Dunning–Kruger effect

In the field of psychology, the **Dunning–Kruger effect** is a cognitive bias in which people with low ability at a task overestimate their ability. It is related to the cognitive bias of illusory superiority and comes from the inability of people to recognize their lack of ability. Without the self-awareness of metacognition, people cannot objectively evaluate their competence or incompetence.[1]

As described by social psychologists David Dunning and Justin Kruger, the bias results from an internal illusion in people of low ability and from an external misperception in people of high ability; that is, "the miscalibration of the incompetent stems from an error about the self, whereas the miscalibration of the highly competent stems from an error about others."[1]

Contents

Original study

The psychological phenomenon of illusory superiority was identified as a form of cognitive bias in Kruger and Dunning's 1999 study, "Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments".[1] The identification derived from the cognitive bias evident in the criminal case of McArthur Wheeler, who robbed banks while his face was covered with lemon juice, which he believed would make it invisible to the surveillance cameras. This belief was based on his misunderstanding of the chemical properties of lemon juice as an invisible ink.[2]

Other investigations of the phenomenon, such as "Why People Fail to Recognize Their Own Incompetence" (2003), indicate that much incorrect self-assessment of competence derives from the person's ignorance of a given activity's standards of performance.[3] Dunning and Kruger's research also indicates that training in a task, such as solving a logic puzzle, increases people's ability to accurately evaluate how good they are at it.[4]

In *Self-insight: Roadblocks and Detours on the Path to Knowing Thyself* (2005), Dunning described the Dunning–Kruger effect as "the anosognosia of everyday life", referring to a neurological condition in which a disabled person either denies or seems unaware of his or her disability. He stated: "If you're incompetent, you can't know you're incompetent ... The skills you need to produce a right answer are exactly the skills you need to recognize what a right answer is."[5][6]

In 2011, David Dunning wrote about his observations that people with substantial, measurable deficits in their knowledge or expertise lack the ability to recognize those deficits and, therefore, despite potentially making error after error, tend to think they are performing competently when they are not: "In short, those who are incompetent, for lack of a better term, should have little insight into their incompetence—an assertion that has come to be known as the Dunning–Kruger effect".[7] In 2014, Dunning and Helzer described how the Dunning–Kruger effect "suggests that poor performers are not in a position to recognize the shortcomings in their performance".[8]

Later studies

Dunning and Kruger tested the hypotheses of the cognitive bias of illusory superiority on undergraduate students of introductory courses in psychology by examining the students' self-assessments of their intellectual skills in logical reasoning (inductive, deductive, abductive), English grammar, and personal sense of humor. After learning their self-assessment scores, the students were asked to estimate their ranks in the psychology class. The competent students underestimated their class rank, and the incompetent students overestimated theirs, but the incompetent students did not estimate their class rank as higher than the ranks estimated by the competent group. Across four studies, the research indicated that the study participants who scored in the bottom quartile on tests of their sense of humor, knowledge of grammar, and logical reasoning, overestimated their test performance and their abilities; despite test scores that placed them in the 12th percentile, the participants estimated they ranked in the 62nd percentile.[1][9]

Moreover, competent students tended to underestimate their own competence, because they erroneously presumed that tasks easy for them to perform were also easy for other people to perform. Incompetent students improved their ability to estimate their class rank correctly after receiving minimal tutoring in the skills they previously lacked, regardless of any objective improvement gained in said skills of perception.[1] The study "Mind-Reading and Metacognition: Narcissism, not Actual Competence, Predicts Self-estimated Ability" (2004) extended the cognitive-bias premise of illusory superiority to test subjects' emotional sensitivity toward other people and their perceptions of other people.[10]

The study "How Chronic Self-Views Influence (and Potentially Mislead) Estimates of Performance" (2003) indicated a shift in the participants' view of themselves when influenced by external cues. The participants' knowledge of geography was tested; some tests were intended to affect the participants' self-view positively and some were intended to affect it negatively. The participants then were asked to rate their performances; the participants given tests with a positive intent reported better performance than did the participants given tests with a negative intent.[11]

To test Dunning and Kruger's hypotheses, "that people, at all performance levels, are equally poor at estimating their relative performance", the study "Skilled or Unskilled, but Still Unaware of It: How Perceptions of Difficulty Drive Miscalibration in Relative Comparisons" (2006) investigated three studies that manipulated the "perceived difficulty of the tasks, and, hence, [the] participants' beliefs about their relative standing". The investigation indicated that when the experimental subjects were presented with moderately difficult tasks, there was little variation among the best performers and the worst performers in their ability to predict their performance accurately. With more difficult tasks, the best performers were less accurate in predicting their performance than were the worst performers. Therefore, judges at all levels of skill are subject to similar degrees of error in the performance of tasks.[12]

In testing alternative explanations for the cognitive bias of illusory superiority, the study "Why the Unskilled are Unaware: Further Explorations of (Absent) Self-insight Among the Incompetent" (2008), reached the same conclusions as previous studies of the Dunning–Kruger effect: that, in contrast to high performers, "poor performers do not learn from feedback suggesting a need to improve".[13]

Individuals of relatively high social class are more overconfident than lower-class individuals.[14]

Mathematical critique

The Dunning-Kruger Effect is a statement about a particular disposition of human behavior, but it also makes quantitative assertions that rest on mathematical arguments.

The Effect relies on the quantifying of paired measures consisting of (a) the measure of the competence people can demonstrate when put to the test (actual competence) and (b) the measure of competence people believe that they have (self-assessed competence). Researchers express the measures either as percentages or as percentile scores scaled from 0 to 1 or from 0 to 100. By convention, researchers express the differences between the two measures as self-assessed competence minus actual competence. In such a convention, negative numbers signify erring toward underconfidence, positive numbers signify erring toward overconfidence, and zero signifies perfectly accurate self-assessment.

Ehrlinger et al.[13] summarized the major assertions of the Effect that first appeared in the 1999 seminal paper and continued to be supported by many studies after nine years of research: "People are typically overly optimistic when evaluating the quality of their performance on social and intellectual tasks. In particular, poor performers grossly overestimate their performances" (Ehrlinger et al. 2008, p. 98).

The Effect asserts that most people are overconfident about their actual abilities, and that the least competent people are the most overconfident. Support for both assertions rests upon interpreting the patterns produced from graphing the paired measures,

The most common graphical convention is the Kruger-Dunning type graph typified by Figure 1 in the seminal paper.[1] That paper depicted college students' accuracy in self-assessing their competencies in humor, logical reasoning, and grammar. Researchers adopted that convention in subsequent papers on the Effect. Additional graphs used by other researchers who argued for the legitimacy of the Effect include (y-x) versus (x) cross plots (Figure 5 of Pazicni and Bauer, 2015[15]), bar charts (Figure 3 of Bell and Volckman, 2011[16]) and histograms (Figure 1 of Stinson and Xiaofeng, 2008[17]). The first two of these studies depicted college students' accuracy in self-assessing their competence in introductory chemistry, and the third depicted their accuracy in self-assessing their competence in business classes.

Recent researchers who focused on the mathematical reasoning[18][19] behind the Effect studied 1154 participants' ability to self-assess their competence in understanding the nature of science. These researchers graphed their data in all the earlier papers' various conventions, and explained how the numerical reasoning used to argue for the Effect are similar in all. When graphed in these established conventions, the researchers' data also supported the Effect. Had the researchers ended their study at this point, their results would have added to the established consensus that validated the Effect. But their deeper analyses led them to conclude that the numerical procedures used repeatedly in all previous work were the likely sources of misleading conclusions.

To expose the sources of the misleading conclusions, the researchers employed their own real data set of paired measures from 1154 participants, and created a second simulated data set that employed random numbers to simulate random guessing by an equal number of simulated participants. The simulated data set contained only random noise, without any measures of human behavior.

The researchers[18][19] then used the simulated data set and the graphical conventions of the behavioral scientists to produce patterns like those described as validating the Dunning-Kruger Effect. They traced the origin of the patterns, not to the dominant literature's claimed psychological disposition of humans, but instead to the nature of graphing data bounded by limits of 0 and 100 and to the process of ordering and grouping the paired measures to create the graphs. These patterns are mathematical artifacts that random noise devoid of any human influence can produce. They further showed that the graphs used to establish the Effect in three of the four case examples presented in the seminal paper are patterns characteristic of purely random noise. These patterns are numerical artifacts that behavioral scientists and educators seem to have interpreted as evidence for a human psychological disposition toward overconfidence.

But the graphic presented on the case study on humor in the seminal paper's Figure 1[1] and the Numeracy researchers' real data (Figure 4 of Nuhfer et al.[18]) were not the patterns of purely random noise. Although the data was noisy, that human-derived data exhibited some order that could not be attributed to random noise. The researchers attributed it to human influence and called it the "self-assessment signal."[18]

The researchers went on to characterize the signal and worked to determine what human disposition it revealed. To do so, they employed different kinds of graphics that suppress or eliminate the noise responsible for most of the artifacts and distortions. The authors discovered that the different graphics refuted the assertions made for the Effect. Instead, they showed that most people are reasonably accurate in their self-assessments. About half of the 1154 participants in their studies accurately estimated their performance within ±10 percentage points (ppts). Two-thirds of these participants self-assessed their competency scores within ±15 ppts. Only about 6% of participants displayed wild overconfidence and were unable to accurately self-assess their abilities within 30 ppts. All groups overestimated and underestimated their actual ability with equal frequency. No marked tendency toward overconfidence, as predicted by the Effect, occurs, even in the most novice groups. In 2020, with an updated database of over 5000 participants, this relationship still held true. The revised mathematical interpretation of data confirmed that people typically have no pronounced tendency to overestimate their actual proficiency.

Groups' mean self-assessments prove more than an order of magnitude more accurate than do individuals'. In randomly selected groups of 50 participants, 81% of groups' self-assessed mean scores were within 3 ppts of their actual mean competency score. The discovery that groups of people are accurate in their self-assessments opens an entirely new way to study groups of people with respect to paired measures of cognitive competence and affective self-assessed competence. A third Numeracy paper by these researchers[20] reports from a database of over 3000 participants to illuminate the effects of privilege on different ethnic and gender groups of college students. The paper confirms that minority groups are on average less privileged and score lower in the cognitive test scores and self-assessed confidence ratings on the instruments used in this research. They verified that women on average self-assessed more accurately than men, and did so across all ethnic groups that had sufficient representation in the researchers' database.

Cultural differences in self-perception

Studies of the Dunning–Kruger effect usually have been of North Americans, but studies of Japanese people suggest that cultural forces have a role in the occurrence of the effect.[21] The study "Divergent Consequences of Success and Failure in Japan and North America: An Investigation of Self-improving Motivations and Malleable Selves" (2001) indicated that Japanese people tended to underestimate their abilities, and tended to see underachievement (failure) as an opportunity to improve their abilities at a given task, thereby increasing their value to the social group.[22]

Popular recognition

In 2000, Kruger and Dunning were awarded an Ig Nobel Prize in recognition of the scientific work recorded in "their modest report".[23] "The Dunning–Kruger Song"[24] is part of *The Incompetence Opera*,[25] a mini-opera that premiered at the Ig Nobel Prize ceremony in 2017.[26] The mini-opera is billed as "a musical encounter with the Peter principle and the Dunning–Kruger Effect".[27]

Journalists have often cited the Dunning–Kruger effect in discussions of political incompetence. In 2018, the British Brexit withdrawal deal was described by Bonnie Greer as "the supreme example of the Dunning–Kruger effect... Dunning-Kruger implies that we may be in the midst of an epidemic of incompetence."[28] At the same time, Martie Sirois wrote that President Donald Trump was "the Dunning Kruger effect personified."[29] In 2020, Otto English discussed Priti Patel's defence of the death penalty on a TV debate in which she appeared "completely unfazed by the inherent contradictions in her responses... Here is the very essence of the Dunning Kruger effect in motion."[30]

See also

- Big-fish–little-pond effect – People feel better about themself when they're more obviously superior
- Cognitive dissonance – Psychological stress experienced by an individual who holds two or more contradictory beliefs, ideas, or values at the same time
- Curse of knowledge – Cognitive bias of assuming that others have the same background to understand

- Four stages of competence – Learning model relating the psychological states in progressing from incompetence to competence in a skill
- Grandiose delusions
- Hanlon's razor – Never attribute to malice that which is adequately explained by stupidity
- Hubris – Extreme pride or overconfidence, often in combination with arrogance
- Illusory superiority – overestimating one's abilities and qualifications; a cognitive bias
- Impostor syndrome – Psychological pattern of doubting one's accomplishments and fearing being exposed as a "fraud"
- Narcissism – Personality trait of self-love of a fake perfect self
- Narcissistic personality disorder – Personality disorder that involves an excessive preoccupation with personal adequacy, power, prestige and vanity
- Not even wrong – Based on invalid reasoning or premises that cannot be proved or disproved
- Optimism bias – A cognitive bias that causes someone to believe that they themselves are less likely to experience a negative event
- Overconfidence effect – Bias in which a person's subjective confidence in their judgement is greater than the objective accuracy of those judgements
- Peter principle – Concept that people in a hierarchy are promoted until no longer competent
- Self-deception
- Self-efficacy – Psychology concept
- Self-serving bias – Distortion to enhance self-esteem, or to see oneself overly favorably
- Superiority complex – Psychological defense mechanism articulated by Alfred Adler
- True self and false self – Psychological concepts often used in connection with narcissism
- Ultracrepidarianism – Giving opinions on topics poorly understood
- Law of triviality – Focusing on what is irrelevant but easy to understand

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