

REVIEW

The Social Psychology of Biased Self-Assessment

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Objective: To describe the psychological mechanisms that underlie biased self-assessment and suggest pedagogical techniques to counter them.

Findings: Since the psychological mechanisms that underlie bias self-assessment occur below awareness, strategies that attempt to address bias directly are unlikely to succeed. A more effective approach may be to structure students' learning experiences in ways that prevent the unconscious biasing mechanisms from operating efficiently.

Summary: Given the importance of accurate self-knowledge for professional students and clinicians, as well as its difficulty to attain, an understanding of the psychological mechanisms that contribute the most common forms of biased self-assessment is essential for creating and implementing effective mitigation strategies.

Keywords: self, self-awareness, self-assessment, self-knowledge, bias, Entrustable Professional Outcomes, EPA

INTRODUCTION

Unbiased self-knowledge is critical for professionals who routinely make life and health altering decisions.¹⁻⁵ Indeed, Standard 4.1 of the Accreditation Council for Pharmacy Education Standards 2016 and Domain 4 of the Center for the Advancement of Pharmacy Education (CAPE) outcomes addresses it directly: The graduate is able to examine and reflect on personal, knowledge, skills, abilities, beliefs, biases, motivation, and emotions that could enhance or limit personal growth. Several lines of research in clinical education, however, suggest that both students' and clinicians' self-knowledge is often biased.⁶⁻¹⁴ The goal of this review is to demonstrate that completely unbiased self-knowledge is neither attainable nor desirable, because bias is deeply engrained, and because the mechanisms that cause bias occur below awareness.¹⁵ Consequently, this review also demonstrates that interventions that help students function despite their self-knowledge biases are more effective than interventions that attack the biases directly. While this position seems defeatist, it is also realistic. On this point, 50 years of social and cognitive psychological research is virtually unanimous.¹⁵

Consequences of Biased Self-Assessment

Before entertaining solutions to a problem, one should assess its extent. Hence, this manuscript reviews

common situations in which peoples' estimates of their character, abilities, or future prospects are more optimistic than reality warrants. One of the most common manifestations of biased self-knowledge is weak correlations between ability estimates and actual performance. For example, only seven out of 20 papers in a meta-analysis of practicing physicians' self-assessment accuracy reported a moderate positive correlation between physicians' self-assessment and their performance; the remaining papers reported either non-significant or negative correlations.¹⁶ Similarly, a review by Mabe and West found an average correlation of 0.29 between self-assessments and external standards.¹⁷ Correlations were lowest for vague abilities associated with ambiguous or delayed feedback – 0.04 for managerial ability and 0.17 for interpersonal ability – and highest for concrete abilities associated with prompt feedback – 0.47 for athletics.¹⁷ Other studies have examined intelligence ($r=0.20$),¹⁸ academic ability ($r=0.35$),¹⁹ and workplace performance ($r=0.20$).²⁰ To date, few studies have found a strong or even moderate relationship between self-assessment and actual ability.

Like knowledge of one's abilities, knowledge of one's traits is imperfect.²¹ The Big Five personality inventory, an instrument that classifies respondents in terms of openness, conscientiousness, extraversion, agreeableness, and neuroticism, only correlates with related behaviors at ($r=0.34$) when the behaviors are performed in a laboratory and ($r=0.27$) when the behaviors are performed outside of a laboratory.^{22,23} In one of the most thorough investigations of the relationship between

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self-reports and behavior, researchers asked participants to wear an electronic recorder for several days to capture the linguistic and behavioral correlates of traits that they rated in a previous session. The average correlation between self-reports and behavior was a modest ($r=0.27$).²⁴ Another way to examine self-knowledge is to determine whether one's personality descriptions align with reports made by members of his/her social circle. Again, several meta-analyses indicate that self-ratings are weakly to moderately aligned with others' ratings.²⁵ The Big Five correlates with others' ratings at about ($r=0.45$) while the California Adult Q-Set correlates with others' ratings at ($r=0.27$).²⁶⁻²⁹ Whether using actual behavior or others' ratings as accuracy criteria, the message is consistent: people's self-knowledge is imperfect.

Weak correlations between self-assessment and performance demonstrate that people misestimate their abilities. Additional research, however, demonstrates that this misestimate is often an overestimate. An early study by The College Board found that 70% of high schoolers rated themselves above average in terms of leadership ability, and 100% rated themselves above average in terms of social skills.³⁰ In fact, 25% of students placed themselves in the top 1% in terms of social skills.³⁰ Before citing high schoolers' immaturity, readers should note that 94% of college faculty believe their work is better than their average faculty peer.³¹ In addition to ability assessments, a majority of people also believe that they are more moral, and more popular than average.³²⁻³⁴ Just as people often believe that they are better than average in most broadly defined domains, they also believe that they are more likely than average to experience positive outcomes, and less likely than average to experience negative outcomes.^{35,36} A majority believe that they are less likely than average to experience cancer, divorce, a car accident, or to become substance dependent, and more likely than average to live past 80, enjoy their job, have a gifted child, travel to Europe, or be recognized for their accomplishments.³⁶ In testament to this bias's refractoriness, such violations of statistical logic occur even in the presence of disconfirming evidence. Ninety-three percent of U.S. drivers believe that they are in the top 50% of driving ability, including those who have been hospitalized for accidents that they caused.³⁷ Even the incarcerated rate themselves as no less law-abiding than the average citizen, and as substantially more dependable, trustworthy, and self-controlled.³⁸

There is one group, however – about 7% of the population – that consistently demonstrates accurate self-knowledge. Their ability estimates align with external standards; their aspirations are realistic; and their self-worth is within reality's bounds. They are clinically

depressed.³⁹⁻⁴¹ Our illusions occasionally mislead us, but they also get us out of bed. Indeed, a moderate amount of self-enhancement has been linked to contentment, altruism, and persistence.⁴²⁻⁴⁹ As such, completely accurate self-knowledge may not only be infeasible, but also undesirable. When self-enhancement becomes more pronounced, however, it can lead to unhealthy relationships, risky behavior, and poor academic performance.⁵⁰⁻⁵² Accordingly, educators should seek to minimize biases in self-knowledge, but should also accept limited success in narrow domains, as perfect self-knowledge is neither possible nor healthy.

Causes of Biased Self-Assessment

One of the primary reasons that self-knowledge biases are so recalcitrant is that the mechanisms driving them operate below consciousness.⁵³ It is difficult to modify processes of which we are unaware. While people have a multitude of cognitive tools for diffusing threatening information and enhancing positive information, the most common are self-serving reasoning, biased hypothesis testing, and biased recall.

People often attribute success and failure in a self-serving manner, so that success is attributed to internal factors, such as skill or intelligence, and failure is attributed to external factors, such as bad luck or distraction.^{54,55} For example, researchers found that students and teachers each attributed student success to themselves, but attributed student failure to one another.⁵⁶⁻⁵⁸ Similarly, students who scored poorly on an examination were more likely to question the examination's validity than students who scored well.⁵⁹ Outside of the classroom, drivers attribute accidents to external factors, such as the weather or other drivers, and near misses to alertness and expertise.⁶⁰ No matter the domain, success and failure attributions are unknowingly made in the service of self-enhancement, not accuracy.⁵⁴

People also create self-serving definitions of competence when the characteristics or abilities being assessed are vague, and the standards of comparison are missing or subjective.⁶¹ Empathetic people believe that empathy is the most important leadership quality; ergo, they are competent leaders. Decisive people believe that decisiveness is the most important leadership quality; ergo, they are also competent leaders. Whether or not one believes that a trait is desirable often depends more on whether or not he/she possesses it than on the properties of the trait itself.⁶¹

People also use biased hypothesis testing in service of self-enhancement. When confronted with information that confirms a positive self-view, people typically ask themselves, "Can I believe this?" Answering

in the affirmative only requires adequate support, not overwhelming evidence. When information disconfirms a positive self-view, however, people ask, “Must I believe this?” Answering this question in the affirmative requires a great deal of solid evidence.^{62,63} Thus, when confronted with equal amounts of confirming and disconfirming evidence, people tend to strengthen their previously held beliefs.⁶⁴ For example, when research criticizes social groups with which people identify, they are more likely to critique the methodology than when it does not.⁶⁵ When self-assessing, people often ask themselves whether their desired conclusion is true, and determine that it is once they accumulate just enough asymmetrically vetted evidence. Like self-serving attributions and definitions, this process also occurs outside of awareness.

When testing hypotheses about themselves, people commonly rely on memory for evidence, but memory can be an additional source of bias since people are more likely to remember self-enhancing information than self-critical information.^{66,67} Specifically, positive qualities are more memorable than negative ones, success feedback is more memorable than failure feedback, and negative feedback is preferentially forgotten.⁶⁸⁻⁷¹ Memories are even re-written in the service of self-enhancement. Researchers found that students remembered their test scores as higher than they actually were, and that this bias became more extreme with time.⁷² Not only do people often test hypotheses in a biased manner, they buttress the hypotheses with positively biased recall. Together, biased recall, self-serving reasoning, and biased hypothesis testing allow individuals to believe that their self-assessments are objective: They are based on memories; alternatives have been considered; they can rationally link their traits to positive outcomes; any deficits can be easily explained away. Armed with the impression of objectivity, individuals have little reason to adjust their self-assessments; hence, it should come as no surprise that most people believe that they are more objective than average.^{73,74}

Countermeasures

While this review has so far described people as incorrigibly biased, we usually function well enough. We chronically overestimate our abilities and character, but we do not wander the world in gleeful delusion, making one disastrous decision after another. Self-enhancement has limits, and one of the most helpful things that educators can do is to keep their students within those limits. Since the self-knowledge biasing mechanisms operate below consciousness, interventions that encourage students to introspect on the quality of their decisions or

the content of their character will have limited success, because they are conscious solutions to unconscious problems. The same biases that operate during normal cognition also operate during introspection. Even informing people of the biasing mechanisms and their effects on cognition is ineffective.⁷⁵ Consequently, the most effective interventions may be those that circumvent the mechanisms or do not allow them to operate efficiently. To date, researchers have uncovered two promising strategies: requiring students to evaluate themselves on specific, measurable, and externally generated outcomes, and providing non-threatening feedback that guides students toward improvement.

Students’ ability to employ self-serving reasoning is severely limited when the evaluation criteria are generated by another person. Accordingly, Dunning and colleagues found that participants’ self-assessments of athleticism, artistic talent, and extracurricular involvement showed very little positive bias when they assessed themselves using externally generated criteria.⁷⁶ These findings may be particularly applicable when students are asked to self-assess vague soft skills. Rather than asking students to assess their communication ability, educators should identify the specific traits and abilities that make an effective communicator, and then ask students to self-assess on those traits and abilities. For example, educators may conclude that maintaining eye contact, being concise, and asking follow-up questions are practices of a good communicator. Asking students how often they do these things will likely result in less positive bias than asking them how well they communicate. When the criteria for good communication are externally generated, students no longer have the opportunity to create a self-serving definition.

Similarly, people show substantially less positive bias when the evaluation criteria are specific and measurable. Dunning and colleagues found that participants showed more positive bias when self-assessing ambiguous positive (eg, sensitive, sophisticated, sensible) or negative (eg, neurotic, impractical, naïve) traits than when self-assessing specific positive (eg, thrifty, studious, punctual) or negative (eg, sarcastic, gossipy, clumsy) traits.⁷⁶ Consequently, the American Association of Colleges of Pharmacy’s entrustable professional activities (EPAs) – due to their inherent measurability and specificity – may be particularly valuable bias-mitigation tools.⁷⁷ Each EPA consists of a general ability and several specific and measurable supporting tasks. Asking students the extent to which they perform each of the supporting tasks will likely result in less biased self-assessments than asking them about a broad ability or trait that can be re-defined in a self-serving manner. For

example, asking students whether they can collect medical history from a patient or caregiver, discuss a patient's experience with medication, determine a patient's medication adherence, and use health records to determine a patient's health-related needs should yield less biased estimates of patient assessment skills than asking students to reflect on their patient assessment skills. Patient assessment skills are somewhat vague and therefore susceptible to self-serving redefinition. The supporting tasks are less so. Even if students are not self-assessing on the EPAs, the EPAs' general structure can help educators to create their own self-assessment standards. Rather than asking about broad abilities and allowing students to create self-serving definitions of competence, educators should create specific criteria for competence ahead of time and ask students to self-assess according to the criteria. While Dunning's findings support this strategy, there is currently no research on the use of EPAs as bias reduction tools, nor is there any field research on the use of specific, measurable, and externally generated competence criteria as a bias reduction technique. To date, all research is laboratory based and has yet to be translated to the classroom.

Positive bias is also reduced when the ability in question is modifiable. In a study by Dunning and colleagues, participants learned that they would take a standardized test measuring "integrative orientation," a fictitious trait that was either described as either modifiable or fixed.⁷⁸ When "integrative orientation" was described as modifiable, participants were equally likely to seek additional feedback after success and failure, but when "integrative orientation" was described as fixed, participants were more interested in additional feedback after success than after failure.⁷⁸ Relatedly, Lockwood found that participants' beliefs about their ability to improve were the main determinant in whether they found examples of excellent performance demoralizing or inspirational.⁷⁹ Whenever possible, educators should provide clear guidance on improvement strategies, as it minimizes the threat to the self, and therefore minimizes the likelihood that underlying biasing mechanisms will be activated. Indeed, a review by Marsh and Roche concluded that providing concrete guidance with feedback was one of the most effective methods of improving performance. While Marsh and Roche were primarily interested in teaching evaluations, some research has been conducted on the effectiveness of guided feedback for students.⁸⁰ Lane and Gottlieb asked third-year medical students to assess their performance on 21 core elements of a medical interview that they had just conducted. Each student also spent 20-30 minutes reviewing a videotape of his/her interview with one or two faculty members who had also watched the videotape and

rated his/her performance. During the interview, both parties critiqued the student's performance, and the faculty member(s) suggested improvement strategies. When the exercise was repeated one week later, researchers found that the discrepancy between faculty's ratings and students' self-ratings had decreased significantly. Although this study did not have a proper control condition, it did provide evidence that non-threatening feedback along with guidance can significantly reduce self-assessment bias. Feedback aside, the use of videotapes may be helpful since they provide objective, real-time documentation of student performance. Indeed, Scherer and colleagues found that feedback with a videotape review increased surgical residents' trauma resuscitation skills significantly more than feedback alone.⁸¹

Feedback does not always need to come from instructors. Peer review can also be beneficial, as it is associated with improved grades, increased time on task, critical thinking, and an opportunity to exercise professionalism and social skills.^{82,83} Furthermore, instructor evaluations are more strongly correlated with peer evaluations than with self-evaluations, suggesting that peers can stand in for instructors if they are given clear assessment criteria.⁸⁴ Xiao and Lucking asked undergraduates to review one another's writing assignments and either provide a quality rating or both a quality rating and qualitative feedback. The researchers found that in both conditions peer evaluations were significantly correlated with instructor evaluations and that students who received the rating and feedback performed better than students who only received the rating, suggesting that peer feedback with additional guidance benefits students' performance. This study, however, did not ask students to self-assess.⁸⁵ However, Peer review does have several notable limitations. As Kruger and Dunning suggest, less knowledgeable students are not in an ideal position to provide feedback since competence in a domain is required to judge competence in a domain.⁸⁶ Furthermore, for peer review to be successful, multiple reviewers should be recruited, trained, and given clear assessment criteria, such as a rubric.⁸⁷ Despite their limitations, both guidance for improvement and concrete assessment criteria are successful because they either circumvent the biasing mechanisms or do not allow them to operate efficiently. Some tactics, however, attempt to deal directly with the mechanisms. The most common technique is self-reflection on one's own thoughts, biases, and behaviors.

Self-reflection's success is likely to be limited because people do not have access to many of their mental processes,⁸⁸⁻⁹² especially the ones that bias self-knowledge.⁵³ In some cases, self-reflection even has negative consequences.^{93,94} Specifically, self-reflection can

produce sub-optimal choices, overconfidence, and poor attitude-behavior consistency when people reflect on the reasons for their preferences or their behaviors.⁹³⁻⁹⁶ To assess reflection's effect on preference, Wilson and colleagues asked participants to choose between two posters (one artistic and one funny) either without a manipulation or after reflecting on their reasons for liking/disliking each poster. People in the reflection condition were more likely to choose the artistic poster than those in the control condition, but when contacted three weeks later, they were less satisfied with their choice than those in the control condition. Researchers also found that when participants reflected on their preferences for consumer goods and college courses, their preferences were less aligned with experts' ratings than the preferences of students who did not reflect.⁹⁴ While Wilson's studies primarily dealt with preferences, studies found that reflection could lead to sub-optimal choices when a rational best choice existed.⁹⁷

In addition to encouraging sub-optimal choices, self-reflection can also weaken the link between attitudes and subsequent behaviors.^{95,96} Wilson and LaFleur found that students who reflected on why they would or would not perform a given behavior made less accurate and more overconfident behavioral predictions than participants who did not reflect.⁹⁵ Similarly, Wilson and colleagues found that participants who reflected on their attitudes before reporting them showed lower attitude-behavior correspondence than participants who did not reflect.⁹⁸ Not only can self-reflection sometimes lead to sub-optimal choices, it can also hamper people's ability to predict their own behavior. This occurs because people's primary reasons for their preferences and behaviors are often either implicit or not easily verbalized. To the extent that the reasons generated during self-reflection mismatch one's actual reasons, predictions and choices based on the generated reasons will be disadvantageous or inaccurate.^{94,98}

There are situations, however, when self-reflection shows some benefit. Specifically, one study has demonstrated that when self-reflection is about traits (not abilities, preferences or behaviors), is written down, and is explanatory rather than descriptive, it can result in slightly less – though still statistically significant – positive bias.⁹⁹ Explanatory self-reflection occurs when people contemplate why they have (or do not have) certain traits. What are the reasons why I am irritable, empathetic, logical, etc.? Descriptive self-reflection, however, occurs when people consider whether or not they have certain traits in the first place. Am I cheerful? Only explanatory self-reflection, when its contents are written down, appears to have an effect on bias. Sedikides and colleagues asked participants to read a list of both positive and negative traits and then to either engage in written or internal

explanatory or descriptive reflection. They found that while everyone believed that they possessed positive traits to a significantly greater extent than negative traits, the participants who engaged in written explanatory self-reflection showed significantly less bias than participants in all other conditions. If educators choose to use self-reflection as a bias mitigation tool, they should be sure to ask students to write down their thoughts and to engage in explanatory – rather than descriptive – self-reflection. Educators should also expect small reductions in bias, not total elimination. The weakness of self-reflection as a bias mitigation tool does not mean that all types of reflection are ineffective in all scenarios. For example, educators have routinely used reflective practice in an attempt to improve student's critical thinking and problem solving skills.^{100,101} This manuscript, however, is primarily concerned with efficacy of reflecting on one's attitudes and motivations as a way to decrease self-biases.

Accountability manipulations can also reduce self-assessment bias.¹⁰² Sedikides and colleagues found that when participants expected to justify their work to an expert, their self-assessments became significantly less positive because they engaged in pre-emptive self-criticism. The researchers asked all participants to write an essay defending their position on a controversy. After writing the essay, half of the participants were told that they would later justify their response to a logician, and the other half simply wrote the essay. Following the accountability manipulation, participants graded their essay on clarity of thinking, writing style, smoothness of transitions, logic of arguments and persuasiveness of arguments. Participants in the accountability condition assigned themselves significantly lower grades than participants in the control condition. Thus, to the extent possible, students should justify their self-assessments, not simply produce them. It should be noted that these studies were not designed to test whether self-enhancement had been eliminated. Even though accountable participants assigned themselves lower grades than unaccountable participants, their grades could have still been higher than those assigned by an instructor.

Even when tactics that deal with bias directly appear to work, instructors should not immediately celebrate, because the effect of one intervention on one outcome cannot differentiate correction from debiasing. Correction is an adjustment to one's estimate that leaves the mental processes that biased the estimate unaffected. A student who is correcting may say to him/herself, "I noticed that I've over estimated my performance on the last two patient interview exercises. I should revise my next estimate for the next exercise downward by about half

a letter grade.” Notice that this student said nothing about explaining away weaknesses or preferentially recalling strengths when estimating academic performance; he/she simply made an adjustment to one specific estimate that is unlikely to generalize to other times or tasks. Debiasing, however, alters the mental processes that created the bias, and exerts effects across time and domain.^{103,104} A student who has been debiased may say, “This intervention has made me realize that I usually focus on my past successes and explain away past failures when I estimate exercise scores. In the future I will use different estimation strategies and be more in tune with my strengths and weaknesses.” Since the mental processes that create biased estimates were altered, the student is likely to be less biased – but not completely unbiased – on related future tasks. No research in either general education or clinical education has clearly differentiated correction from debiasing. If debiasing – to the extent that it is possible – is the goal of self-knowledge interventions, additional research is required to identify the types of interventions – if any – that produce it.

Given the importance of accurate self-knowledge for professional students and clinicians, as well as its difficulty to attain, an understanding of the psychological mechanisms that contribute the most common forms of biased self-assessment is essential for creating and implementing effective mitigation strategies. The current article outlines said mechanisms and discusses strategies to circumvent them; however, it is a partial step toward mitigating biased self-assessment. While valuable research has come from several areas of the health sciences, additional research is needed to determine how well mitigation strategies work in the classroom.^{105,106} Future research should also determine whether debiasing is possible in real world settings. While this manuscript has painted a gloomy picture of human cognition, it is worth noting that humans do well most of the time, and that even small interventions – when properly implemented – can have significant mitigating effects.

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REFERENCES

1. Accreditation Council for Pharmacy Education. Accreditation standard and key elements for the professional program in pharmacy leading to the doctor of pharmacy degree. Standards 2016. <https://www.acpe-accredit.org/pdf/Standards2016FINAL.pdf>. Accessed January 1, 2017.
2. Liaison Committee on Medical Education. Functions and structure of a medical school. 2016. <http://lcme.org/publications/#Standards>. Accessed January 1, 2017.

3. Commission of Collegiate Nursing Education. Standards for accreditation of baccalaureate and graduate nursing programs. 2013. <http://www.aacn.nche.edu/cene-accreditation/Standards-Amended-2013.pdf>. Accessed January 1, 2017.
4. Commission on Accreditation in Physical Therapy Education. Standards and required elements. 2016 <http://www.capeonline.org/AccreditationHandbook/>. Accessed January 1, 2017.
5. Council on Education for Public Health. Accreditation criteria. 2016. <http://ceph.org/assets/2016.Criteria.pdf>. Accessed January 1, 2017.
6. Marteau TM, Johnson M, Wynne G, Evans TR. Cognitive factors in the explanation of the mismatch between confidence and competence in performing basic life support. *Psychol Health*. 1989; 3(3):172-182.
7. Risucci DA, Tortolani AJ, Ward RJ. Ratings of surgical residents by self, supervisors, and peers. *Surg Gynecol Obstet*. 1989;169(6): 519-526.
8. Mattheos N, Nattestad A, Falk-Nilsson E, Attström R. The interactive examination: assessing students' self-assessment ability. *Med Educ*. 2004;38(4):378-389.
9. Baxter P, Norman G. Self-assessment or self-deception? A lack of association between nursing students' self-assessment and performance. *J Adv Nurs*. 2011; 67(11):2406-2413.
10. Austin Z, Gregory PAM. Evaluating the accuracy of pharmacy students' self-assessment skills. *Am J Pharm Educ*. 2007;71(5): Article 89.
11. Lundquist LM, Shogbon AO, Momary KM, Rogers HK. A comparison of students' self-assessments with faculty evaluations of their communication skills. *Am J Pharm Educ*. 2013;77(4):Article 72.
12. Austin Z, Gregory PA, Galli M. “I just don't know what I'm supposed to know:” evaluating self-assessment skills of international pharmacy graduates in Canada. *Res Social Admin Pharm*. 2008;4(2): 115-124.
13. Naughton CA, Friesner DL. Comparison of pharmacy students' perceived and actual knowledge using the pharmacy curricular outcomes assessment. *Am J Pharm Educ*. 2012;76(4):Article 63.
14. Davis DA, Mazmanian PE, Fordis M, Van Harrison R, Thorpe KE, Perrier L. Accuracy of physician self-assessment compared with observed measures of competence: a systematic review. *JAMA*. 2006;296(9):1094-1102.
15. Gilovich T, Griffin D. Heuristics and biases: then and now. In: Gilovich T, Griffin DW, Kahneman DW, eds. *Heuristics and Biases: The Psychology of Intuitive Judgment*. Cambridge, UK: Cambridge University Press; 2002:1-18.
16. Davis DA, Mazmanian PE, Fordis M, Van Harrison R, Thorpe KE, Perrier L. Accuracy of physician self-assessment compared with observed measures of competence: a systematic review. *JAMA*. 2006; 296(9):1094-1102.
17. Mabe PA, West SG. Validity of self-evaluation ability: a review and meta-analysis. *J Appl Psychol*. 1982;67(3):280-296.
18. Hansford BC, Hattie JA. The relationship between self and achievement/performance measures. *Rev Educ Res*. 1982;52(1):123-142.
19. Chemers MM, Hu L, Garcia BF. Academic self-efficacy and first-year college student performance and adjustment. *J Educ Psychol*. 2001;93(1):55-64.
20. Stajkovic AD, Luthans F. Self-efficacy and work-related performance: a meta-analysis. *Psychol Bull*. 1998;124(2):240-261.
21. Vazire S, Carlson EN. Self-knowledge of personality: do people know themselves? *Soc Pers Psychol Compass*. 2010;4(8):605-620.
22. Back MD, Schmukle SC, Egloff B. Predicting actual behavior from the explicit and implicit self-concept of personality. *J Pers Soc Psychol*. 2009;97(3):533-548.

23. Mehl MR, Gosling SD, Pennebaker JW. Personality in its natural habitat: manifestations and implicit folk theories of personality in daily life. *J Pers Soc Psychol.* 2006;90(5):862-877.
24. Mehl MR, Pennebaker JW, Crow DM, Dabbs J, Price JH. The electronically activated recorder (EAR): a device for sampling naturalistic daily activities and conversations. *Behav Res Meth Instr.* 2001;33(4):517-523.
25. Connolly JJ, Kavanaugh EJ, Viswesvaran C. The convergent validity between self and observer ratings of personality: a meta-analytic review. *Int J Select Assess.* 2007;15(1):110-117.
26. Vazire S, Mehl MR. Knowing me, knowing you: the accuracy and unique predictive validity of self-ratings and other-ratings of daily behavior. *J Pers Soc Psychol.* 2008;95(5):1202-1216.
27. Biesanz JC, West SG. Towards understanding assessments of the big five: multitrait-multimethod analyses of convergent and discriminant validity across measurement occasion and type of observer. *J Pers.* 2004;72(4):845-876.
28. Vazire S, Gosling SD. e-perceptions: personality impressions based on personal websites. *J Pers Soc Psychol.* 2004;87(1):123-132.
29. Funder DC, Colvin CR. Friends and strangers: acquaintanceship, agreement, and the accuracy of personality judgment. *J Pers Soc Psychol.* 1988;55(1):149-158.
30. College Board. Student descriptive questionnaire. 1976-1977. Princeton (NJ): Educational Testing Service.
31. Cross KP. Not can, but will college teaching be improved? *New Dir for Higher Educ.* 1977;17(1):1-15.
32. Sedikides C, Strube MJ. Self-evaluation: to thine own self be good, to thine own self be sure, to thine own self be true, and to thine own self be better. In: Zanna MP, ed. *Advances in Experimental Social Psychology.* Vol. 29. San Diego: Academic Press; 1997:209-269.
33. Epley N, Dunning D. Feeling “holier than thou:” are self-serving assessments produced by errors in self or social prediction? *J Pers Soc Psychol.* 2000;79(6):861-875.
34. Zuckerman EW, Jost JT. What makes you think you’re so popular? Self-evaluation maintenance and the subjective side of the “friendship paradox.” *Soc Psychol Q.* 2001;64(3):207-223.
35. Klein CTF, Helweg-Larsen M. Perceived control and the optimistic bias: a meta-analytic review. *Psychol Health.* 2002;17(4):437-446.
36. Weinstein ND. Unrealistic optimism about future life events. *J Pers Soc Psychol.* 1980;39(5):806-820.
37. Svenson O. Are we all less risky and more skillful than our fellow drivers? *Acta Psychol.* 1981;47(2):143-148.
38. Sedikides C, Meek R, Alicke MD, Taylor S. Behind bars but above the bar: prisoners consider themselves more prosocial than non-prisoners. *Br J Soc Psychol.* 2014;53(2):396-403.
39. Taylor SE, Brown JD. Illusions and well-being: a social psychological perspective on mental health. *Psychol Bull.* 1988;103(2):193-210.
40. Alloy LB, Abramson LY. Judgment of contingency in depressed and nondepressed students: sadder but wiser? *J Exp Psychol Gen.* 1979;108(4):441-485.
41. Dobson K, Franche RL. A conceptual and empirical review of the depressive realism hypothesis. *Can J Behav Sci.* 1989;21(4):419-433.
42. Kuiper NA, Derry PA. Depressed and nondepressed content self-reference in mild depressives. *J Pers.* 1982;50(1):67-80.
43. Rizley R. Depression and distortion in the attribution of causality. *J Abnorm Soc Psychol.* 1978;87(1):32-48.
44. Abramson LY, Alloy LB. Depression, nondepression, and cognitive illusions: a reply to Schwartz. *J Exp Psychol Gen.* 1981;110(3):436-447.
45. Alloy LB, Ahrens AH. Depression and pessimism for the future: biased use of statistically relevant information in predictions for self versus others. *J Pers Soc Psychol.* 1987;52(2):366-378.
46. Batson CD, Coke JS, Chard F, Smith D, Taliaferro A. Generality of the “glow of goodwill”: effects of mood on helping and information acquisition. *Soc Psychol Q.* 1979;42(2):176-179.
47. Baumann DJ, Cialdini RB, Kendrick DT. Altruism as hedonism: helping and self-gratification as equivalent responses. *J Pers Soc Psychol.* 1981;40(6):1039-1046.
48. Baumeister RF, Hamilton JC, Tice DM. Public versus private expectancy of success: confidence booster or performance pressure? *J Pers Soc Psychol.* 1985;48(6):1447-1457.
49. Dweck CS, Licht BG. Learned helplessness and intellectual achievement. In: Garber J, Seligman MEP, eds. *Human Helplessness: Theory and Application.* New York, NY: Academic Press; 1980:197-221.
50. Colvin CR, Block J, Funder DC. Overly positive self-evaluations and personality: negative implications for mental health. *J Pers Soc Psychol.* 1995; 68(6):1152-1162.
51. Baumeister RF, Heatherton TF, Tice DM. When ego threats lead to self-regulation failure: negative consequences of high self-esteem. *J Pers Soc Psychol.* 1993;64(1):141-156.
52. Robbins RW, Beer JS. Positive illusions about the self: short-term benefits and long-term costs. *J Pers Soc Psychol.* 2001; 80(2):340-352.
53. Eva K, Regehr G, Gruppen LD. Blinded by insight: self-assessment and its role in performance improvement. In: Hodges BD, Lingard L, eds. *The Question of Competence.* Ithaca, NY: Cornell University Press; 2012:131-154.
54. Shepperd J, Malone W, Sweeny K. Exploring causes of the self-serving bias. *Soc Personal Psychol Compass.* 2008;2(2):895-908.
55. Miller DT, Ross M. Self-serving bias in the attribution of causality: fact or fiction? *Psychol Bull.* 1975;82(2):213-225.
56. McAllister HA. Self-serving bias in the classroom: Who shows it? Who knows it? *J Educ Psychol.* 1996;88(1):123-131.
57. Beckman L. Effect of students’ performance on teachers’ and observers’ attributions of causality. *J Educ Psychol.* 1970;61(1):76-82.
58. Brandt LJ, Hayden ME, Brophy JE. Teachers’ attitudes and ascription of causation. *J Educ Psychol.* 1975;67(5):677-682.
59. Stevens L, Jones EE. Defensive attribution and the Kelley cube. *J Pers Soc Psychol.* 1976;34(5):809-820.
60. Stewart AE. Attributions of responsibility for motor vehicle crashes. *Accid Anal Prev.* 2005;37(4):681-688.
61. Kunda Z. Motivated inference: self-serving generation and evaluation of causal theories. *J Pers Soc Psychol.* 1987;53(4): 636-647.
62. Gilovich T. *How We Know What Isn’t So: The Fallibility of Human Reason in Everyday Life.* 1991. New York, NY: Free Press; 1991.
63. Dawson E, Gilovich T, Regan DT. Motivated reasoning and performance on the Watson selection task. *Pers Soc Psychol Bull.* 2002;28(10):1379-1387.
64. Lord CG, Ross L, Lepper MR. Biased assimilation and attitude polarization: the effects of prior theories on subsequently considered evidence. *J Pers Soc Psychol.* 1979; 37(11):2098-2109.
65. Doosje B, Spears R, Koomen W. When bad isn’t all bad: the strategic use of sample information in generalization and stereotyping. *J Pers Soc Psychol.* 1995;69(4):642-655.
66. Linton M. The maintenance of complex knowledge base after seventeen years. In: Medin DL, ed. *The Psychology of Learning and Motivation.* Vol. 35. London, UK: Academic Press; 1996:127-162.
67. Sanitioso R, Kunda Z, Fong GT. Motivated recruitment of autobiographical memories. *J Pers Soc Psychol.* 1990;59(2):229-241.
68. Kuiper NA, Derry PA. Depressed and nondepressed content self-reference in mild depressives. *J Pers.* 1982;50(1):67-80.

69. Skowronski JJ, Betz AL, Thompson CP, Shannon L. Social memory in everyday life: recall of self-events and other-events. *J Pers Soc Psychol.* 1991;60(6):831-843.
70. Silverman I. Self-esteem and differential responsiveness to success and failure. *J Abnorm Psychol.* 1964;69(1):115-119.
71. Sedikides C, Green JD. On the self-protective nature of inconsistency-negativity management: using the person memory paradigm to examine self-referent memory. *J Pers Soc Psychol.* 2000;79(6):906-922.
72. Gramzow RH, Willard G. Exaggerating current and past performance: motivated self-enhancement versus reconstructive memory. *Pers Soc Psychol Bull.* 2006;32(8):1114-1125.
73. Pronin E, Lin DY, Ross L. The bias blind spot: perceptions of bias in self versus others. *Pers Soc Psychol Bull.* 2002;28(3):369-381.
74. Pronin E, Gilovich T, Ross L. Objectivity in the eye of the beholder: divergent perceptions of bias in self versus others. *Psychol Rev.* 2004;111(3):781-799.
75. Buehler R, Griffin DW, Ross MR. Exploring the "planning fallacy:" why people underestimate their task completion times. *J Pers Soc Psychol.* 1994;67(3):366-381.
76. Dunning D, Meyerowitz JA, Holzberg AD. Ambiguity and self-evaluation: the role of idiosyncratic trait definitions in self-serving assessments of ability. *J Pers Soc Psychol.* 1989;57(6):1082-1090.
77. American Association of Colleges of Pharmacy. Core entrustable professional activities for new pharmacy graduates. <https://www.aacp.org/sites/default/files/2017-11/Appendix-2-Glossary-for-Core-Entrustable-Professional-Activities-for-New-Pharmacy-Graduates.pdf>. Updated November 21, 2016. Accessed March 17, 2017.
78. Dunning D. Trait importance and modifiability as factors influencing self-assessment and self-enhancement motives. *Pers Soc Psychol Bull.* 1995;21(12):1297-1306.
79. Lockwood P, Kunda Z. Superstars and me: predicting the impact of role models on the self. *J Pers Soc Psychol.* 1997;73(1):91-103.
80. Lane JL, Gottlieb RP. Improving the interviewing and self-assessment skills of medical students: is it time to readopt videotaping as an educational tool? *Ambul Pediatr.* 2004;4(3):244-248.
81. Scherer LA, Chang MC, Meredith JW, Battistella FD. Videotape review leads to rapid and sustained learning. *Am J Surg.* 2003;185(6):516-520.
82. Bol L, Hacker DJ. A comparison of the effects of practice tests and traditional review on performance and calibration. *J Exp Educ.* 2001;69(2):133-151.
83. Dunlosky J, Nelson TO. Importance of kind of cue for judgments of learning (JOL) and the delayed JOL effect. *Mem Cogn.* 1992;20(4):374-380.
84. Falchikov N, Goldfinch J. Student peer assessment in higher education: a meta-analysis comparing peer and teacher marks. *Rev Educ Res.* 2000;70(3):287-322.
85. Xiao Y, Lucking R. The impact of two types of peer assessment on students' performance and satisfaction within a Wiki environment. *Internet Higher Educ.* 2008;11(3-4):186-193.
86. Kruger J, Dunning D. Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessment. *J Pers Soc Psychol.* 1999;77(6):1121-1134.
87. Evans C. Making sense of assessment feedback in higher education. *Rev Educ Res.* 2013;83(1):70-120.
88. Nisbett RE, Wilson TD. Telling more than we can know: verbal reports on mental processes. *Psychol Rev.* 1977;84(3):231-259.
89. Wilson TD. *Strangers to Ourselves: Discovering the Adaptive Unconscious.* Cambridge, MA: Belknap Press; 2002.
90. Bargh JA. *Social Psychology and the Unconscious: The Automaticity of Higher Mental Processes (Frontiers of Social Psychology).* New York, NY: Psychology Press; 2014.
91. Uleman JS, Blader SL, Todorov A. Implicit impressions. In: Hassin RR, Uleman JS, Bargh JA, eds. *The New Unconscious (Social Cognition and Social Neuroscience).* New York, NY: Oxford University Press; 2006:362-392.
92. Kihlstrom JF. The cognitive unconscious. *Sci.* 1987;237(4821):1445-1452.
93. Wilson TD, Lisle DJ, Schooler JW, Hodges SD, Klaaren KJ, LaFleur SJ. Introspecting about reasons can reduce post-choice satisfaction. *Pers Soc Psychol Bull.* 1993;19(3):331-339.
94. Wilson TD, Schooler JW. Thinking too much: introspection can reduce the quality of preferences and decisions. *J Pers Soc Psychol.* 1991;60(2):181-192.
95. Wilson TD, LaFleur SJ. Knowing what you'll do: effects of analyzing reasons on self-prediction. *J Pers Soc Psychol.* 1995;68(1):21-35.
96. Wilson TD, Dunn DS. Effects of introspection on attitude-behavior consistency: analyzing reasons versus focusing on feelings. *J Exp Soc Psychol.* 1986;22(3):249-263.
97. Dijksterhuis A. Think different: the merits of unconscious thought in preference development and decision making. *J Pers Soc Psychol.* 2004;87(5):586-598.
98. Wilson TD, Dunn DS, Bybee JA, Hyman DB, Rotondo JA. Effects of analyzing reasons on attitude-behavior consistency. *J Pers Soc Psychol.* 1984;47(1):5-16.
99. Sedikides C, Horton RS, Gregg AP. The why's the limit: curtailing self-enhancement with explanatory introspection. *J Pers.* 2007;75(4):783-824.
100. Tsingos C, Bosnic-Anticevich S, Smith L. Reflective practice and its implications for pharmacy education. *Am J Pharm Educ.* 2014;78(1):Article 18.
101. Mann K, Gordon J, MacLeod A. Reflection and reflective practice in health professions education: a systematic review. *Adv Health Sci Educ Theory Pract.* 2009;14(4):595-621.
102. Sedikides C, Herbst KC, Hardin DP, Dardis GJ. Accountability as a deterrent to self-enhancement: the search for mechanisms. *J Pers Soc Psychol.* 2002;83(32):592-605.
103. Larrick RP, Debiating. In: Koehler DJ, Harvey N, eds. *Blackwell Handbook of Judgment and Decision Making.* Malden MA: Academic Press; 2004:316-337.
104. Hirt ER, Kardes FR, Markman KD. Activating a mental simulation mind-set through generation of alternatives: implications for debiasing in related and unrelated domains. *J Exp Soc Psychol.* 2004;40(3):374-383.
105. Motycka CA, Rose RL, Ried LD, Brazeau G. Self-Assessment in Pharmacy and Health Science Education and Professional Practice. *Am J Pharm Educ.* 2010;74(5):Article 85.
106. Blanch-Hartigan D. Medical students' self-assessment of performance: results from three meta-analyses. *Patient Educ Couns.* 2011;84(1):3-9.