately estimate.”

You’ve told us how you think Lisa should [feel about/estimate] the likelihood of winning the award. Now we’d like to know how you think Lisa should [estimate/feel about] the likelihood of winning the award. Your answer to this question might or might not be similar to your other answer. In light of the situation that she is in, Lisa should [feel] _____ [about] her likelihood of winning the award.

The response options for the feelings prescriptions involved pessimism and optimism terms. Specifically, they were always “extremely pessimistic,” “moderately pessimistic,” “realistic,” “moderately optimistic,” and “extremely optimistic.” The response options for the estimation prescription were always “greatly underestimate,” “slightly underestimate,” “accurately estimate,” “slightly overestimate,” and “greatly overestimate.”

Results

Means for prescriptions across all factors can be found in Table 4. The primary analysis was a 2 (wording: estimation, feeling) $\times$ 3 (version) $\times$ 2 (order) repeated measures ANOVA. There were no significant effects involving order or scenario version (all $ps > .10$), showing that neither the order of the prescriptions nor the different scenario versions had any influence on prescriptions. The only significant effect was a main effect of prescription wording (all other $ps > .17$).

Akin to the findings of Study 1, results of the present study showed that participants answered the prescription questions differently as a function of their wording, $F(1, 204) = 205.45$, $p < .001$, $\eta_p^2 = .502$ (see Fig. 4 for the results pattern). With the feeling-prescription measure (involving pessimism/optimism response options),

participants prescribed optimism, which was significantly above the midpoint of “realistic” ($M = 0.34$, $SD = 0.48$), $t(207) = 10.22$, $p < .001$, $d = 1.42$, 95% CI = [0.27, 0.41]. However, for the estimation-prescription measure, participants prescribed underestimating the likelihood of the uncertain outcomes, which was also significantly

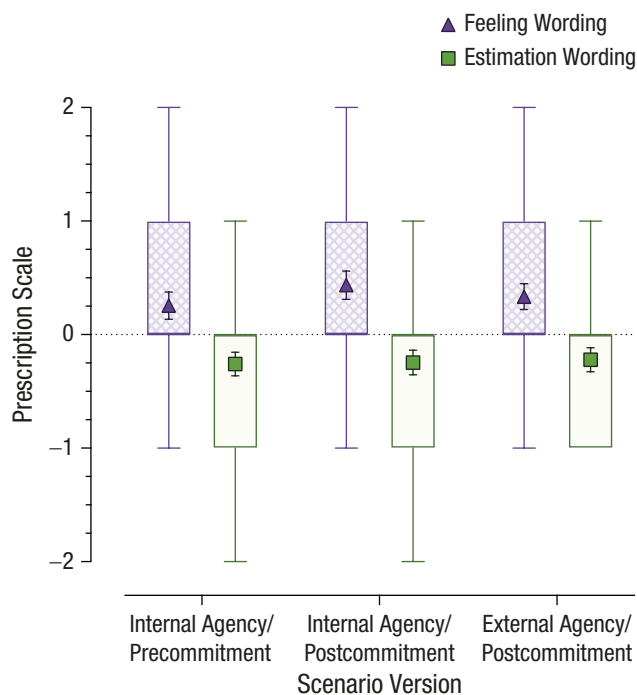


Fig. 4. Mean prescription for each scenario version and prescription wording in Study 3. In each plot, the symbol indicates the estimated mean, the shaded box indicates the distribution of the data from the 25th to the 75th percentile, and both sets of error bars indicate 95% confidence intervals. The box for estimation wording in the external-agency/postcommitment condition lacks an error bar because the distribution of the lowest quartile was equivalent to the minimum value of the scale.

below the midpoint of “accurately estimate” ($M = -0.24$, $SD = 0.45$), $t(207) = -7.77$, $p < .001$, $d = -1.08$, 95% CI = $[-0.31, -0.18]$.² Given that the previously discussed best/ideal confound was not relevant to Study 3, the similarity between the results of Study 1 and Study 3 suggests that the presence of the words *optimism* and *pessimism* in the response anchors is the key factor underlying the difference between the results found by Armor et al. (2008) and the results presented here.

As in Study 1, we ran an analysis with scenario (i.e., award, surgery, investment) as the repeated variable. In a 2 (wording) $\times$ 3 (scenario) repeated measures ANOVA, the effect of wording was the same as that already reported. The effect of scenario was significant, reflecting the fact that optimism was differentially prescribed across scenarios and protagonists, $F(2, 408) = 18.74$, $p < .001$, $\eta_p^2 = .040$. However, there was not a significant Wording $\times$ Scenario interaction, indicating that the difference in prescribed optimism between the feeling and estimation prescriptions was similar across the different scenarios, $F(2, 408) = 0.86$, $p = .424$, $\eta_p^2 = .004$.

Finally, because Study 3 had a within-subjects design (as did Study 2), the results show that the same participants can and will prescribe feeling optimistic yet still underestimate the likelihood of desired outcomes. In fact, 151 out of the 208 participants prescribed optimism yet also prescribed accuracy or underestimation to at least one of the three scenarios.

General Discussion

Although the findings of Armor et al. (2008) are commonly interpreted as showing that people think it is better to be optimistic than accurate or pessimistic, the present findings offer a crucial clarification and extension. In Study 1, we replicated the prescribed-optimism findings with the original prescription questions used by Armor et al. (2008). However, a different question wording produced quite different results—people prescribed underestimating the likelihood of the outcomes.

Studies 2 and 3 teased out which of three wording differences accounted for the dramatic change in results. An emphasis on feeling as opposed to thinking did not account for the change, nor did removing potentially biasing words. Instead, the change was attributable to a switch from asking about optimism and pessimism to asking about likelihood estimations. This is broadly consistent with our notion that the term *optimism* holds many potential meanings, some of which are viewed favorably and might make prescriptions of optimism generally appealing.

These findings reveal that even as people generally prescribe being optimistic, feeling optimistic, or even thinking optimistically, they do not generally prescribe

overestimating the likelihood of desirable outcomes. Does this mean that people prescribe overoptimism? By “overoptimism,” we refer to a level of optimism that is greater than what objective standards warrant (Windschitl & O’Rourke Stuart, 2016). The answer might be both yes and no. When people were asked for prescriptions using the familiar language of pessimism, accuracy, and optimism—which is the original language used by Armor et al. (2008)—the fact that people tended to pick a response that was above “accurate” arguably fits the definition of overoptimism. Yet when asked for prescriptions in reference to the likelihood estimation, the results did not suggest that people endorsed overoptimism.

This is not a trivial clarification. Prescribing optimism does not necessarily suggest an endorsement of self-deception or wishful thinking, but prescribing overoptimism—whether by favoring optimism over accuracy or by favoring an overestimation of the likelihood of a desired event—seems almost tantamount to such endorsements (von Hippel & Trivers, 2011; Windschitl et al., 2010).

Curiously, participants’ prescriptions about likelihood estimates in our studies were not balanced on “accurately estimate”—they were significantly below the midpoint of the scale (Studies 1 and 3). This could also be considered a form of self-deception, albeit in a cautious direction. A full explication of why people would endorse this pessimistic position (even when they would favor “optimism” on a pessimism-accuracy-optimism scale) is beyond the scope of this article, but it could be that participants recognized that the protagonists of each scenario had little to no control over the outcome and that this reduced optimistic outlooks (e.g., Shepperd et al., 2018). This might reflect that people perceive benefits to being defensively pessimistic and/or bracing (Carroll et al., 2006; Norem & Cantor, 1986; see also Weber, 1994). Future research could further explore these connections by using scenarios that manipulated how much control the protagonist has over the outcome.

Future research could also delve further into the generalizability of our findings. Although optimism is sometimes said to be a universal feature of human cognition (Fischer & Chalmers, 2008; Sharot et al., 2011), there is evidence for differences across Eastern and Western cultures in the prevalence and degree of optimism (E. C. Chang & Asakawa, 2003; Heine & Hamamura, 2007; Rose et al., 2008), as well as evidence for gender differences (Helweg-Larsen et al., 2011). There is also substantial variability in optimism as a personality trait (Carver et al., 2010). Although our findings were robust against gender effects, our studies were conducted in the United States and without personality measures, limiting our knowledge of how our

findings about prescriptions might generalize across cultures or other dimensions.

In conclusion, our work provides another example of how adding new measures, perhaps of more specific components, can be crucial when studying people's reports about constructs that may have vague, malleable, or complex lay interpretations (e.g., Barrett, 2006; Lucas, 2018; Moore & Schatz, 2017). We have suggested that lay interpretations of optimism and pessimism are vague and malleable and that various associations people have with the terms may underly people's tendency to favor an endorsement of optimism. Using the scenarios of Armor et al. (2008) but with new measures, we showed that although people favored prescriptions of optimism, they also prescribed likelihood estimates that were essentially pessimistic. Interpreting people's prescriptions of optimism is not straightforward.

Transparency

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Author Contributions

P. D. Windschitl conceived the idea for the study. All the authors designed and developed the study. J. E. Miller and I. Park prepared materials for testing. J. E. Miller analyzed the data. J. E. Miller and P. D. Windschitl wrote the manuscript. All authors edited the manuscript and approved the final version for submission.

Declaration of Conflicting Interests

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

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Open Practices

All data and materials have been made publicly available via OSF and can be accessed at <https://osf.io/kd6hu/>. The design and analysis plans for the studies were preregistered on OSF at <https://osf.io/r2muz> (Study 1), <https://osf.io/3azj6> (Study 2), and <https://osf.io/zq8xj> (Study 3). This article has received the badges for Open Data, Open Materials, and Preregistration. More information about the Open Practices badges can be found at <http://www.psychologicalscience.org/publications/badges>.



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Notes

1. The data presented in Study 2 were collected after the data in Study 3, but the two studies were created and developed at the same time.

2. It is unlikely that the wording effect is attributable to response pressures created by the within-subjects design, because Study 2 also used a within-subjects design.

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