The Association Between Adjustment and Self-Insight into Emotional and Cognitive Abilities

Abstract

Despite the popularity of the Ancient Greek maxim “know thyself,” the importance of self-insight for adjustment remains unclear. Here we examine four perspectives about how abilities and self-views about these abilities relate to adjustment for the domains of cognitive and emotional abilities. We will administer tests of cognitive and emotional abilities and assess self-views about these abilities. Participants will then complete daily diaries for a week to report multiple indicators of adjustment. We will analyze data using polynomial regression and response surface analysis. The results will illuminate the merits of self-insight and the effects of giving employees and students feedback about their cognitive and emotional abilities in organizations and in schools.

Introduction

Mental health experts and scholars in the humanities and social sciences have touted the importance of self-insight for adjustment[1-3]. In a seminal treatise on personality psychology, Allport[4] wrote that "an impartial and objective attitude toward oneself is held to be a primary virtue" (p. 422). Despite the popularity of the Ancient Greek maxim "know thyself," however, there are reasons to think that self-insight into one's abilities may not be necessary—and may even be detrimental—for adjustment. Taylor and Brown[5] wrote that the notion that "… established contact with reality [is] a hallmark of mental health … is increasingly difficult to maintain" (p. 193). In particular, self-insight into low or average abilities might deprive individuals of the confidence needed to perform actions that facilitate adjustment, such as initiating projects[5-7]. Moreover, an implicit assumption of research on the validity of intelligence tests is that self-insight is unnecessary because abilities directly promote adaptive engagement with the environment regardless of whether people know they possess these abilities[8].

The nature of the association between self-insight and adjustment has important implications for policy, education, and management. Decisions in schools and organizations are often based on the assumption that students and employees will benefit from knowing their strengths and weaknesses. For example, training and development programs commonly involve giving feedback to employees about their strengths and weaknesses in an effort to improve their performance[9]. However, this feedback might be harmful if self-insight into low or average abilities reduces employees' confidence that they can complete projects. Further, school and organizational leaders may waste resources to provide feedback to highly skilled students and employees if these individuals feel highly adjusted even if they do not know their strengths.

The debate about the importance of self-insight for adjustment persists to this day[10,11] because of two notable limitations of past research. First, several past studies used problematic criteria to determine if individuals possess self-insight[12,13]. Several studies considered individuals to have self-insight if they perceived themselves the same way peers perceived them[14,15]. Peers are imperfect judges of abilities, however, because they fall prey to biases such as halo effects[16] and stereotypes[17]. Thus, a match between self-views and peer ratings does not necessarily imply self-insight, and a mismatch does not imply a lack of self-insight. Other studies considered individuals to have self-insight if they perceived themselves the same way they perceived other people[18,19]. In any group, however, some people truly have higher abilities than others. This approach thus mistakenly considers these people to have poor self-insight if they (correctly) give themselves the highest ratings[12]. This approach also incorrectly considers highly skilled people to possess good self-insight if they report having abilities that are comparable to most others. Thus, a match between self-views and perceptions of others does not necessarily imply self-insight, and a mismatch does not imply a lack of self-insight.

A second notable limitation concerns the analytical approaches used in the majority of past studies on self-insight and adjustment. Most frequently, researchers correlated adjustment with discrepancy scores created by subtracting abilities from self-views (or vice versa) and then taking the absolute value of this difference [1,14] or squaring this difference[20]. This approach has been strongly criticized because there are multiple ways to interpret correlations between absolute or squared difference scores and adjustment, only some of which reflect effects of self-insight[13,21-23]. A negative correlation between absolute or squared difference scores and adjustment could imply that self-insight is beneficial, so that a larger gap between abilities and self-views is associated with lower adjustment, but it could also imply other theoretically

meaningful patterns. In particular, absolute and squared difference scores are likely to be large when abilities are low, and therefore a negative correlation between these scores and adjustment could imply that lower abilities are associated with lower adjustment, independently of self-insight. Other analytical approaches used in this literature (e.g., using residuals from a regression of self-ratings on ability scores) have similar, fundamental problems[13,21-24].

To illuminate the relationship between self-insight and adjustment, the present study was designed to address these limitations. First, to overcome limitations concerning the criteria for self-insight, we will measure cognitive and emotional abilities with objective tests. Second, to overcome limitations concerning the analytical approach, we will analyze the data using polynomial regression and response surface analysis (RSA)[21-23]. This approach preserves all original variables (self-views, abilities, and adjustment) and does not collapse them. As such, it provides detailed information about how all combinations of self-views and abilities relate to adjustment, and allows direct tests of relationships between self-insight and adjustment.

Our study aims to advance theory by revealing which of the competing perspectives about the nature of the association between self-insight and adjustment is best supported by the data (see[13] for a similar approach). In particular, our study was designed to provide more definitive conclusions about the relative merits of self-insight and positive self-views, which have been intensely debated in behavioral science for several decades. Further, our study aims to advance practice by identifying the value and limitations of giving individuals feedback to increase their awareness of their levels of abilities.

Individual Differences in Self-Insight

Some people know their ability levels, but for most people, there is a gap between their abilities and self-views. Meta-analytic research reveals small to moderate correlations between

abilities measured with objective tests and self-views about these abilities[25-27]. One explanation for these correlations is that some people hold unrealistically favorable views of their abilities to maintain a high self-esteem[28]. Other people hold overly negative views of their abilities because they get criticized by others or are pessimistic by nature[29]. In addition, individuals often cannot acquire all of the information needed to accurately judge their abilities, and thus they judge their abilities based on incomplete and partly invalid information[30]. For instance, job applicants may perceive that they were rejected from a position because of their low competence. Job applicants could underestimate their abilities, however, if the hiring committee had unknown reasons to reject them—for example, there was a competitive pool of applicants, or candidates were promoted internally. The low correspondence between abilities and self-views invites questions about whether a match between abilities and self-views relates to higher levels of adjustment than mismatches.

Self-Insight and Adjustment: Four Competing Perspectives

Researchers have proposed several models about how abilities and self-views about these abilities influence adjustment. These models make different predictions. Consistent with the approach used by Humberg and colleagues[13], we pit these models against one another in the same study. Below, we describe the four perspectives that we believe have the strongest theoretical support: the self-insight, positive self-views, optimal margin of illusion, and high abilities perspectives (plus variants of these perspectives). We articulate the roles of abilities and self-views in influencing adjustment within each of the perspectives. The predictions from the various perspectives (and their variants) are displayed in Figure 1.

Self-insight perspective. The self-insight perspective posits that individuals holding accurate views of their abilities—at any levels of these abilities—are more adjusted than

individuals holding unrealistic views[1,3,31]. This perspective is illustrated in Panel 1A of Figure 1. According to this perspective, individuals are optimally adjusted when their self-views and abilities match, so that they assign the same numerical values to their abilities as objective measures provide. As the difference between abilities and self-views becomes larger, adjustment decreases.

Social cognitive theory posits that individuals with high abilities best maximize these abilities in their performance if they have high self-efficacy—the belief that they will succeed in accomplishing tasks[32]. From the perspective of social cognitive theory, self-insight boosts adjustment because highly capable individuals leverage their abilities more if they trust their expert judgments and, in turn, act on these judgments. By contrast, individuals who doubt their high abilities incur costs because they fail to leverage their expert judgments[33]. For example, students with the same high abilities to analyze information may achieve different outcomes if some trust and communicate their judgments to peers, while others doubt their judgments and refrain from contributing to group projects. Students with a combination of high abilities and high self-views should be perceived as strong contributors and receive credit for group outcomes, which should enhance their adjustment, relative to equally capable, but less efficacious students.

Self-insight may also boost adjustment by allowing those with low abilities to correct or compensate for their weaknesses. Individuals with low abilities but high self-views might fail to correct or compensate for their weaknesses, and as a result, their adjustment could suffer in the long term. One reason why organizations use 360-degree feedback is that employees who receive negative feedback about their abilities can take steps to improve their abilities and become better adjusted[34]. When employees are unaware of their deficiencies, their abilities are unlikely to improve. Beyond compensating for weaknesses, individuals who know their deficiencies in a

particular domain can also harness this knowledge to avoid errors of overconfidence in that domain. Individuals who lack self-insight into low abilities might make errors such as investing too much time and money in failing projects or drawing incorrect inferences about how other people feel[35,36].

Self-insight could also be beneficial to individuals with low abilities because it causes peers to form more favorable impressions of them compared to those who are overconfident. Individuals lacking self-insight into low abilities might suffer social consequences that undermine their adjustment, because people might dislike those who have inflated views of their social standing[1,37]. Self-insight may boost adjustment by leading those with low abilities to send more appropriate signals to others during social interactions.

In sum, the self-insight perspective suggests that adjustment is highest among individuals who possess self-insight into their abilities, regardless of the levels of these abilities. Adjustment is lowest among both individuals who underestimate and individuals who overestimate their abilities. Notably, the self-insight perspective makes the unique prediction that individuals with low abilities and low self-views will be highly adjusted, whereas the positive self-views, optimal margin of illusion, and high abilities perspectives predict that these individuals will be poorly adjusted.

More formally, the self-insight only perspective predicts: *Abilities and self-views are jointly related to adjustment, so that adjustment is highest when abilities and self-views match, and adjustment is lowest when abilities and self-views do not match (Hypothesis 1a).*

One variant of this perspective is that there is an effect of self-insight and, in addition, there are main effects of abilities and self-views (the two of which are of the same magnitude). This variant is labeled a rising ridge model[23,38] and is illustrated in panel 1B of Figure 1. This

variant posits that it is simultaneously beneficial to know one's levels of abilities, have higher abilities, and hold more favorable self-views. According to this variant, adjustment is generally highest among individuals with self-insight into their abilities, and among individuals with self-insight, those with high abilities are more adjusted than those with low abilities. We thus propose the following additional self-insight plus main effects hypothesis: *Abilities and self-views are jointly related to adjustment, so that adjustment is highest when abilities and self-views match and adjustment is lowest when abilities and self-views do not match and, in addition, there are separate positive effects of abilities and self-views on adjustment (Hypothesis 1b).*

Positive self-views only perspective. A longstanding stream of psychological research suggests that favorable beliefs about one's abilities, or positive self-regard, facilitate adjustment[5,6,39]. The positive self-views only perspective proposes that people's judgments of their own abilities determines their adjustment, and levels of actual abilities are not related to adjustment. This perspective is illustrated in Panel 2A of Figure 1. Individuals with highly favorable self-views are most highly adjusted—regardless of actual abilities—and adjustment decreases as self-views become less favorable.

Psychological accounts have argued that positive self-views reflect a self-protective strategy that guards against threats to the ego. In this view, having a positive self-image is critical to maintaining self-esteem[5,40]. Across several studies, individuals showed a tendency to rate their traits and abilities highly. For instance, individuals consider themselves more attractive than the average person[41] and more attractive than others see them[42]. From this perspective, individuals are highly adjusted because they perceive themselves favorably, and it is irrelevant whether their self-views are correct. Further, individuals who hold favorable self-views despite having low abilities are better adjusted than individuals who have self-insight into low abilities. Studies on

depressive realism suggesting that individuals who have insight into their (sometimes low or average) abilities show elevated depression symptoms provide some support for this perspective[43,44].

In addition, favorable views of one's abilities might be critical to fuel the motivation to initiate the sort of stimulating relationships, ambitious projects, and challenging collaborations that boost adjustment[5]. Across a series of studies, high self-efficacy was related to effort, persistence, and performance on complex tasks[45-47]. This suggests that individuals could benefit from having high self-views. By contrast, an absence of confidence among individuals with low abilities could be costly, because these individuals might not initiate the sort of actions that could make them satisfied with their relationships and successful at work and in school.

Further, according to a status-enhancement account, adjustment hinges on garnering status in the eyes of others, and perceivers confer status to those who engage in dominant and assertive behaviors fueled by a high degree of self-confidence[48,49]. Group members who act with confidence (for example, by exhibiting proud postures or engaging in verbal self-promotion) are perceived as more competent than those who do not, enabling them to achieve higher status and adjustment, compared to less confident group members[50,51]. This perspective posits that self-insight into low or average abilities prevents individuals from gaining status because their peers believe they lack competence.

Thus, the positive self-views perspective posits that individuals with favorable self-views are better adjusted than individuals with unfavorable self-views, regardless of the accuracy of these self-views. This perspective makes the unique prediction that individuals with low abilities but high self-views are highly adjusted. By contrast, the self-insight, optimal margin of illusion, and high abilities perspectives predict that these individuals are poorly adjusted.

The positive self-views only perspective formally makes the following prediction: *Positive self-views about one's abilities are directly and linearly related to adjustment, so that adjustment is highest when self-views are high (regardless of actual abilities), and adjustment is lowest when self-views are low (also regardless of actual abilities) (Hypothesis 2a).*

One variant of the positive self-views only perspective is that self-views have a curvilinear (rather than linear) relationship with adjustment. This variant is illustrated in Panel 2B of Figure 1. In this variant, as self-views increase, adjustment also increases, up to an inflection point, and after this inflection point, as self-views increase, adjustment decreases[52,53], so that positive self-views facilitate adjustment only up to a certain inflection point. Beyond the inflection point, more favorable self-views have a negative impact on adjustment[52]. Overly high levels of optimism may be detrimental because they involve high expectations that are difficult to maintain and meet, and encourage overly risky behaviours[54]. There is some evidence that the relationship between optimism—a construct related to having positive self-views—and adjustment is curvilinear. In one study, compared to individuals with low or high levels of optimism, those with moderate levels of optimism were more effective at coping with multiple sclerosis[55] and had slower HIV disease progression[54]. Similarly, overly high levels of self-esteem could be detrimental to interpersonal relationships, performance, and health[56]. Thus, we propose an additional hypothesis: *Self-views have a curvilinear relationship with adjustment, so that adjustment is highest at a certain level of self-views (regardless of abilities), and adjustment is lower when self-views are too low or too high (also regardless of abilities) (Hypothesis 2b).*

Optimal margin of illusion perspective. Individuals might be optimally adjusted when their self-views exceed their actual abilities by a set amount, but not more[57,58]. This perspective is illustrated in Panel 3 of Figure 1. Individuals whose self-views exceed their abilities by a set

amount—at any level of abilities—are more adjusted than both a) individuals with perfectly matched self-views and abilities and b) individuals whose self-views and abilities are mismatched in different ways.

A relatively small distortion in self-views might be optimal because these self-views could provide benefits, such as motivation and confidence to initiate projects, relationships, and collaborations, while being relatively easy to maintain[57,58]. Larger distortions from reality might be detrimental because they are exhausting and stressful to maintain. This perspective makes the unique prediction that having a slight distortion in self-views is associated with adjustment, while the self-insight and high abilities only perspectives posit that these individuals are not optimally adjusted. Further, the optimal margin of illusion perspective differs from the positive self-views perspective by positing that a relatively small distortion is more adaptive than highly favorable self-views. The optimal margin of illusion perspective formally makes the following prediction: *Abilities and self-views are jointly related to adjustment, so that adjustment is highest when self-views exceed abilities by a set amount; adjustment is lower when self-views exceed abilities by a larger amount, self-views match abilities, or abilities exceed self-views (Hypothesis 3).*

High abilities only perspective. The copious literature on the predictive validity of intelligence[8,59,60] suggests that abilities are positively and directly associated with adjustment, independently of self-views. This perspective is illustrated in Panel 4A of Figure 1. Individuals with the highest abilities are optimally adjusted—regardless of their self-views—and as abilities decrease, adjustment decreases.

The rationale for the high abilities perspective is that individuals with high cognitive and emotional abilities are effective in various facets of life (e.g., workplace performance,

relationships)[61,62]. In turn, being a generally effective person directly contributes to high levels of adjustment. Individuals with high abilities and high self-views, and also individuals with high abilities and low self-views, are better adjusted than individuals with low abilities.

In the literature on the predictive validity of ability tests, researchers routinely implicitly assume that abilities enhance performance independently of self-views. Self-views about abilities are rarely invoked in this literature[8,59]. One reason why employees with high cognitive abilities perform their jobs more effectively is that they acquire knowledge and learn how to do their jobs effectively faster than lower ability employees[61,62]. In addition, theorists have proposed that higher ability employees are faster at cognitive operations that facilitate job performance[62]. Through these cognitive operations, individuals convert information into successful solutions and solve technical and social problems correctly. This rationale also applies to the link between high abilities and adjustment, such that individuals who have higher cognitive and emotional abilities tend to perform better in various aspects in life, and are better adjusted[63,64]. Studies have reported correlations between indicators of abilities and adjustment[65,66]. In this formulation, having high abilities facilitates adjustment directly, because individuals with high abilities process information more efficiently.

This perspective is supported to some extent by research on validity generalization—the extent to which intelligence test scores predict performance across different jobs and contexts[8]. Ability predicts performance across a wide range of jobs and situations[8,67]. In addition, some studies have often found that abilities are directly related to performance independently of psychological factors, particularly motivation[68,69].

The high abilities perspective makes the unique prediction that individuals with high abilities but low self-views about these abilities are optimally adjusted. By contrast, the self-

insight, optimal margin of illusion, and positive self-views only perspectives predict that these individuals are poorly adjusted. The high abilities perspective predicts that individuals with low abilities and high self-views are poorly adjusted, whereas the positive self-views only perspective predicts that these individuals will be highly adjusted. Similarly, the high abilities perspective predicts that individuals with somewhat distorted self-views are also poorly adjusted, whereas the optimal margin of illusion perspective posits that these individuals will be highly adjusted. Moreover, the high abilities perspective predicts that individuals with low abilities and low self-views are poorly adjusted, whereas the self-insight perspective predicts that they are highly adjusted.

In particular, the high abilities only perspective predicts: *Abilities are directly related to adjustment, so that adjustment is highest when abilities are high (regardless of self-views), and adjustment is lowest when abilities are low (also regardless of self-views) (Hypothesis 4a).*

One variant of the high abilities only perspective is that abilities exhibit a curvilinear relationship with adjustment. Abilities might facilitate adjustment to a certain inflection point, beyond which increased abilities are associated with reduced adjustment[52,53]. This variant is illustrated in Panel 4B of Figure 1.

Individuals with high emotional abilities might be less than optimally adjusted because they discover potentially hurtful attitudes and information about others through their particularly high sensitivity[70,71]. There might also be interpersonal costs to having high cognitive abilities that undermine adjustment[72,73]. Individuals with high cognitive abilities might appear overly sophisticated and complex to others, which may elicit unfavorable responses from others. For example, in one study, cognitive abilities exhibited a curvilinear relationship with perceived leadership[72]. Thus, we propose the following variant of the high abilities only perspective:

Abilities have a curvilinear relationship with adjustment, so that adjustment is highest at a certain point of ability (regardless of self-views), and adjustment is lowest when abilities are too low or too high (also regardless of self-views) (Hypothesis 4b).

Positive self-views and high abilities perspective. Finally, positive self-views and high abilities might facilitate adjustment independently of one another, as two main effects that additively contribute to adjustment. This perspective is displayed in Panel 5 of Figure 1. The most adjusted individuals are those who have high abilities and favorable self-views. The least adjusted individuals are those who have low abilities and unfavorable self-views. There is no advantage of self-insight in this perspective. For our final hypothesis, we propose: *Self-views and ability both have a positive relationship with adjustment after controlling for one another (Hypothesis 5).*

The Present Study

The preceding sections outline predictions made by the self-insight, positive self-views only, optimal margin of illusion, and high abilities only perspectives. We also described some variants of these perspectives. The competing perspectives make different predictions for virtually everyone except individuals with high abilities and favorable self-views, who are predicted to be optimally adjusted by all perspectives. In particular, the self-insight only perspective makes the unique prediction that individuals with low abilities and low self-views are highly adjusted, because self-insight is always optimal. The positive self-views only (linear) perspective makes the unique prediction that individuals with high self-views and low abilities are highly adjusted, because abilities are irrelevant. The optimal margin of illusion perspective makes the unique prediction that some—but not too much—distortion in self-views facilitates adjustment. Finally, the high abilities only (linear) perspective makes the unique prediction that

328 individuals with high abilities and low self-views are highly adjusted, because self-views are
329 irrelevant.

330 We will use a time-separated survey design to test the role of self-insight in adjustment.
331 We will assess cognitive and emotional abilities, as well as self-views about these abilities, in a
332 large sample. These measures will be followed by measures of adjustment collected in daily
333 diary format to reduce the potential influence of common method bias and recall biases[74,75]. We
334 will analyze data using polynomial regression and response surface analysis (RSA)[21,23,38]. RSA is
335 a two-step process consisting of a) regressing adjustment on abilities, self-views, their interaction,
336 and their squared terms, and then b) using parameters from this regression model to generate and
337 test theoretically-relevant aspects of a three-dimensional response surface (with abilities, self-
338 views, and adjustment on the axes). RSA can reveal if self-insight is associated with higher
339 adjustment by modeling all possible combinations of abilities and self-views. By using RSA, we
340 can model self-insight without mathematical operations that conceal or distort information, such
341 as difference scores, which have been described as severely flawed[13,21-23,76].

342 We conducted four pilot studies with participants from Amazon Mechanical Turk
343 (MTurk) to guide our decisions about methodology. The purposes of the pilot studies were to a)
344 verify the validity and reliability of the measures; b) examine if correlations between the
345 measures of abilities and self-views are comparable to past research; c) verify that common
346 method variance does not unduly inflate associations between self-views and adjustment; d)
347 predict how long it will take to recruit our target sample; e) verify the length of the surveys, f)
348 predict the attrition rate and, in turn, decide how much to oversample; g) verify that participants
349 complete surveys honestly; h) ensure there are no technical issues; i) ensure that the
350 measurements of self-views and abilities are conceptually close enough to the measurements of

adjustment to generate informative results; and j) verify that error of measurement of abilities and self-views does not unduly undermine tests of the self-insight hypothesis.

Participants in the first pilot study completed a 45-minute survey that included tests of cognitive and emotional abilities, as well as measures of self-views about these abilities, and daily diaries over a week that included measures of adjustment. Below, we report the results from this first pilot study concerning the attrition rate, measure of honest responding, and measures of adjustment. The results of the first pilot study supported the validity and reliability of the emotional abilities measure, but we decided to clarify the instructions and test the revised instructions in a second pilot study. In addition, the results of our first pilot study showed that the majority of participants overestimated their performance on the cognitive abilities test, potentially because this test was difficult, and participants with average cognitive abilities (e.g., an "IQ" of 100) solved fewer than half of the problems correctly. We thought that a time limit of 15 seconds to solve each problem might have reduced performance on the test because participants did not have enough time to complete the most difficult problems. We therefore decided to test a different format whereby participants had three minutes to complete all of the problems in each of four sections of the test.

Participants in the second pilot study completed a 45-minute survey that included revised tests of cognitive and emotional abilities, as well as measures of self-views about these abilities. Below, we report the results from this second pilot study concerning the emotional abilities test. In this pilot study, again, the majority of participants overestimated their performance on the cognitive abilities test, despite the revised format and instructions. Therefore, we abandoned this test of cognitive abilities and examined a different test in a third pilot study.

Participants in the third pilot study completed a different test of cognitive abilities and a measure of self-views about cognitive abilities. The results of this pilot study supported the reliability of this test. Further, in this pilot, there were participants who overestimated, underestimated, and showed self-insight into their cognitive abilities. Therefore, below, we report the results from this third pilot study concerning the cognitive abilities test.

Participants in the fourth pilot study completed a test of emotional abilities, a measure of self-views about emotional abilities, and a measure of adjustment. Although the sample size for this pilot study was relatively small (i.e., smaller than what our power analysis suggested), the results reveal some statistically significant relationships between emotional abilities, self-views, and adjustment. Further, model comparisons revealed that the null model, which posits that emotional abilities and self-views are unrelated to adjustment, was not a plausible model. This suggests that the constructs and measures of abilities, self-views, and adjustment are not too distant, and that our investigation is likely to detect relationships among them. Moreover, the linear and curvilinear versions of the positive self-views (only) perspective were not supported, suggesting that common method variance or statistical artifacts created by measurement error will not create spurious positive associations between self-views and adjustment. Moreover, some of the criteria for self-insight were met, suggesting that measurement error would not seriously undermine tests of this model.

The materials, data, and code for analysis for the pilot studies are publicly available (see data and materials and code availability sections below for details). The results of the first three pilot studies are described in the methods section. The results of the fourth pilot study concerning multivariate outliers and multicollinearity are described in the methods section, and the results of the other analyses are described in Supplementary Notes.

Methods

Ethics Statement

This study was approved by the Social Science, Humanities, and Education research ethics board at the University of Toronto (protocol ID 31813). Participants will provide informed consent and will be debriefed at the conclusion of the study.

Planned Sample

We will recruit participants from Amazon Mechanical Turk Prime (MTurk Prime), which is a similar recruitment source as all of the pilot studies. With MTurk Prime, we will be able to obtain a large sample that will provide power of .95 to test the hypotheses.

We determined the sample size from a power analysis[77] using an alpha value of .05. The required sample size varied depending on the hypothesis because different analyses are required to test the various models. We focused on four types of tests that are conducted: a) main effects (of abilities or self-views), b) curvilinear terms, c) incremental variance explained from adding the polynomial terms (i.e., the squared terms and interaction term) to a model including only the linear terms, and d) the full polynomial model. We identified the sample size required for each type of analysis using two separate strategies, and planned to recruit the largest of the required sample sizes. We conducted one set of power analyses for conventional small effect sizes, and another set with effect sizes from our fourth pilot study plus three past studies of self-insight and self-esteem (a facet of adjustment related to life satisfaction)[78]. The largest required sample was testing a significant main effect of ability. The weighted average of the effect sizes was f^2 = .01312 (a value that is somewhat smaller than the conventional value for a small effect size of f^2 = .02). A sample of 980 participants will provide .95 power to detect a relationship of this size.

To recruit a representative sample with respect to gender and ethnicity, we will establish quotas using population distribution statistics from the American Community Survey conducted by the U.S. Census Bureau[79]. Applying these statistics to our planned sample of 980 participants, we will recruit 302 male and 309 female Caucasian participants; 85 male and 83 female Hispanic participants; 58 male and 63 female African American participants; 24 male and 25 female Asian participants; and 16 men and 15 women reporting other ethnicities. In MTurk Prime it is possible to specify the number of participants from each gender and ethnicity category.

We will take several steps to maximize the incentive for participants to complete all measures and, thus, minimize attrition. First, we will provide adequate compensation. Participants will receive $3 for the initial 45-minute survey (that includes the two abilities tests) plus $1 for each two-minute daily diary. Second, compensation will be structured so that participants will earn a monetary bonus of $2 if they complete the initial survey plus all seven daily dairies. Thus, participants who complete the entire study will earn a total of $12, for an hourly rate that exceeds the typical rate on MTurk Prime. Third, we will give participants the opportunity to complete up to three daily diaries that they have missed. We will consider all responses in the daily diaries valid, even for participants who do not complete seven diaries. Our piloting suggests that these steps will be successful in recruiting enough participants.

In our first pilot study, 60 participants started the initial survey. Of those, 52 met the criteria for inclusion in the main analyses. Specifically, an observation is deemed complete if the participant has completed a) at least one abilities test (emotional or cognitive abilities), b) the corresponding measure(s) of self-views, and c) at least one of the daily diaries. An abilities test is deemed complete if participants responded to at least half of the items. Thus, our piloting suggested an attrition rate of 13% (8 out of 60 participants).

We will oversample to 1126 participants to account for this predicted attrition rate. If 146 (or 13%) of the 1126 participants fail to complete all measures, we will achieve the necessary sample size of 980 participants. After the 1126 recruited participants finish the study, and before doing any analyses, we will determine how many of the observations are complete. In the case that attrition decreases our sample to less than 980 participants, we will collect more responses. We will calculate the observed attrition rate from our initial data collection (for example, if 901 out of 1126 participants complete the study, the attrition rate will be 20%). We will then use this observed attrition rate to calculate the additional number of participants we should recruit to achieve a sample of 980 participants (for example, with 901 responses already obtained and an observed attrition rate of 20%, we would need to recruit an additional 99 participants to obtain 79 more complete responses). We will repeat this procedure until we have 980 complete responses. If our final sample size exceeds 980, we will conduct the analyses as planned.

Procedure

The details of the study that potential participants will view in the MTurk Prime interface before entering our study are shown in Supplementary Methods. Participants will access the survey through an online link to a survey hosted by Qualtrics. Participants will first read a consent form that is shown in Supplementary Methods.

The initial questionnaire includes tests of emotional and cognitive abilities. After each test, participants will report their beliefs about their performance on these tests. Participants will first complete the emotional abilities test and the measure of self-views about their emotional abilities. Then, participants will complete the cognitive abilities test and the measure of self-views about their cognitive abilities. After the ability tests and self-views questions, participants

will complete demographic questions. In our piloting, the average length of the initial survey was 45 minutes.

Following the initial questionnaire, participants who have completed at least one abilities test (emotional or cognitive abilities) and the corresponding self-views measure(s) will be invited to complete the daily diaries that include the measures of adjustment. Following past research, we will send links to daily surveys in the evening[80,81]. At 8 pm EST, participants will receive an email with a link to complete the diary. Participants will expect these emails because they will be informed at the end of the initial survey that they will receive emails for the daily surveys at 8 pm EST. A diary will be considered valid if it is completed before 6 am EST the next morning. Participants will be able to complete the diaries on a computer, tablet, or smartphone. If participants miss any daily diary during the initial seven-day period, we will give them opportunities to make up as many as three missed surveys by sending them additional links after the seven-day period. In our piloting, the average length of the daily diary was 124 sec., or slightly above 2 minutes (*SD* = 377 sec.). After completing the last survey, participants will be debriefed (see Supplementary Methods).

In the last diary of our first pilot study, participants indicated their agreement with the statement "I was honest in my responses throughout this survey" using a scale of a 1 (*strongly disagree*) to 7 (*strongly agree*). Before they answered, participants were informed that their compensation would not be affected in any way by their response. The average rating was very high (*M* = 6.86, *SD* = .35), suggesting that participants answered the questions honestly throughout the study.

During our piloting, one participant informed us that the images from the abilities tests loaded slowly. This could be because this participant used a slow Internet connection. We will

indicate that to complete the initial survey, participants must use a reliable Internet connection. Also, at the end of the initial survey, we will ask participants if they have anything to report about the study. If participants volunteer that images loaded slowly, then they will be removed from the analyses. If any participant contacts us to indicate they cannot complete a survey or diary because of any other technical issue, we will give them another opportunity to complete a survey or diary by sending them a direct web link. If participants continue to have technical issues, we will assume that the technical issues are on the participants' end, and we will inform them that they can no longer participate in this study.

Measures

All surveys with all measures and items appear in Supplementary Methods.

Emotional abilities. We will administer a 72-item test of the ability to perceive others' emotional expressions. Participants will view pictures from the Montréal Set of Facial Displays of Emotion[82]. We will use pictures shown at 60% intensity because in our past research participants achieved very high scores for pictures shown at 100% intensity. The pictures show males and females from three ethnic groups (Caucasian, Asian, and African-American) who posed facial displays of one of six emotions (happiness, sadness, anger, surprise, shame, and disgust). There are 36 male and 36 female faces in our test. Each gender is further split equally by race such that there are 12 items for each ethnic group for each gender. These 12 items include two pictures for each of the six emotions. Thus, participants will see all six emotions across all three races and both genders. Participants will view each picture for two seconds following by five seconds to choose the emotion that the person in the picture is expressing out of the six possible emotions. In our second pilot study, the split-half reliability of this measure was .95. The average score was 50.63, or 70% (*SD* = 14.29) suggesting both an absence of

ceiling or floor effects and the existence of individual variation on this ability. The maximum score was 69 (96%), and the minimum score was 10 (14%).

We verified the convergent validity of this measure, because we created it from a set of pictures of emotional expressions[82]. In our second pilot study, we also administered the Diagnostic Analysis of Nonverbal Accuracy (DANVA), a shorter (and thus often less reliable) measure of emotion recognition ability[83]. The DANVA assesses how well participants identify emotions (among anger, fear, happiness, and sadness) in 24 photographs of facial expressions (M = 18.15 correct answers, SD = 4.07, split-half reliability = .83). The correlation between our measure of emotion recognition ability and the DANVA was large, $r(50) = .80$, $p < .001$, supporting the convergent validity of the measure of emotional abilities we will use in the main study.

Self-views about emotional abilities. Participants will indicate how many questions they think they answered correctly on the emotional abilities test from 0 to 72. We adapted this procedure from a previous study of actual and self-perceived emotional abilities[84]. This item will allow us to meet the principle of commensurability for RSA[21,23]. For this principle to be met, abilities and self-views must be measured on corresponding scales. Our design will meet this principle because the ability will be assessed via performance on 72 questions, and self-views will be assessed though corresponding beliefs about performance on these 72 questions. In our piloting, the average self-views score was 52.85 (SD = 13.81), or 73%, suggesting both an absence of ceiling or floor effects and the existence of individual variation in self-views. The maximum self-views score was 70 (97%) and the minimum score was 12 (17%).

Our piloting revealed a correlation between emotional abilities test scores and self-views that was moderate in size, $r(52) = .42$, $p < .01$, consistent with past research on abilities and self-

views[27]. For the purpose of verifying the existence of matches and mismatches between abilities and self-views, we adapted a strategy used in past research[24,85]. We first created adjusted scores for each predictor variable by subtracting the midpoint of each scale (i.e., 36 in each case) from the scores, and then dividing by the standard deviation of each predictor. We defined a mismatch as a participant with an adjusted score on one predictor variable that is half a standard deviation above or below the adjusted score on the other predictor variable. More specifically, an adjusted score of self-views that is half a standard deviation above the adjusted score of ability would be classified as an over-estimate, an adjusted score of self-views that is half a standard deviation below the adjusted score of ability would be classified as an under-estimate, and an adjusted score of self-views that falls within half a standard deviation of the adjusted score of ability would be classified as a match. Out of 54 participants who completed the emotional abilities test in our second pilot study, 20 (37%) overestimated their performance on the test, 17 (31%) underestimated their performance, and 17 (31%) had self-insight. The presence of both over- and under-estimators meets the requirement of RSA that each type of individuals be present in the sample[22].

Cognitive abilities. We will administer a shortened version of Raven's advanced progressive matrices[86] used in previous research[78,87]. Participants are given 20 minutes to complete 15 perceptual problems. The original unabridged Raven's advanced progressive matrices test is a well-validated measure of cognitive abilities. We chose the shortened version of this test for its high validity, reliability, and practicality. The shortened version was created by selecting all problems with item-total correlations with the full version higher than .35[87]. The shortened version had adequate reliability in past research[87]. Because it has a time limit of 20 minutes, it is a shorter but equally valid measure as the standard form of Raven's advanced

progressive matrices. For instance, in a previous study, the shortened version predicted academic performance measured at a later time[87]. Administering this test will allow us to calculate exactly how many questions the participant answered correctly. This is critically important because our analyses require cognitive abilities and self-views about these abilities to be measured on the same scale[21-23]. Other tests of cognitive abilities are only available through online interfaces that provide us with standardized scores, but not the total number of problems solved correctly.

In our third pilot study, the split-half reliability of the (shortened) test was .79. The mean was 6.35, or 42%, suggesting an absence of ceiling or floor effects. The standard deviation was 3.33, indicating individual variation on this ability. The maximum score was 15 (100%) and the lowest score was 0 (0%).

Self-views about cognitive abilities. Participants will indicate how many questions they think they answered correctly in the cognitive abilities test from 0 to 15. In our piloting, the average self-rating was 8.51, or 57% (SD = 3.14) suggesting both an absence of ceiling or floor effects and the existence of individual variation on self-views. The maximum self-views score was 15 (100%), and the minimum score was 0 (0%). The correlation between cognitive abilties test scores and self-views in our piloting was comparable to the correlation for emotional abilities, $r(96) = .48$, $p < .001$. Also, using the same criteria as for self-views about emotional abilities, 48 participants (49%) overestimated their performance on the cognitive abilities test, 11 (11%) underestimated their performance, and 39 (40%) showed self-insight, meeting the requirement that each type of individuals be present in our sample[22].

Adjustment. We will collect and aggregate responses to up to seven daily diary measurements of each index of adjustment. Daily diaries provide a cure for memory biases such as retrospective biases and focusing illusions that contaminate one-time global judgments[74,88].

These biases increase measurement error and attenuate observed associations between adjustment and other constructs. For instance, past research suggests that one-third of any measurement of life satisfaction represents true variance, and the remaining two-thirds consists of error[89]. Daily diaries also provide a cure for several sources of common method bias[75]. Separation between the measures of abilities and self-views and adjustment reduce the extent to which observed associations are affected by factors such as participants' mood when filling out the questionnaires[74,75]. To reduce measurement error and common method variance, we will average up to seven daily reports of adjustment. In our piloting, 51 of the 52 recruited participants completed all seven diaries (two of these participants completed an additional diary, for a total of eight diaries, because we invited them to complete the third make-up diary by mistake, even though they had already completed the seven required diaries). The other participant completed three diaries.

We selected the indices of adjustment based on theoretical considerations. We selected criteria that comprehensively cover the domain of adjustment. Specifically, we selected indices reflecting psychological, interpersonal, and institutional adjustment. Further, we selected facets of adjustment that are conceptually close to the abilities and self-views of interest.

Psychological adjustment. We will assess psychological adjustment by assessing one of its core components: life satisfaction. Life satisfaction reflects evaluative beliefs and attitudes about one's life[90,91]. We will administer the Satisfaction with Life Scale[90], a commonly used and established measure. Five items ask participants to evaluate their life on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*): "In most ways my life is close to my ideal," "The conditions of my life are excellent," "I am satisfied with my life," "So far I have gotten the important things I want in life," and "If I could live my life over, I would change almost nothing."

In past research, this scale was reliable (Cronbach alphas = .80 to .89) and showed convergent validity with other measures of life satisfaction[92]. In our first pilot study, the reliability (Cronbach alpha) across all 362 diaries done by all participants was .93. The mean across all diaries was 4.30 (*SD* = 1.63).

Interpersonal adjustment. We will measure interpersonal adjustment by assessing the quality of one's relationships in general. We will adapt a measure used in previous research on relationships[93]. Participants indicate the extent to which they agree with four statements about their relationships in general, including but not limited to relationships with friends, family members, significant others, co-workers, and acquaintances, using a scale of 1 (*very slightly or not at all*) to 5 (*a lot).* The statements are: "I feel satisfied with my relationships," "I feel close to my relationship partners," "I feel there is tension between my relationship partners and me" (reverse scored), and "My relationship partners and I experience conflict" (reverse scored). In past research, the reliability of this scale was high (Cronbach alphas ranging from .88 to .91)[93].

Institutional adjustment. We will administer a measure of career satisfaction[94]. Participants indicate their agreement with five statements using a scale of 1 (*strongly disagree*) to 5 (*strongly agree*). Sample items include "I am satisfied with the success I have achieved in my career" and "I am satisfied with the progress I have made toward meeting my goals for income." In past research, this measure exhibited convergent validity with various indices of job quality and performance[94] and high reliability (Cronbach alpha = .89)[95].

Demographics. Participants will report their age, gender, ethnicity, income, education, marital status, and occupation. We will measure these characteristics to describe the nature of our sample in our report.

Timeline

We have obtained ethics approval, programmed the surveys in Qualtrics, set up the study in MTurk Prime, and conducted four pilot studies. We therefore anticipate beginning the study promptly. We recruited participants from the first pilot study during a 13-hour period on a single day, at a rate of approximately 4 participants per hour. Recruiting 1126 participants would likely take 18 days (estimating that we could recruit participants during 16 waking hours per day). We anticipate that data collection will take approximately three weeks, data analysis would take approximately two weeks, and write-up would take at most three months (with time for gathering and incorporating feedback from colleagues). Thus, we would submit a full manuscript within four months of acceptance of this proposal.

Proposed Analysis Pipeline

Preprocessing steps after the initial questionnaire and before the diaries. After participants complete the initial questionnaire and before we invite them to complete the diaries, we will verify that they have completed a) at least one of the abilities tests (emotional or cognitive abilities), and b) the corresponding measure(s) of self-views. The emotional abilities test will be deemed complete if participants provide a response to at least 36 of the 72 items. Further, we will remove responses in which participants select the exact same emotion for all 72 items, because we assume that it is virtually impossible to genuinely believe that all 72 pictures show the same emotion. The cognitive abilities test will be deemed complete if participants provide a response to at least 8 of the 15 items. Further, we will remove responses in which participants select the exact same letter for all 15 items, because we assume that it is virtually impossible to genuinely believe that the correct answer to all 15 problems corresponds to the same letter. We will then calculate split-half reliabilities of the tests of cognitive and emotional abilities. Because we have selected measures that have been validated and shown to be reliable—

including in our pilot studies—the possibility that reliability will be inadequate is low. Even so, in the unlikely event that the split-half reliability of the cognitive or emotional abilities test is lower than .60, we will iteratively remove items with the lowest item-total correlations until reliability of at least .60 is achieved[96]. This technique would be more appropriate for a pre-registered study than throwing away the data.

Preprocessing steps after the diaries. For each diary for each participant, we will aggregate across relevant items to create separate scores for life satisfaction, relationship quality, and career satisfaction. We will then aggregate across up to seven days to obtain life satisfaction, relationship quality, and career satisfaction scores for each participant. We will treat these three scores as separate indicators of adjustment.

Outcome-neutral conditions for ensuring that the results obtained are able to test the hypotheses. In this section, we describe the outcome-neutral conditions that would impede our ability to test the hypotheses, decisions we would make if these conditions occurred, and evidence from our pilot or other studies providing reassurance that these conditions are unlikely to occur.

Floor or ceiling effects. If means of the measure of abilities, self-views, or adjustment are overly low or overly high, this could undermine our hypotheses tests. The results of past research and our pilot studies (described above) indicate that floor or ceiling effects are unlikely because the means of all of the variables were far enough from the ends of the scales. In the unlikely event that floor and ceiling effects are observed, we will consider these effects in the interpretation of the results.

Existence of matches between abilities and self-views and both types of mismatches. The results can only be interpreted for combinations of abilities and self-views that actually

occur[22]. Thus, we will verify that the data include both matched and mismatched observations. The results reported above indicate that our pilot studies included individuals with self-insight and both over- and under-estimators. These results reassure us that we will likely find both matched and mismatched observations in the proposed study. In the unlikely event that our data do not feature one or more type of observations, we will consider this in the interpretation of the results.

Unreliability of measures. Insufficiently reliable measures would undermine our hypotheses tests. Above, we described that all of the measures have achieved high reliability in past research, our pilot tests, or both. Even so, if the reliability of any measure is below .60 in this research, we will iteratively remove items with the lowest item-total correlations until reliability of at least .60 is achieved[96].

Farcical responses. Participants who do not take the study seriously and offer farcical responses can undermine our hypotheses tests. We did not observe this behavior in our pilot tests. If this behavior occurs in the larger sample that we are planning to recruit for the main study, we expect it to be minimal. As noted above, we will remove responses from any respondent who provides the same answer to each of the 72 items of the emotion recognition test or chooses the same letter for each of the 15 items of the cognitive abilities test. We will only remove responses to the specific test, and non-farcical data provided by the same participants will be retained.

Missing data. Missing data were minimal in our pilot tests. The proportion of missing data ranged from 0% (for the tests of cognitive and emotional abilities, the measure of self-views about emotional abilities, and the measure of life satisfaction) to 2% (for the measure of self-views about cognitive abilities). If we fail to achieve our target sample size because of missing

data, we will recruit additional participants until we obtain our target sample size (and, thus, power of .95 or above) is achieved for all of our hypothesis tests.

Outliers. Outliers can bias hypotheses tests, but they are unlikely to be observed in this research within the possible range of measurement of the variables. Using a cut-off of 3.29 standard deviations above and below the mean suggested by Tabachnick and Fidell[97], we did not identify any outliers on any of the measures in any of our pilots. Even so, we will remove any outliers identified using this cut-off in the main investigation prior to analysis.

We will further remove multivariate outliers (i.e., observations with unique combinations of abilities and self-views)[97]. To do so, for each observation in the data set, we will examine influence on three indices: Cook's *D*, Hat values, and difference in fits (DFFITS). Following the approach used by Humberg et al.[13], we will remove any observation with values that exceed the cut-offs recommended by Bollen and Jackman[98] and Belsley, Kuh, and Welsch[99] on all three indices. In our fourth pilot study of emotional abilities, self-views about abilities, and adjustment, we did not identify any observations with values exceeding the cut-offs on all three indices, providing reassurance that this problem is unlikely to occur in the proposed study.

Multicollinearity. Multicollinearity of the predictors, when substantial, can undermine hypothesis testing by increasing standard errors around the estimate and causing estimates to be imprecise[99]. We will examine multicollinearity in the full model by computing the Variance Inflation Factor (VIF). A value of 10 has been recommended as a cut-off for VIF[100-102]. We examined multicollinearity in our fourth pilot study. All VIF values were below 4 (and the cut-off of 10), providing reassurance that multicollinearity is unlikely to be a problem in the proposed study.

Data and Materials Availability for the Pilot Studies

The materials and data for the pilot studies reported in this proposal have been deposited at Harvard Dataverse, https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/BSUNGB

To download the csv versions of the data that are required by the code, researchers need to select the "Original File Format (Comma Separated Values)" option under "Download." The code for analysis will not work if researchers download the tab versions of the data files instead.

Code Availability for the Pilot Studies

The code for analysis for the pilot studies reported in this proposal have been deposited at Harvard Dataverse, https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/BSUNGB

Results

Descriptive Statistics

We will report means and standard deviations of age and income, and frequencies for gender, ethnicity, education, and marital status.

Focal Analyses

We will conduct six sets of analyses (one for each facet of ability and for each indicator of adjustment). We will first examine how emotional abilities and self-views about emotional abilities relate to each of the three indicators of adjustment (life satisfaction, relationship quality, and career satisfaction). We will then repeat this set of analyses for cognitive abilities and self-views about cognitive abilities.

We will conduct polynomial regression and response surface analyses (RSA)[21-23] using the *RSA* and *getPar* functions in the *RSA* package (Version 0.9.11) for R[103]. This analytical approach assesses whether (mis)matches between self-views and abilities relate to adjustment by

modeling how all possible combinations of predictors and criteria in three-dimensional space. RSA is superior to other techniques to test the hypotheses because it models (mis)matching without using mathematical operations that conceal or distort information, such as difference scores[22,23].

The *RSA* function tests the full polynomial model, in which adjustment is regressed on abilities, self-views about the abilities, their squared terms, and the interaction between abilities and self-views[21]. The full polynomial model will be specified as follows (*AB* = abilities and *SV* = self-views):

$$ADJ = b_0 + b_1\,AB + b_2\,SV + b_3\,AB^2 + b_4\,AB{*}SV + b_5\,SV^2 + e$$

If the full polynomial model is not significant, we will infer that adjustment is not related to self-views or abilities (alone or in interaction with one another), and that none of the models is supported[22,23]. If the full polynomial model is significant, as in our fourth pilot study, we will test the hypothesized models.

The coefficients from the full polynomial model will be used to generate a response surface (which will be plotted) and derive other coefficients that test several aspects of this surface[23]. The *getPar* function in the *RSA* package provides these coefficients. We will use the parameter estimates from the full polynomial model (i.e., b_1 to b_5) to test the linear and curvilinear versions of the self-views only and high abilities only hypotheses (Hypotheses 2a, 2b, 4a, and 4b) and the additive hypothesis (Hypothesis 5)[13]. Tests of the self-insight (Hypothesis 1) and optimal margin of illusion (Hypothesis 3) will be based on coefficients derived from the parameter estimates[23]. These coefficients include the slope (denoted by a_1) and curvature (denoted by a_2) along the line of congruence (which includes cases when abilities and self-views match perfectly), and the slope (denoted by a_3) and curvature (denoted by a_4) along the line of

761 incongruence (which includes cases when abilities and self-views are perfectly opposite)[23,104].
762 Other coefficients include the shift and rotation of the first principal axis (which runs along the
763 ridge where adjustment is highest, if the response surface is concave) from the line of
764 congruence (denoted by p_{10} and p_{11}, respectively)[23,104]. Table 1 displays the results that will lead
765 us to infer support for each of the hypotheses.

766 For our focal analyses, we will center the predictors around the midpoints of their
767 respective scales[21,23]. Specifically, we will center the scores for emotional abilities and self-views
768 about emotional abilities by subtracting 36 from the scores, given that 36 is the midpoint of the
769 scale ranging from 0 to 72 correct answers. Also, we will center the scores for cognitive abilities
770 and self-perceptions of cognitive abilities by subtracting 7.5 from the scores, given that 7.5 is the
771 midpoint of the scale ranging from 0 to 15 correct answers. As a robustness check, we will re-do
772 all analyses after centering the predictors around their common grand mean (i.e., the average of
773 the mean for abilities and the mean for self-views) because the data may largely lie away from
774 the midpoint of the scales. Re-centering the predictors changes the coefficients for the effects of
775 abilities and self-views and some of the derived coefficients[23], because it changes the location
776 where the slopes of the lines of congruence and incongruence and the shift of the first principal
777 axis away from the line of congruence are tested on the response surface. We will infer strong
778 support for a particular model if it passes this robustness check. If a model does not pass this
779 robustness check, support will be considered tentative.

780 **Test of self-insight only hypothesis (Hypothesis 1a).** The self-insight model posits that
781 adjustment is highest when people know their level of abilities—at any level of these abilities.
782 This model is labeled the basic squared difference (*SQD*) model in the *RSA* package[103]. Support
783 for this model will be inferred if all six of the conditions in the first row of Table 1 are met[22,23,104].

First, there is significant curvature along the line of incongruence (indicated by a significant and negative a_4 coefficient). Second, the line of incongruence is not sloped (indicated by a non-significant a_3 coefficient). Third, the first principal axis is not shifted away from the line of congruence in the surface (indicated by a non-significant p_{10} coefficient). Fourth, the first principal axis is parallel to the line of congruence (indicated by a 95% confidence interval for the p_{11} coefficient that includes 1). Finally, there is no linear or curvilinear trend along the line of congruence (indicated by non-significant a_1 and a_2 coefficients). If all six of these conditions are satisfied, we will infer that adjustment is higher when abilities and self-views match at all levels, compared to when abilities and self-views do not match.

Test of self-insight plus main effects hypothesis (Hypothesis 1b). This variant of the self-insight model posits that adjustment is highest when people know their level of abilities and, in addition, there are separate positive effects of abilities and self-views on adjustment. This model is labeled the rising ridge (*RR*) model in the *RSA* package[103]. Support for this model will be inferred if all six of the conditions in the second row of Table 1 are met[13,22,23]. First, there is significant curvature along the line of incongruence (indicated by a significant and negative a_4 coefficient). Second, the line of incongruence is not sloped (indicated by a non-significant a_3 coefficient). Third, the first principal axis is not shifted away from the line of congruence in the surface (indicated by a non-significant p_{10} coefficient). Fourth, the first principal axis is parallel to the line of congruence (indicated by a 95% confidence interval for the p_{11} coefficient that includes 1). Fifth, there is a positive linear trend along the line of congruence (indicated by significant and positive a_1 coefficient). Finally, there is no curvilinear trend along the line of congruence (indicated by a non-significant a_2 coefficient). If all six of these conditions are met,

we will then infer that adjustment is optimized when abilities and self-views are matched and, in addition, there are separate positive effects of abilities and self-views on adjustment.

Test of positive self-views only hypothesis (linear version – Hypothesis 2a). The positive self-views only hypothesis (labeled *onlyy* in the *RSA* package) posits that self-views are positively and linearly associated with adjustment. Support for the model is inferred if all five of the conditions listed in the third row of Table 1 are met[13]: self-views are positively associated with adjustment (indicated by a significant and positive b_2 coefficient); there is no linear or curvilinear association between abilities and adjustment (indicated by non-significant b_1 and b_3 coefficients); self-views do not interact with abilities to predict adjustment (indicated by a non-significant b_4 coefficient); and the association between self-views and adjustment is not curvilinear (indicated by a non-significant b_5 coefficient). If all five of these conditions are met, we will infer that as self-views increase, adjustment also increases.

Test of positive self-views only hypothesis (curvilinear version – Hypothesis 2b). Support for the curvilinear version of the positive self-views only hypothesis (labeled *onlyy2* in the *RSA* package) will be inferred if all of the following conditions are met[13]: the quadratic term for self-views is significant and negative (indicated by a significant and negative b_5 coefficient); there is no linear or curvilinear association between abilities and adjustment (indicated by non-significant b_1 and b_3 coefficients); and self-views do not interact with abilities to predict adjustment (indicated by a non-significant b_4 coefficient).

To infer a curvilinear association, we will also examine the percentage of observations with self-views scores that exceed the inflection point, based on a regression model that only includes the linear and curvilinear terms for self-views. Adapting decisions made in past research[13], we will infer support for a curvilinear association if all of the conditions listed above

are met and more than 10% of data points exceed the inflection point. If this number is between 10 and 20%, we will infer that support for a curvilinear association is tentative. If all of these conditions listed above are met, but the data lie only on the rising side of the surface, we will tentatively infer that adjustment increases as self-views increase, but the effects of self-views diminish at high levels. This pattern would be consistent with a variant of the positive self-views perspective, but the exploratory observation of the diminishing effect of self-views would lead us to infer that support for this variant is tentative.

Test of optimal margin of illusion hypothesis (Hypothesis 3). This model posits that adjustment is optimal when self-views exceed abilities by a set amount, and is labeled the shifted squared difference (*SSQD*) model in the *RSA* package[103]. Support for the optimal margin of illusion hypothesis will be inferred if all of the following conditions are met[13]. First, there is a significant curvature along the line of incongruence (indicated by a significant a_4 coefficient). Second, the first principal axis (which runs along the ridge where adjustment is highest) is shifted away from the line of congruence in the surface (indicated by a significant and positive p_{10} coefficient). Third, the first principal axis is parallel to the line of congruence (indicated by a 95% confidence interval for the p_{11} coefficient that includes 1). Finally, there is no linear or curvilinear trend along the line of congruence (indicated by non-significant a_1 and a_2 coefficients).

We will infer support for an optimal margin of illusion if at least 10% of data points are on each side of the first principal axis. We will consider this support to be tentative if this number is between 10 and 20% on either side. If all of these conditions are met, we will infer that adjustment is higher when self-views exceed abilities by the same set amount at all levels,

compared to when self-views exceed abilities by a larger amount, when self-views and abilities match perfectly, or when abilities exceed self-views.

If the optimal margin of illusion model is supported, the C coefficient (calculated as: $C = b_1/2b_3$)[103] will tentatively suggest the amount by which self-views must exceed abilities to optimize adjustment. This analysis is exploratory, however, because we are not making a prediction about this amount.

Test of high abilities only hypothesis (linear version – Hypothesis 4a). The high abilities only hypothesis (labeled *onlyx* in the *RSA* package) posits that abilities are positively and linearly associated with adjustment. Support for the model will be inferred if all five of the conditions listed in the sixth row of Table 1 are met[13]: abilities are positively associated with adjustment (indicated by a significant and positive b_1 coefficient); there is no linear or curvilinear association between self-views and adjustment (indicated by non-significant b_2 and b_5 coefficients); abilities do not interact with self-views to predict adjustment (indicated by a non-significant b_4 coefficient); and the association between abilities and adjustment is not curvilinear (indicated by a non-significant b_3 coefficient). If all five of these conditions are met, we will infer that as abilities increase, adjustment also increases.

Test of high abilities only hypothesis (curvilinear version – Hypothesis 4b). Support for the curvilinear version of the high abilities only hypothesis (labeled *onlyx2* in the *RSA* package) will be inferred if all of the following conditions are met[13]: the quadratic term for abilities is significant and negative (indicated by a significant and negative b_3 coefficient); there is no linear or curvilinear association between self-views and adjustment (indicated by non-significant b_2 and b_5 coefficients); and self-views do not interact with abilities to predict adjustment (indicated by a non-significant b_4 coefficient).

To infer a curvilinear association, we will also examine the percentage of observations with ability scores that exceed the inflection point, based on a regression model that only includes the linear and curvilinear terms for abilities. We will infer support for a curvilinear association if all of the conditions listed above are met and more than 10% of data points exceed the inflection point. If this number is between 10 and 20%, we will infer that support for a curvilinear association is tentative. If all of these conditions are met, we will infer that as abilities increase, adjustment also increases, up to an inflection point, and after this inflection point, as abilities increase, adjustment decreases. If all of these conditions listed above are met, but the data lie only on the rising side of the surface, we will tentatively infer that adjustment increases as abilities increase, but the effect of abilities diminish at high levels. This pattern would be consistent with a variant of the high abilities only perspective, but the exploratory observation of the diminishing effect of abilities would lead us to infer that support for this variant is tentative.

Test of positive self-views and high abilities hypothesis (Hypothesis 5). Support for this model (labeled *additive* in the *RSA* package) is inferred if all five of the conditions listed in the last row of Table 1 are met[13]: both self-views and abilities are positively and significantly related to adjustment (indicated by significant and positive b_1 and b_2 coefficients); neither self-views nor abilities has a curvilinear association with adjustment (indicated by non-significant b_3 and b_5 coefficients); and there is no interaction between self-views and abilities predicting adjustment (indicated by a non-significant b_4 coefficient). If all five of these conditions are met, we will infer that as abilities increase, adjustment increases and, separately, as self-views increase, adjustment increases.

Exploratory Analyses

If none of the hypothesized models is supported, we will conduct exploratory analyses to guide future research. We will first examine the coefficients from the polynomial regression model and the derived coefficients to see if they are consistent with any existing model described in past research[13,38]. These models include, for example, the detrimental effect of abilities model[13]. We did not include these models because the theoretical support for them is weaker than the models we hypothesized. Any support for these models will be considered tentative and would need to be confirmed in future research. If the coefficients are not consistent with any of the existing models, we will rely on them to tentatively suggest a new model of how abilities, self-views, and adjustment are associated. This model would need to be examined in future high-powered confirmatory tests.

Data and Materials Availability for the Main Study

All data sets (i.e., data sets for the original survey and each of the daily diaries) and PDF and Word versions of all questionnaires will be deposited at Harvard Dataverse. To download the csv versions of the data that are required by the code, researchers will need to select the "Original File Format (Comma Separated Values)" option.

Code Availability for the Main Study

R code for analysis will be deposited at Harvard Dataverse.

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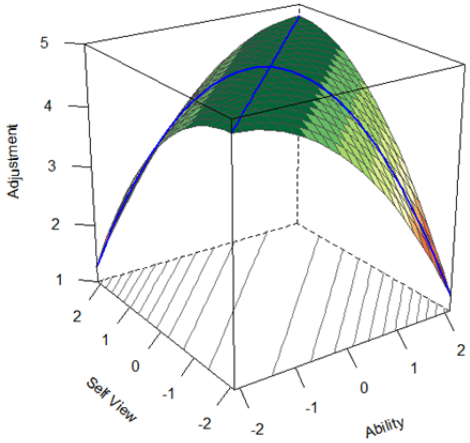
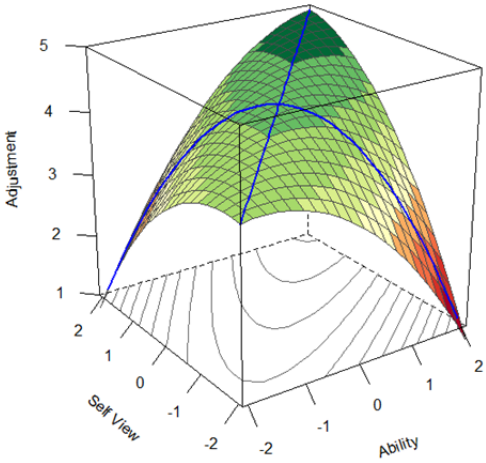
Figure 1

1A



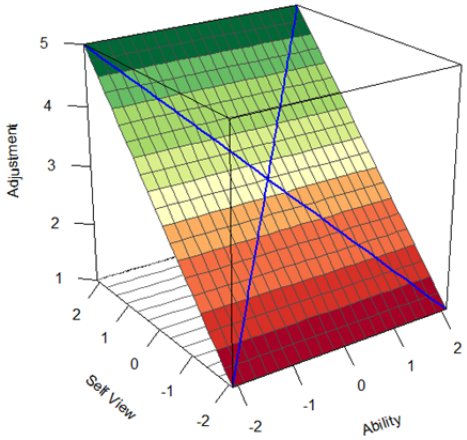
Hypothesis 1a
Self-insight only perspective

1B



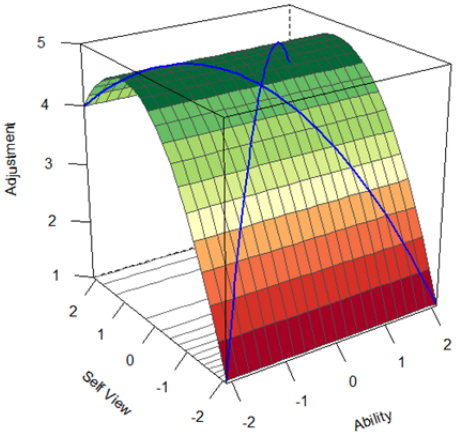
Hypothesis 1b
Self-insight plus main effects perspective

2A



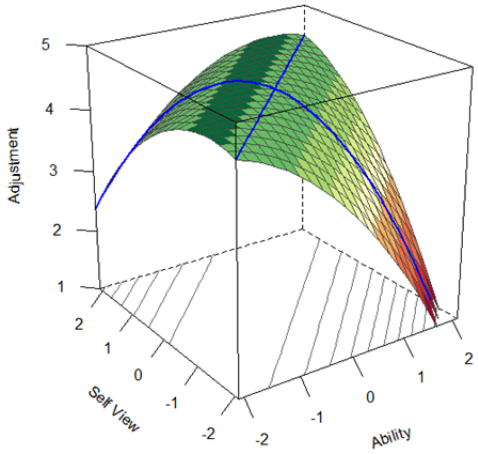
Hypothesis 2a
Positive self-views only perspective
(linear)

2B



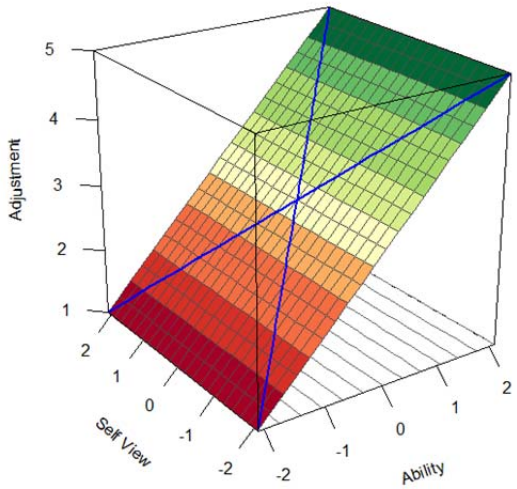
Hypothesis 2b
Positive self-views only perspective
(curvilinear)

3

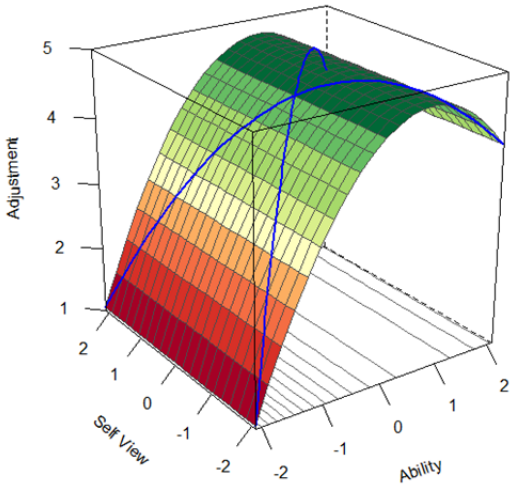


Hypothesis 3
Optimal margin of illusion perspective

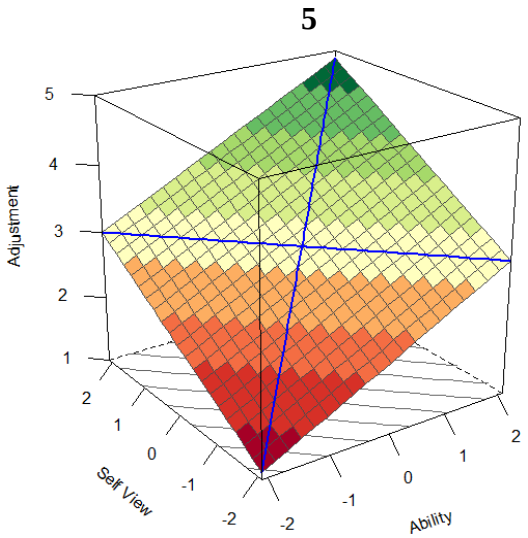
4A **4B**



Hypothesis 4a
High abilities only perspective
(linear)



Hypothesis 4b
High abilities only perspective
(curvilinear)



Hypothesis 5
Positive self-views and high abilities perspective

The Figures depict response surface graphs for the associations between abilities, self-views, and adjustment that are predicted by each perspective. Abilities are on the x axis (on the bottom right), self-views are on the y axis (on the bottom left), and adjustment is on the vertical, z axis. The Figures are color-coded so that green depicts the highest levels of adjustment and red depicts the lowest levels.

Table 1

Summary of Conditions for Each Hypothesis

Hypothesis	a_1	a_2	a_3	a_4	p_{10}	p_{11}	b_1	b_2	b_3	b_4	b_5
H1a: Self-insight only perspective	non-significant	non-significant	non-significant	significantly negative	non-significant	95% confidence interval incudes 1					
H1b: Self-insight plus main effects perspective	significantly positive	non-significant	non-significant	significantly negative	non-significant	95% confidence interval incudes 1					
H2a: Positive self-views only perspective (linear)							non-significant	significantly positive	non-significant	non-significant	non-significant
H2b: Positive self-views only perspective (curvilinear)							non-significant		non-significant	non-significant	significantly negative
H3: Optimal margin of illusion perspective	non-significant	non-significant		significantly negative	significantly positive	95% confidence interval incudes 1					
H4a: High abilities only perspective (linear)							significantly positive	non-significant	non-significant	non-significant	non-significant
H4b: High abilities only perspective (curvilinear)								non-significant	significantly negative	non-significant	non-significant
H5: Positive self-views and high abilities perspective							significantly positive	significantly positive	non-significant	non-significant	non-significant

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Author contributions

J.C.H. jointly conceived the study with S.C., designed and conducted the pilots, analyzed the pilot data, and wrote the manuscript; S.C. supervised the design and analysis of the pilots, and wrote and edited the manuscript.

Competing interests

The authors declare no conflict of interest.