A strategic mindset: An orientation toward strategic behavior during goal pursuit

Patricia Chen,a,1 Joseph T. Powersb, Kruthika R. Katragaddab, Geoffrey L. Cohenc, and Carol S. Dwecka,b,1

aDepartment of Psychology, National University of Singapore, Singapore 117572; and bDepartment of Psychology, Stanford University, Stanford, CA 94305

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Many attractive jobs in today’s world require people to take on new challenges and figure out how to master them. As with any challenging goal, this involves systematic strategy use. Here we ask: Why are some people more likely to take a strategic stance toward their goals, and can this tendency be cultivated? To address these questions, we introduce the idea of a domain-general “strategic mindset.” This mindset involves asking oneself strategy-eliciting questions, such as “What can I do to help myself?”, “How else can I do this?”, or “Is there a way to do this even better?”, in the face of challenges or insufficient progress. In three studies (n = 864), people who scored higher on (or were primed with) a strategic mindset reported using more metacognitive strategies; in turn, they obtained higher college grade point averages (GPAs) (Study 1); reported greater progress toward their professional, educational, health, and fitness goals (Study 2); and responded to a challenging timed laboratory task by practicing it more and performing it faster (Study 3). We differentiated a strategic mindset from general self-efficacy, self-control, grit, and growth mindsets and showed that it explained unique variance in people’s use of metacognitive strategies. These findings suggest that being strategic entails more than just having specific metacognitive skills—it appears to also entail an orientation toward seeking and employing them.

Significance

Modern life and work involve grappling with many novel challenging tasks. What makes some people more strategic, and hence more effective, as they approach these tasks? This research introduces and tests a psychological construct—a “strategic mindset”—which involves asking oneself strategy-eliciting questions, such as “What can I do to help myself?” or “Is there a way to do this even better?” in the face of challenges or insufficient progress. A strategic mindset uniquely predicts how much people report actually using strategies and, in turn, how effective they are at pursuing goals across life domains. The findings suggest that being strategic entails more than just having specific strategic skills—it appears to also entail an orientation toward accessing and employing them.


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1To whom correspondence may be addressed. Email: patchen@nus.edu.sg or dweck@stanford.edu.

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might prompt them to plan, generate, monitor, and adjust their study techniques when needed. In turn, the more such strategic behavior they practice, the better they should learn and perform (10, 23). If we could demonstrate that a strategic mindset is indeed associated with greater use of metacognitive strategies during goal pursuit (beyond just the knowledge of individual strategies), and that inducing a strategic mindset can increase people’s spontaneous use of such metacognitive strategies, we may be on our way toward understanding how to help people achieve their goals.

We present the results of three studies: two field surveys of people pursuing important life goals and an experimental laboratory study in which a strategic mindset was induced. In our studies, we predicted that a strategic mindset would have an indirect effect on goal achievement. This is because simply asking oneself the strategic mindset questions may not in itself make people higher performers; rather, these self-primes need to be translated into actual metacognitive strategy use to make people more likely to achieve their goals. Thus, these studies tested, and found support for, the hypotheses that (i) a strategic mindset predicts individual differences in the use of metacognitive strategies during goal pursuit (above and beyond knowledge of individual strategies), (ii) a strategic mindset indirectly predicts goal achievement through the use of such metacognitive strategies, and (iii) a strategic mindset can be experimentally induced to causally increase people’s use of metacognitive strategies.

Study 1

In Study 1, 365 college students participated (59.2% female, 0.5% “other” gender, 0.8% gender missing; M_age = 20.0 y; M_GPA = 3.53; 71 freshmen, 106 sophomores, 83 juniors, 91 seniors, 11 fifth year seniors or above, 3 class standing missing; see SI Appendix, Study 1 Supplementary Text for further information on the sample). All studies reported in this paper had approval from the University of Michigan or Stanford University Institutional Review Board, where they were conducted, and all participants provided informed consent.

Participants completed an online survey midway through the fall semester. They self-reported their general strategic mindset on our six-item strategic mindset scale (e.g., When studying for a class, I tend to...); 1 = Never, 5 = Most of the time; eight-item scale α = 0.84; see SI Appendix, Table S2 for full scale adapted from ref. 10).

In all our studies, we sought to minimize any carryover or demand effects by taking a number of precautions. In Studies 1 and 2, we separated the strategic mindset and metacognitive strategy-use scales into different sections of the survey, with other scales and questions (e.g., self-control scale, grit scale, descriptions and ratings of people’s professional/educational and health/fitness goals) placed in between. In a later study, Study 3, we manipulated a strategic mindset, assessed metacognitive strategy use in a different situation, and corroborated our metacognitive strategy-use measure with two additional measures, including independent coders’ observations of participants’ actual behavior and participants’ descriptions of actual techniques they had used.

To test our key hypothesis in Study 1, we examined the extent to which students’ strategic mindset indirectly predicted their objective college grade-point average (GPA) through their use of metacognitive strategies in their courses. Participants gave consent for us to obtain their college GPA from the school registrar, which included (i) their GPA for the fall semester in which they took the survey (“Fall GPA”), and (ii) their GPA for the winter semester immediately following (“Winter GPA”). These GPA measures gave us objective outcome measures of their performance within the same fall semester that we measured their strategic mindset and metacognitive strategies, and also during the subsequent winter semester in which they took new classes.

As hypothesized, students’ general strategic mindset scores were positively and significantly associated with how much they reported using specific metacognitive strategies in their classes: A one-unit increase in students’ strategic mindset was positively associated with a 0.41-unit increase in their use of metacognitive strategies (out of a five-point scale), linear regression b = 0.41, [0.32, 0.50], se = 0.05, t(358) = 9.04, P < 0.001. In turn, students’ reported use of metacognitive strategies in the fall semester predicted their Fall GPA, b = 0.08, [0.01, 0.16], se = 0.04, t(344) = 2.30, P = 0.022, and also their Winter GPA in new, different classes, b = 0.13, [0.03, 0.23], se = 0.05, t(331) = 2.52, P = 0.012.

Also as hypothesized, students’ strategic mindset indirectly predicted their Fall GPA, indirect effect ab = 0.05, [0.02, 0.08], se = 0.02 and their Winter GPA, indirect effect ab = 0.06, [0.02, 0.11], se = 0.02, through their use of such adaptive metacognitive strategies (see Fig. 1; analyzed with 1,000 bootstrap resamples using the lavaan package in R; version 0.5–23.1097; ref. 24). There was no total effect of strategic mindset on either of the GPA outcomes, P values >0.250. Results were the same when we transformed the GPA measures using a Box–Cox transformation (λ = 5) to correct for nonnormality (25, 26).

Study 2

We proposed that a strategic mindset is a domain-general tendency that has implications for effective goal pursuit more broadly, but Study 1 only tested its effects within one domain.
Hence, Study 2 extended this research to investigate whether a strategic mindset can apply across important domains of striving, such as people’s professional/educational goals and their health/fitness goals. Another purpose of Study 2 was to address the question of whether a strategic mindset has explanatory power above and beyond other self-regulatory and mindset constructs that are related to goal progress, including general self-efficacy, self-control, grit, and growth mindsets of intelligence, of personality, and of the social world. Here, we investigated whether a strategic mindset significantly predicted goal progress when we controlled for each of the other variables.

To replicate our own Study 2 findings, we conducted two independent, well-powered rounds of sampling with similar measures (sample 1: n = 202, sample 2: n = 163; total n = 365 Amazon Mechanical Turk participants; 45.2% female, 0.3% gender missing; M_age = 37.0 y). We report the analysis of data aggregated across both rounds, which each produced the same pattern of results (the SI Appendix, Study 2 Supplementary Text presents the analyses of each sample separately). All regression analyses employed listwise deletion, reflected in the degrees of freedom reported.

Participants completed our strategic mindset scale, as in Study 1. They were all asked to list a current professional/educational goal of theirs (e.g., “learn programming in Python”) and a current health/fitness goal of theirs (e.g., “I want to lose 20 pounds”). As our primary outcome measure of goal progress, participants reported how much progress they had made toward each of their goals (“So far, how much progress would you say you have made towards this goal?”) on a seven-point scale.

Later, after answering filler questions, participants rated our key mediational measure: how frequently they had been applying metacognitive strategies during their pursuit of each goal within each of these previous constructs. We measured participants’ general self-efficacy (e.g., “I can always manage to solve difficult problems if I try hard enough.”); 10-item α = 0.92; ref. 28), self-control (e.g., “I am good at resisting temptation.”); 13-item scale α = 0.90; ref. 29), grit (e.g., “Setbacks don’t discourage me.”); 8-item scale α = 0.90; ref. 30), and three growth mindset measures of intelligence (e.g., “You have a certain amount of intelligence, and you can’t really do much to change it.”); 4-item scale α = 0.97; ref. 31), personality (e.g., “The kind of person you are, is something very basic about you and it can’t be changed very much.”); 4-item scale α = 0.94; ref. 32), and the social world (e.g., “Though we can change some social phenomena, it is

![Mediation models representing the relationship among people’s strategic mindset, reported use of metacognitive strategies during goal pursuit, and reported goal progress toward their professional/educational goals (Upper) and their health/fitness goals (Lower).](https://www.pnas.org/doi/10.1073/pnas.2002529117)

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Fig. 2. Mediation models representing the relationship among people’s strategic mindset, reported use of metacognitive strategies during goal pursuit, and reported goal progress toward their professional/educational goals (Upper) and their health/fitness goals (Lower). Regression coefficients were estimated using 1,000 bootstrapped resamples; numbers in brackets represent their 95% CIs.
unlikely that we can alter the core characteristics of our social world.”; 4-item scale $\alpha = 0.96$; adapted from ref. 33).

A strategic mindset showed moderate to low correlations with the array of potentially related constructs we measured (general self-efficacy: $r = 0.52$, $P < 0.01$; self-control: $r = 0.34$, $P < 0.01$; grit: $r = 0.45$, $P < 0.01$; growth mindset of intelligence: $r = 0.10$, $P = 0.062$; growth mindset of personality: $r = 0.09$, $P = 0.091$; growth mindset of the social world: $r = 0.08$, $P = 0.108$), suggesting that it is not the same as these prior constructs. Importantly, a strategic mindset offered unique value in (i) predicting people’s use of metacognitive strategies and (ii) indirectly predicting their reported goal progress across domains. That is, when we controlled for each of the aforementioned covariates, a strategic mindset still significantly predicted people’s reported use of metacognitive strategies, and it also indirectly predicted their reported goal progress within each domain (Table 1).

Taken together, Studies 1 and 2 support the proposal that a strategic mindset is a domain-general tendency that is associated with more strategic behavior (i.e., using metacognitive strategies) as people pursue important goals across different life domains; and that such strategic behavior, in turn, predicts people’s progress toward each of their goals. Moreover, a strategic mindset is a meaningful psychological construct—it offers unique predictive value beyond other relevant self-regulatory and mindset constructs, including general self-efficacy, self-control, grit, and growth mindsets.

**Study 3**

Thus far, we have examined correlations between holding a strategic mindset and engaging in metacognitive strategies. However, we propose that a strategic mindset, like other mindsets (31, 32, 34), has causal effects beyond other relevant self-regulatory and mindset constructs, including general self-efficacy, self-control, grit, and growth mindsets. During debriefing, very few participants in our study (only 4 of 134) spontaneously reported any suspected link between the strategic mindset exercise in Part 1 of the study and their strategy-use behaviors in Part 2 of the study.

We recruited 134 participants from a private university and the surrounding community in the Western United States (gender: 88 females, 1 “other”; $M_{age} = 24.5$ y). One participant’s data were excluded due to an experimenter’s error during data collection.

**Part 1: Random Assignment to Condition and Experimental Induction.**

In Part 1, participants were randomly assigned to either the strategic mindset condition or a comparison control condition. Participants in the strategic mindset condition read an online article emphasizing that the key to success is strategic thinking (SI Appendix, C1). It described strategic thinking as being able to take a step back from what one is doing to ask oneself questions such as, “How else can I do this? Are there things that I can do differently? Are there ways to do this even better?” The article contained anecdotes and research findings, for example about children and Fortune 500 CEOs, that emphasized the benefits of a strategic mindset.

For comparison, those in the control condition read an online article of comparable length and structure about an unrelated topic that was unlikely to prime a strategic mindset or metacognitive strategies: the mental health benefits of cold showers (SI Appendix, C2). Pretesting with an independent group of adults, separate from the sample used in this study, showed that the two articles did not significantly differ in their persuasiveness, engagingness, informational value, or aesthetic qualities.

After reading their assigned articles, participants were given an open-ended summary box, and asked to write about the main message of the article as though they were sharing it with others on social media. Such saying-is-believing exercises are commonly used in social psychological experiments to encourage participants’ self-endorsement, personalization, and internalization of the content (e.g., refs. 35 and 36).

**Part 2: Metacognitive Strategy Use, Performance, and Practice on an Unfamiliar Challenging Task.** In Part 2, a new experimenter obtained participants’ consent to take part in an ostensibly unrelated study. We carefully developed and pretested a laboratory task—an egg cracking and separating task. Although this task does not seem like the kind of task that most people will encounter in modern life or the modern workplace, it was carefully designed to meet the

![Table 1. Coefficients from covariate-inclusive (i) multiple regression models predicting reported metacognitive strategy use and (ii) indirect effect tests, with goal progress as outcome and metacognitive strategy use as a mediator](https://www.pnas.org/content/pnas/early/2020/06/23/1920064117.full.pdf)

All regression coefficients are unstandardized; 95% CIs of the coefficients are represented in square brackets. Covariates were added individually to the regression models to avoid problems of multicollinearity.
following criteria: The task was relatively unfamiliar and challenging for most participants; it could be accomplished with different methods, some of which were more effective than others; and there were clear performance metrics.

All participants were given the same goal: to crack eggs and collect the greatest volume of egg white into a designated egg white bin within 2 min. To motivate them, participants were told that they would win $100 if they collected the greatest volume of egg white of any participant (i.e., performed the task with the fastest speed). Participants’ reports that they were, on average, highly motivated to win ($M = 5.02, SD = 1.51$ on a seven-point scale), and this did not differ between conditions (control condition: $M = 5.11, SD = 1.44$; strategic mindset condition: $M = 4.92, SD = 1.59$), $P = 0.490$. In addition, participants were cautioned that if any yolk from any egg was accidentally poured into the egg white bin, they would have that egg (i.e., the average weight of one egg used in the study) deducted from their total egg white weight. This was to encourage participants to crack and separate the egg whites as cleanly as possible, while focusing on maximizing speed.

We measured each participant’s reported use of metacognitive strategies on the task immediately after they performed the task, using the same kind of measure we used in the previous studies (e.g., “Throughout the study, I kept track of how effective each of my approaches to cracking and separating the eggs was.”; $1 = $ Not at all true of me, $5 = $ Very true of me; four-item scale $\alpha = 0.80$; see SI Appendix, Table S2 for full scale). In this case, we were able to corroborate participants’ reports with two additional methods (i.e., performed the task with their reported use of metacognitive strategies; first, how many concrete techniques participants described using other than the default technique demonstrated by the experimenter ($r = 0.42$, $P < 0.001$); second, observation and coding of such technique use by independent observers ($r = 0.30, P = 0.001$; refer to SI Appendix, Study 3 Supplementary Text for detailed description and analyses). These correlations suggest that participants who reported high degrees of metacognitive strategy use actually tended to generate and apply more new, different techniques during the task.

As a key outcome measure of participants’ performance, we assessed the total volume of egg white that each participant had collected in the egg white bin within the 2 min allotted—a measure of their performance speed. We also compared participants’ volume of egg white minus spills—a measure of performance taking into account speed and the strict accuracy penalty—by subtracting the average weight of one egg for any yolk spilled during cracking.

As a secondary outcome of interest in this study, we asked whether participants in the strategic mindset condition would be more likely to practice the task when given the opportunity. Practice is an indication of forethought and preparation—key indications of metacognition (3, 10). We gave participants 5 min of free time and eight practice eggs, allowing them to practice as little or as much as they wanted. We assessed two measures of practice behavior: (i) did participants practice at all (coded by two independent observers as “1” when there was observed practice, or “0” when there was not; interrater reliability was high at $k = 1$ for this simple coding), and (ii) how many eggs did they practice on (which ranged from 0 to 8)?

**Results**

We tested our hypothesis that, compared to controls, people randomly assigned to the strategic mindset condition would report using more metacognitive strategies on the laboratory task, and that this, in turn, would predict better task performance. In all our analyses, we controlled for participants’ reported prior experience with this egg cracking and separating task, because as one might expect, prior experience was significantly related to all dependent variables of interest, including reported use of metacognitive strategies, performance, and practice (see SI Appendix, Study 3 Supplementary Text for more details).

Was there a difference between conditions in participants’ use of metacognitive strategies? As hypothesized, participants in the strategic mindset condition indeed reported using metacognitive strategies to a greater extent than those in the control condition, $b = 0.38, [0.07, 0.69]$, $se = 0.16$, $t(128) = 2.39$, $P = 0.018$. At the mean level of prior experience ($M = 3.17$), participants’ average ratings of metacognitive strategy use in the strategic mindset condition was 3.77, compared to an average of 3.39 in the control condition. Therefore, inducing a strategic mindset causally increased participants’ reported likelihood of spontaneously exhibiting such strategic behavior during the egg cracking and separating task—building upon our earlier correlational findings. Random assignment to condition also supported the idea that differences in the number of metacognitive strategies resulting from a strategic mindset are not just a function of a larger repertoire of preexisting metacognitive strategies or other such individual differences.

The more participants reported using metacognitive strategies, the faster they performed on the task, $b = 25.79$ g, $[5.45$ g, $46.13$ g], $se = 10.28$, $t(124) = 2.51$, $P = 0.013$. For every one-unit increase in reported metacognitive strategy use, participants deposited an average of 25.79 g more egg white during the 2-min performance time window—approximately one-third the weight of the average egg used in our experiment. As in earlier studies, we found an indirect effect of strategic mindset condition on performance speed, controlling for prior experience as a covariate. Use of metacognitive strategies mediated the relationship between participants’ condition and their speed on the egg cracking and separating task, bootstrapped indirect effect $ab = 9.45$, $[0.42, 25.94]$, $se = 6.61$ (Fig. 3).

On our additional performance measure of speed with the stringent accuracy penalty, we found an indirect effect of

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**Fig. 3.** Mediation model representing the relationship among condition (0 = Control, 1 = Strategic Mindset), participants’ reported use of metacognitive strategies, and their performance speed. Performance speed refers to the total egg white volume participants collected during the 2-min performance time window. Participants’ prior experience with the activity was included as a covariate in the mediation model but not represented in this figure. Regression coefficients were estimated using 1,000 bootstrapped resamples; numbers in brackets represent their 95% CIs.
strategic mindset condition that was trending in the same predicted direction, but its 95% CI overlapped with 0, bootstrapped indirect effect $ab = 7.50, [-0.27, 21.70], se = 5.69$. Participants in the strategic mindset condition reported using more metacognitive strategies during the task, compared to those in the control condition, $b = 0.38, [0.07, 0.69], se = 0.16, t(128) = 2.39, P = 0.018$. In turn, the more metacognitive strategies they reported using, the (marginally but nonsignificantly) faster they performed on the task when we subtracted a stringent penalty of 1 entire egg's weight for any yolk spilled per egg, $b = 19.24, [-1.20, 39.67], se = 10.32, t(125) = 1.86, P = 0.065$. It is possible that we might have penalized inaccuracy too severely, particularly given the inexperience on the part of most participants. It is also possible that the task instructions put the premium on speed and, hence, speed was what most participants strove for.

Prior to performing, did participants take the initiative to practice the task at all? Five participants' practice data were not included in the analyses due to technical issues with their practice time videos (e.g., video recording ended midway), leaving 128 videos for analyses. We found that exposure to the strategic mindset induction increased participants' observed likelihood of practicing at all, as well as how much they practiced before they had to perform. Controlling for prior experience, the odds of practicing at all were 2.40 times higher among participants in the strategic mindset condition than those in the control condition, log odds $= 0.88, [0.08, 1.72], se = 0.42, z = 2.11, P = 0.035$. On average, participants in the strategic mindset condition practiced on more eggs ($M = 4.17$ eggs, $SD = 3.21$), compared to those in the control condition ($M = 3.16$ eggs, $SD = 3.38$), $b = 1.16, [0.03, 2.30], se = 0.57, t(124) = 2.03, P = 0.045$, controlling for prior experience. Results were the same when we used a nonparametric Wilcoxon Rank Sum test (because of the nonnormally distributed data) after parceling out the variance explained by their prior experience, $Z = 2.19, P = 0.028$.

In summary, Study 3’s findings provide empirical support for causality by showing that inducing a strategic mindset can evoke changes in people’s strategic behavior as they undertake a novel, challenging task. Relative to controls, those presented with a brief strategic mindset induction reported applying more metacognitive strategies to the task, and in turn, they performed the task more quickly. They were also more likely than controls to be observed practicing techniques in the initial phase of the task.

**Discussion**

A major motivation for our research was the observation that many jobs in the modern world, as well as challenging goals more generally, require people to actively think through and figure out how to best navigate the tasks at hand. In the midst of such challenges, many people simply adopt and stick with suboptimal ways to approach them. In the context of trying to seek new and better strategies, future research could fruitfully explore these intriguing boundary conditions of strategic mindset effects.

What are the implications of our findings for interventions that seek to enhance goal progress and attainment? As noted above, since a strategic mindset is proposed to facilitate goal progress by priming metacognitive strategy use, it might not be fruitful to teach a strategic mindset if an individual has a sparse repertoire of metacognitive strategies. In such cases, an intervention to promote metacognitive strategies and a strategic mindset might be most effective. That is, future interventions could build upon our brief laboratory induction by designing and testing more extensive interventions that guide people to ask themselves these few, simple self-prompts whenever they encounter challenges or would like to raise their game. At the same time, these interventions should also ensure that the target individuals have a repertoire of strategies that they can access and apply.

Another implication for interventions may reside in the combining of a strategic mindset with other interventions or using it as a support for other self-regulatory processes. Although a strategic mindset has distinct predictive power beyond self-control, grit, and growth mindsets, it could potentially complement any of these factors in facilitating goal achievement. For example, practicing a strategic mindset could relieve the need for exerting chronically high levels of self-control during goal pursuit, which may not be sustainable. Indeed, research suggests that active and effective strategizing can actually minimize the need for exerting self-control (Study 3). These are goals that may require the repeated accessing or invention of new strategies—precisely the kinds of goals that are increasingly stressed in many modern jobs. However, if an individual does not have appropriate strategies to draw upon, then a strategic mindset may not be as helpful. Similarly, if an individual does not know how to match the strategies in their repertoire to the goal in question, then using a strategic mindset to prime and access strategies may be less beneficial. There may also be times when too much searching for new strategies could derail a perfectly good strategy, which would be counterproductive, particularly if one is under time pressure and needs to be decisive. In a related vein, some activities in life are routine or straightforward and can be efficiently dispatched without being overly perfectionistic or compulsive about seeking new and better strategies. Future research could fruitfully explore these intriguing boundary conditions of strategic mindset effects.
for high levels of effortful control (37). Similarly, a growth mindset or grit may encourage persistence, but persistence also requires effective strategies for goals to come to fruition. That is, people may believe that their abilities can be developed, but they may not necessarily think about how best to do so. Self-exhortations to simply try harder may actually prove discouraging if a person is simply doubling down on the wrong strategy. A strategic mindset might instead encourage the person to search for and try out new strategies, consult with mentors, or seek out other experts. Even when things are going fine, there may still be better ways to move forward, and a strategic mindset may encourage people to find those ways. Thus, a strategic mindset could complement other factors that motivate effort investment and persistence, but often do not directly target strategy regulation (32, 38, 39).

Our hope is that our findings and further research in this area may lead scientists and practitioners to reconsider what being strategic toward one’s goals entails. Importantly, metacognitive strategies need not be just a set of skills that we learn and occasionally remember to apply. Rather, the more people can use a strategic mindset to figure out how to do things differently and better, the more creative and effective they may be in many areas of life.

Data Deposition. The deidentified data and code reported in this paper are available at https://osf.io/f5dzy/?view_only=27d76ad-61664db8d8de491c4ef7e750.

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