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BRIEF REPORT

The Performance Heuristic: A Misguided Reliance on Past Success When Predicting Prospects for Improvement

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In estimating whether they are likely to improve on a performance task, people lean on a *performance heuristic*. That is, people rely on their previous performance success as a positive cue when estimating their prospects for performance improvement. Participants whose initial performance was better—either at a darts game (Study 1) or an anagram task (Study 2)—bet more money (Study 1) or estimated a higher subjective likelihood (Study 2) that their subsequent performance would show a specified amount of improvement. Reliance on the heuristic was unwise, for initial performance did not positively predict (and, in fact, negatively predicted) performance improvement. Study 2 suggests that the performance heuristic emerges because forecasters engage in attribute substitution, naturally focusing on their demonstrated performance instead of whether they have already maxed out their potential for improvement on the task. Self-assessments of their initial performance mediated the performance heuristic, but focusing participants on how much performance potential lay before them disrupted it (Study 2). Study 3 showed that the performance heuristic is a general-purpose heuristic that is used not merely to predict one's own prospects for improvement, but the prospects for other improvement (e.g., mutual funds' rate of return) as well.

Keywords: performance heuristic, improvement, self-assessment, attribute substitution, focalism

When it comes to our own skills and abilities, self-insight requires an accurate assessment not only of how we have performed in the past but also of our likely trajectory for the future. Knowing that we have made six of our last 10 free throws is a simple matter of observation, but predicting whether we can improve on our next 10 is a tricky prediction. How do people forecast chances of improvement? We propose that people rely, in part, on a *performance heuristic*. Heuristics provide shortcut answers to difficult questions; they allow people to substitute a simple, easily answerable question in place of a more challenging one (Kahneman, 2003; Kahneman & Frederick, 2002). We propose that when trying to forecast performance improvement, people instead answer the simpler question of whether they performed well on the task in the past. In more concrete terms, people engage in attribute substitution—relying on whether they showed successful (absolute) performance as a positive cue when forecasting whether they will be successful in achieving subsequent improvement.

At first glance, this heuristic might sound wise. After all, past success often predicts future success (e.g., Helzer & Dunning, 2012). But there are reasons to suspect the performance heuristic may lead people astray. Although performance across time is likely to be correlated (high midterm scores predict high final exam scores), this does not mean that initial performance predicts subsequent *improvement*. Furthermore, two reasons suggest demonstrated ability may *negatively*, not positively, predict subsequent improvement.

First, regression to the mean predicts that initially low performers and initially high performers are likely to demonstrate some convergence in subsequent performance. Although a failure to understand regression to the mean does not itself lead to the performance heuristic, the statistical phenomenon does help explain why past performance may actually be a *negative* predictor of improvement. Second, those who perform poorly on a task have more room to improve. First-time miniature golfers may quickly shave many strokes off their scores as they get a handle on putting, but similar gains by expert golfers will be harder to achieve. If people fall prey to the performance heuristic—focusing on their demonstrated performance instead of their future potential—they may miss this insight.

Although this article is the first to identify and document the performance heuristic, several lines of work converge to support the plausibility of our account. First, people tend to treat relative

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judgments as though they are absolute (Kruger & Burris, 2004)—failing to realize, for example, that adding 10 points to everyone's exam score does not improve one's own *relative* standing in a class (Windschitl, Kruger, & Simms, 2003). The performance heuristic suggests people may make a similar error. That is, when making the relative judgment of likelihood of improvement ("Will I do better than I did before?"), people will be focused on an absolute assessment ("I did well before, so I expect to do well again"). Of course, people can perform well or poorly again (in an absolute sense) even as they do or do not show signs of relative improvement.

Second, research suggests that when people initially perform at a low level, they fail to recognize their subsequent improvement, instead remaining focused on their early incompetence. This pattern emerges in research on learning and memory (the underconfidence-with-practice effect; Koriat, Sheffer, & Ma'ayan, 2002) as well as skill acquisition (Billeter, Kalra, & Loewenstein, 2011). And in fact, several findings in psychology—for example, anchoring (LeBoeuf & Shafir, 2009; Marsden, Veeraraghavan, & Ye, 2008) and presentism biases (Gilbert, Gill, & Wilson, 2002)—converge on the conclusion that forecasts of the future are disproportionately impacted by assessments of the present. Reinforcing this theme, Townsend and Heit (2011) found that people's sense of how much they were improving on a learning-memory task was better predicted by their present sense of task mastery than by how much their self-reported sense of task mastery had actually shifted over time. Together, these findings support our contention that in forecasting improvement, people may focus on their recent performance rather than their sense of their future potential. As a result, people may forecast continued "success" or "failure" on those (invalid) grounds.

Study 1

Study 1 offered an initial test of whether people lean on a performance heuristic—betting more that they would improve on a motor coordination task (a darts game) to the extent they performed better initially. We also tested whether reliance on the heuristic was unwise—that is, whether initial performance *negatively* predicted improvement.

Method

Participants. One hundred twenty-five undergraduates at the University of California, Berkeley, participated as part of a longer session. For this portion, they received $5, plus or minus the winnings or losses from their bet.

Procedure. Participants completed the Darts Game (see below) twice. After the first round, participants (a) learned their Round 1 score, (b) received $5, (c) learned they would play the game again, and then (d) indicated how much of their $5 they wanted to wager on whether they would improve their score by at least 5 points in Round 2. They then completed Round 2 of the game.

Darts Game. Participants stood regulation distance from a dartboard (236.86 cm). In each round, participants threw 12 darts. They were told to attempt to hit the bull's-eye on each throw. On any particular throw, participants' score was the number of inches (rounded to the nearest inch) from the bull's-eye that the dart landed. Darts that did not hit or stick to the dartboard were rethrown. Participants' score for each round was the sum of their 12 throws; thus, lower scores reflected a stronger performance.

Results and Discussion

On average, participants bet $3.50 ($SD$ = $1.54) that they would improve by at least 5 points. A slim majority (50.4%) actually did so. Participants showed evidence of the performance heuristic—the better (i.e., lower) participants scored in Round 1, the more money they bet that they would improve by at least 5 points in Round 2, $r(123) = .21$, $p = .02$. However, reliance on the performance heuristic was unwise—the better participants performed in Round 1, the *less* likely it was that they improved by at least 5 points, $\chi^2(1, N = 125) = 10.17$, $p = .001$ (see Table 1). Note that a 5-point improvement reflected a larger *percentage* improvement for those who performed well (vs. poorly) in Round 1. This worked against our hypothesis, because it made the bet even less enticing for the high-ability performers; thus, this test of the performance heuristic was particularly conservative.

Study 2

Study 2 expanded on Study 1 in three ways. First, we wanted to replicate the performance heuristic in a new domain: anagram performance. Second, we wanted to more directly test whether participants were relying on their subjective sense of the quality of their performance when forecasting improvement. Some participants explicitly reported how well they felt they had performed before stating their likelihood of improvement. We expected reli-

Table 1
Actual and Perceived Likelihood of Improvement by Round 1 (Good or Bad) Performance

Variable	Round 1 (Performance)	Round 1 (score)	Round 2 (likelihood of specified improvement)	Round 2 (bet/prediction)
Study 1	Bad (−1 *SD*)	50.67	70.15%	$3.17
	Good (+1 *SD*)	29.40	34.17%	$3.83
Study 2: L	Bad (−1 *SD*)	0.92 anagrams	52.05%	4.74
	Good (+1 *SD*)	7.37 anagrams	27.13%	5.98
Study 2: Pe + L	Bad (−1 *SD*)	1.50 anagrams	60.25%	5.22
	Good (+1 *SD*)	7.03 anagrams	33.36%	6.15
Study 2: Pe + Po + L	Bad (−1 *SD*)	1.40 anagrams	65.77%	5.63
	Good (+1 *SD*)	6.49 anagrams	34.86%	5.62

Note. L, Pe + L, and Pe + Po + L refer to the Likelihood, Performance + Likelihood, and Performance + Potential + Likelihood conditions, respectively. The final three columns are the predicted values for those who had a Good (+1 *SD*) or Bad (−1 *SD*) Round 1 performance.

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ance on the performance heuristic to hold, with self-reported performance evaluations mediating the effect of actual performance on their likelihood judgments.

Third, we wanted to distinguish between two possible mechanistic accounts for the performance heuristic. Our *attribute substitution* argument holds that when predicting one's prospects of future improvement, participants are not actually considering their potential for performance growth; instead, they are focused on their demonstrated performance. If so, redirecting participants' attention to how much room they have for improvement should disrupt the performance heuristic (see Moore & Kim, 2003, for an analogous approach).

By an alternative *warped perception* account, it is not that people are failing to focus on their potential for growth, but it is that their judgments of this potential have been warped by their own initial performance. That is, those who show good initial performance may take this as evidence that they have lots of untapped potential, whereas those who show initially poor performance feel that they have already maxed out their (limited) potential. If this alternative account is true, refocusing people on their potential to improve should not disrupt the performance heuristic; instead, such skewed assessments of potential should mediate it.

Method

Participants and design. Two hundred forty-five undergraduates at the University of California, Berkeley, participated as part of a longer session for which they received $15. Participants were randomly assigned to one of three conditions: Likelihood (L), Performance + Likelihood (PeL), or Performance + Potential + Likelihood (PePoL).

Procedure. Participants completed two sets of anagrams. This task was identified as a game, "Word Jumble." In each round, participants saw 20 six-letter anagrams. Participants had 2 min to solve, in any order, as many of the anagrams as they could. After Round 1 of anagrams, participants saw the Round 1 solutions, completed a number of questionnaire items (in the order specified in the condition name), then completed Round 2.

Performance. Participants in the PeL and PePoL conditions first completed two items on 9-point scales that asked them about the aptitude they showed in Round 1. "My performance on the Word Jumble task was strong" and "I was not very good at unscrambling the words" (reverse scored). The items were correlated, $r(160) = .86$, $p < .001$, and thus averaged.

Potential. Participants in the PePoL condition then completed two items on 10-point scales that asked them how much potential for improvement they had: "Would you say that Word Jumble is a game for which you still have a lot of room to grow (versus a game for which you have little space for further improvement)?" and "Would you say that Word Jumble is a task for which you have already maxed out your potential (versus do you still have a lot of potential for getting better)?" (reverse scored). The items were correlated, $r(91) = .69$, $p < .001$, and thus averaged.

Likelihood. Only at this point did all participants learn they would complete another round of Word Jumble. They then answered three items on 10-point scales that assessed their perceived likelihood of improving their score by 6% (the average performance improvement as determined by pretesting): "How likely is it that you will solve at least 6% more items?"; "How surprised will you be if you improve your performance by at least 6%?"; and "Would you say that you lack confidence in your ability to improve by at least 6%?" (reverse scored). These items were averaged ($\alpha = .77$). Thus those in the L condition completed only these items, which replicated the procedure from Study 1.

Results

The L condition. Conceptually replicating Study 1, participants who were only asked to report their likelihood of improvement showed evidence of the performance heuristic: Those who did better in Round 1 thought they were most likely to improve, $r(81) = .22$, $p = .05$. Reliance on the performance heuristic was again unwise: A logistic regression showed higher Round 1 scores predicted a decreased likelihood of improving by 6%, $\chi^2(1, N = 83) = 4.80$, $p = .03$.

The PeL condition. When participants assessed the performance they displayed in Round 1 before reporting their likelihood of improvement, they again showed the performance heuristic—relying on their Round 1 performance when predicting their likelihood of improvement, $r(67) = .31$, $p = .01$. Again, reliance on the performance heuristic led participants astray: Better performance in Round 1 predicted a lower likelihood of subsequent improvement, $\chi^2(1, N = 69) = 4.80$, $p = .04$.

To provide more direct evidence that participants relied on a sense of their demonstrated performance when estimating their likelihood of improving (as the performance heuristic suggests), we tested whether self-rated performance mediated the effect of Round 1 performance on estimated likelihood of improvement in Round 2. Indeed, the Round 1 score predicted a higher sense of performance, $r(67) = .71$, $p < .001$, which in turn predicted higher likelihood estimates, $r(67) = .34$, $p = .005$. We used Preacher and Hayes's (2008) boostrapping technique with 10,000 resamples to test the indirect effect of Round 1 score on likelihood estimate through self-reported performance. Providing more direct support for the performance heuristic, the 95% confidence interval of the indirect effect did not include zero [.1980, 1.4992].

The PePoL condition. When participants were explicitly asked to focus on their potential for improvement (a component that would seem to be a core input into judgments of the likelihood for improvement), would the performance heuristic be disrupted (suggesting our other participants had engaged in spontaneous *attribute substitution* and neglected to consider their potential)? Or instead would self-reported potential mediate the performance heuristic (suggesting that participants' sense of their potential for growth was *warped* by their initial performance)? Consistent with the attribute substitution hypothesis, the performance heuristic was disrupted: After being refocused on how much potential they had for further growth, participants no longer leaned on Round 1 performance when forecasting their likelihood of improvement ($r = -.00$). Descriptive statistics, across conditions, are summarized in Table 1.

Note that this condition also allows us to ask what participants *should* have relied on to make accurate forecasts. In a binomial logistic regression predicting whether participants improved by 6%, we included the Round 1 score and participants' judgments of performance, potential, and likelihood of improvement as predictors. As we have consistently found, the Round 1 score was a significant negative predictor of improvement, $\chi^2(1, N = 93) =$

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6.41, $p = .01$. Of the remaining predictors, only self-assessed potential yielded additional insight, though this positive relationship was marginally significant, $\chi^2(1, N = 93) = 3.00$, $p = .08$. Neither self-assessed skill ($\chi^2 < 1$) nor estimated likelihood of improvement, $\chi^2(1, N = 93) = 1.48$, $p > .22$, contributed incremental predictive power. In combination, this suggests that one continued barrier to accuracy was a failure to understand regression to the mean (the negative relationship between the Round 1 score and actual improvement), given that asking people about their potential disrupted the performance heuristic but did not go so far as to lead people to lean on initial performance as a negative predictor. But people's sense of their own potential for improvement may lead them toward accuracy. Although our focus has been on documenting and explaining the performance heuristic, we hope these findings may guide future efforts to help people harness their own potential for accurate self-knowledge.

Study 3

Study 3 was designed with three goals in mind. First, although we examined in our first two studies the performance heuristic in the context of self-predictions, we wanted to test whether the performance heuristic is a general-purpose heuristic that is likely to apply more broadly. We tested whether participants would lean on the performance heuristic in predicting whether real mutual funds would improve their performance. Second, by testing the performance heuristic in this context, we address a third-variable explanation for our earlier results (in which some third variable causes people to be good at both darts and anagrams and simultaneously causes their improvement overconfidence). Of course, any such third-variable account would likely already have trouble accounting for Study 2; it would have to explain why evidence for the performance heuristic held or was diminished in the two additional conditions. Nonetheless, because in Study 3 the experimenter randomly assigned each participant to learn that a particular mutual fund initially performed relatively well or poorly, we can rule out latent third-variable explanations for our earlier results. Third, our earlier studies asked how likely it was that performance would improve by a specific amount (e.g., 6% in Study 2). To make certain that the performance heuristic was not used only when assessing whether a specific improvement standard would be met, we simply asked about the fund's prospects for any improvement.

Method

Participants and design. One hundred twenty-eight Americans were recruited via Amazon Mechanical Turk and paid a nominal amount for their participation.

Procedure. We selected 12 High Yield Bond mutual funds from those catalogued by *U.S. News and World Report*. To select our stimuli, we ordered all catalogued funds based on their June 2012 rate of return. Next, we divided the funds into 12 equally sized groups. From each group, we selected one fund at random. Participants were shown all 12 funds (represented by the corporate logos of their managing investment companies) along with their June 2012 return rates. To unconfound the stated success of each fund with any preexisting knowledge participants may have had about each investment company, we counterbalanced whether participants saw each fund listed with its actual [worst, second-worst, . . ., best] initial rate of return or the "reverse" [best, second-best, . . ., worst] initial rate of return.

For each mutual fund, participants answered four questions about how likely the fund was to improve its rate of return in July 2012. Participants indicated how surprised they would be if the rate of return improved (reverse scored), the percentage chance that it would improve, how diffident (vs. confident) they were that the fund's rate of return would increase (reverse scored), and how much of $10 they would bet that the rate of return would increase ($\alpha = .65$). All but the percentage item were responded to on 0–10 scales. The percentage item was responded to on a 0%–100% slider scale. To permit combining the measures into a single index, we standardized responses before summing them to form a *likelihood of improvement* composite.

Results and Discussion

As predicted, participants again showed evidence of the performance heuristic. The stated June 2012 rate of return predicted the fund's perceived likelihood of improvement, $r(10) = .75$, $p = .01$. Table 2 presents the results by dependent measure for each mutual fund. As in our studies of self-prediction, relying on the performance heuristic was unwise: Initial rate of return was highly negatively correlated with the change in return for the next month, $r(10) = -.90$, $p < .001$. This suggests that the performance heuristic does not merely characterize the way that people forecast their own prospects for improvement, but instead appears to be a more general cognitive shortcut that people spontaneously rely on in forecasting other prospects for improvement as well.

General Discussion

We investigated how people estimate the likelihood of improving on a performance task. In three performance contexts—a motor-coordination game, a cognitive task, and an investment opportunity—people showed evidence of a performance heuristic. That is, people leaned on demonstrated ability as a positive predictor of the prospects for future improvement. Instead of aiding self-insight, the performance heuristic hampered it: Initial performance negatively predicted likelihood of improvement. People's failure to recognize the negative relationship between initial performance and improvement reflects a failure to understand both regression to the mean and that those that begin with worse performance have more room to improve. More important for our purposes, the fact that people lean on initial performance as a *positive* cue to improvement reflects reliance on the performance heuristic. It seems that a sense of task mastery leads people to be optimistic about their prospects for improvement. But note that in predicting improvement (as opposed to predicting absolute performance), one's own mastery is already factored into the question (i.e., the score associated with an x% improvement rises or falls with one's initial performance), explaining in part why reliance on this heuristic leads to forecasting errors.

The performance heuristic reinforces a theme from research on presentism and anchoring: Forecasts of the future are too tethered to assessments of the present. Whereas previous research has supported this broad theme by showing that people do not adjust sufficiently when predicting change, the present research instead

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Table 2
Actual and Perceived Likelihood of Improvement for Each Mutual Fund Rate of Returns (Study 3)

Actual mutual fund	June 2012 rate of return	July–June 2012 rate of return	Surprise	Percentage	Diffidence	Bet
Federated	4.62%	−3.26%	4.41	55.53%	4.00	$5.35
Rydex | SGI	3.54%	−2.63%	4.18	56.21%	3.82	$5.08
MFS	2.04%	−0.32%	3.95	57.36%	3.95	$5.11
Western Asset	1.78%	0.24%	4.29	55.66%	4.52	$4.37
Mainstay Investments	1.78%	−0.01%	4.24	53.86%	4.50	$4.45
Calvert Investments	1.71%	−0.24%	4.28	53.63%	4.55	$4.36
Allianz Global Investors	1.59%	−0.02%	4.63	52.26%	4.67	$4.15
Westcore Funds	1.59%	0.22%	4.35	53.92%	4.58	$4.36
Loomis | Sayles	1.52%	−0.98%	4.50	52.38%	4.57	$4.16
Rochdale Investment Management	1.21%	0.33%	4.75	49.63%	5.09	$3.97
John Hancock	1.14%	0.74%	4.91	48.64%	5.19	$3.99
Intrepid Investments	0.62%	−0.21%	5.12	49.81%	6.07	$3.88
r(June 2012 rate of return, *column*)		−.90***	−.50	.66*	−.76**	.89***

Note. For half of participants, the name of the mutual fund was not the one listed first, second, . . ., 10th, but the one listed 10th, ninth, . . ., first, respectively. The final four columns are the dependent measures assessing the perceived likelihood of improvement. Percentage = percentage chance that they fund's rate of return would be assumed to increase from June 2012 to July 2012.
* $p < .05$. ** $p < .01$. *** $p < .001$.

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emphasizes that people do not appreciate that past success at task *performance* does not imply future success at task *improvement*. Study 2 established that people naturally focus on their initial performance (an easily assessable attribute) and neglect (potentially useful) considerations of their potential for improvement. That is, people engage in attribute substitution. Refocusing people on their potential disrupted the performance heuristic. This is remarkable given the task of forecasting performance improvement is one that would seem to naturally call for a focus on one's unrealized potential.

Given that Study 3 offered initial evidence that the performance heuristic is a general-purpose heuristic—one that guides not only self-predictions but also predictions of improvement more generally—future research should explore more general interventions that push people to avoid the heuristic and make more accurate forecasts. At the same time, future efforts should also be attuned to circumstances in which the performance heuristic may prove rational, or at least adaptive. Although the performance heuristic leads people astray when task improvement shows diminishing returns, the heuristic may push people toward accuracy when they are in the early stages of an "S-shaped" learning curve (Hull, 1943; Son & Sethi, 2006). These are tasks for which people's improvement may be slow initially, but once such individuals reach a certain performance level, they may have more insight into how improvement can unfold, permitting more rapid subsequent gains.

Even when it is not the case that good performance predicts greater improvement, reliance on the performance heuristic may adaptively push people to invest effort in domains that will yield the highest payoffs (Dunlosky & Hertzog, 1998; Nelson & Leonesio, 1988). People invest practice time on tasks when they believe that they are in the process of improving (Kornell & Metcalfe, 2006; Metcalfe, 2009; Metcalfe & Kornell, 2005; Son & Sethi, 2006). This means the performance heuristic may tantalize people into investing their time and money in domains in which performance is already good. Even if the improvement gains they anticipate are not realized, they will at least have invested efforts in those performance tasks (and investment opportunities) likely to maximize their absolute level of success.

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