

Beliefs about success are prone to cognitive fallacies

Brooke N. Macnamara, Richard W. Prather & Alexander P. Burgoyne



Who will achieve high marks in school, flourish in their career or become an Olympian? Current theories of achievement provide answers that are intuitively appealing but scientifically flawed. Consequently, most of what people believe about how to achieve success is likely to be incorrect.

For more than a century, scientists have proposed multiple explanations for who becomes successful – that is, who achieves their goals or attains high levels of performance in a domain. The explanations most embraced by the public are those that align with the cultural milieu of the time¹. Today, the widely accepted ethos is that success is largely under one's own control. Three theories of achievement that are currently popular among scientists, educators and parents – deliberate practice², grit³ and mindset⁴ – reflect this view, emphasizing personal initiative and effort as key determinants.

Deliberate practice theory holds that individual differences in achievement are largely due to differing amounts of deliberate practice – effortful activities designed to improve performance in a particular domain². According to the theory, maximal amounts of deliberate practice over at least 10 years will result in expert performance. Thus, to achieve the highest level of success in a domain, motivated individuals should engage in extensive deliberate practice.

Grit theory holds that individual differences in achievement are largely due to differing amounts of 'grit' – passion and persistence for long-term goals³. According to the theory, the 'grittier' people are, the more they will engage in deliberate practice, resulting in higher achievement. Grit theory further claims that grittiness can be developed. Thus, to achieve the highest level of success in a domain, people should increase their grittiness.

Finally, mindset theory holds that individual differences in achievement are largely due to differences in mindset. According to the theory, holding a growth mindset – believing that attributes such as intelligence can be developed – leads to more effort, increased practice, better learning strategies and greater persistence, which result in higher achievement⁴. Mindset theory further claims that a growth mindset can be developed. Thus, to achieve the highest level of success in a domain, people should foster a growth mindset.

Each of these theories has garnered attention in the popular press, in politics and among educators. Consequently, interventions designed to increase achievement via deliberate practice, grit or growth mindset have been introduced in schools around the world^{5–7}. Furthermore, proponents have argued that these interventions should be made a national funding priority^{5,6}, and laypeople have used these theories to inform personal and parenting decisions^{5–7}.

Nevertheless, conceptual and methodological weaknesses undermine each theory's foundations^{5,7,8}. Furthermore, direct tests of these theories and large-scale meta-analyses have consistently demonstrated that these theories' claims overstate the evidence^{5–7}. For example, although deliberate practice will generally improve an individual's performance, people vary in their starting points, learning rates and apogees; consequently, deliberate practice explains less than a quarter of performance variance^{6,7}. Likewise, in well-controlled studies, the evidence suggests that neither grit nor mindset has any bearing on academic achievement^{5,6}. Despite weak evidence for the theories' claims, the public continues to invest substantial time and money in deliberate practice, grit and growth mindset training^{5–7}. These resources might be better spent elsewhere.

Fallacies in theories of achievement

Although the evidence in support of popular theories of achievement is weak, they are intuitively appealing because they rely on cognitive fallacies.

Each theory commits the oversimplification fallacy: they explain a complex phenomenon with a simpler explanation than is warranted. As their names suggest, deliberate practice, grit and mindset theories largely attribute differences in achievement to a single, primary factor within the individual's control. However, multiple factors, including highly heritable traits (for example, general cognitive abilities, personality traits or physical characteristics), social influences (for example, financial resources or level of discrimination) and their interactions predict achievement⁶.

The oversimplification fallacy maintains the popularity of these theories. Simplified messages are more easily understood and remembered than complex, nuanced messages; simple, pithy messages are also more likely to be repeated, increasing beliefs that the pithy message is true⁹.

Each theory also falls prey to the bootstrap fallacy – the idea that prosperity and success are achieved through personal initiative and effort. The bootstrap fallacy is a type of oversimplification fallacy that focuses on the role of self-determinism in achieving success. Achievement theories reinforce the bootstrap fallacy by suggesting that success can be attained through effortful practice (or factors that lead to effortful practice).

The bootstrap fallacy lends itself to stories of effortful struggle that lead to eventual triumph. In Western societies, such narratives follow a common story format thought to be more appealing than stories of success without effort or stories ending in failure¹⁰. As a result, stories of effortful struggle followed by success might be more likely to come to mind, influencing personal, parenting and policy decisions.

Finally, each theory plays into the fundamental attribution error – the tendency to overemphasize dispositional-based explanations of behaviour. Popular theories of achievement focus on individuals' self-determination and only a narrow scope of environmental factors

(such as classrooms and parenting approaches) that are assumed to influence self-determinism. However, the theories discount many large-scale environmental factors that contribute to achievement, such as societal structures that afford opportunities to some individuals while imposing barriers on others.

The fundamental attribution error of self-determination resonates with the self-help industry, creating a feedback loop: theories of achievement appear in self-help books and talks, which generates public excitement about the theories, which in turn increases market demand for those theories. Research supporting theories of achievement is included in new self-help media, whereas counterevidence is largely ignored, giving the impression that these theories are robust.

Policy implications

Because popular theories of achievement rest on cognitive fallacies, their proposed interventions and policy solutions might be ineffective.

First, the oversimplification fallacy leads to inadequate solutions because they primarily focus on a single factor (deliberate practice, grit, or growth mindset) out of many. Multifactorial problems are unlikely to be solved by single-factor solutions, especially if the single factor is not the most influential.

Second, the bootstrap fallacy overemphasizes individual control and underemphasizes genetic and societal factors, such as learning disabilities or opportunity gaps, that limit the effectiveness of effort on achievement. Belief in the bootstrap fallacy is associated with distorted perceptions of equality of opportunities and reduced support for policies aimed to increase equity¹¹. Thus, the idea that success can be achieved through personal initiative and effort alone not only conceals critical factors that influence the likelihood of success, but also maintains societal structures that contribute to inequitable opportunities. Individual effort is necessary for achievement, but it is rarely sufficient.

Finally, the fundamental attribution error can lead to deficit views: low performance is perceived as a consequence of deficits within individuals facing barriers, rather than as a result of the societal structures that impose those barriers. Attempting to solve a societal problem at the individual level is likely to fail and might even exacerbate the issue. For example, a deficit view could lead to the implementation of interventions to change the dispositions of individuals facing barriers, instead of the allocation of those same resources to changing inequitable systems.

Recognizing fallacies to promote strong theories

Recognizing fallacies underlying theories of achievement is difficult – by their nature, these fallacies ‘feel right’, leading to acceptance with little scrutiny. However, through critical evaluation, weaker theories can be replaced with stronger ones that offer more promising solutions.

First, researchers should take note of whether and how the theory considers multiple factors at multiple levels. Aside from an individual’s motivation and immediate environment (such as classroom support), the theory should address the influence of other individual differences (such as cognitive abilities) and larger-scale societal factors (such as discrimination). If such factors are described as consequential only when they predict the theory’s primary determinant or predict who will best be served by the theory’s intervention, the evidence cited in support for these claims should be examined. If the evidence is largely anecdotal, ignores large bodies of relevant research, is selective in how it is reported (such as emphasizing effects found in one subgroup but de-emphasizing non-significant effects for other subgroups), or interprets non-significant effects as significant, the theory might have shortcomings.

Second, researchers should consider how the primary determinant is defined. If the operational definition conflicts with the theoretical

definition, the theoretical definition changes across papers without acknowledgement, or the theoretical definition changes depending on study results, the theory might be based on an ill-defined construct; such theories cannot be rigorously tested.

Third, researchers should consider how specified the theory’s process model is, identifying the direct effects, mechanisms and moderators. If a path diagram could be drawn in multiple ways on the basis of verbal descriptions within a single paper, or no two papers offer independent evidence for the same process model, the theory is likely to be underspecified.

Finally, researchers should consider whether the strength of the claims presented in the scientific literature and popular media outweighs the strength of the evidence. Researchers should be wary of evidence presented in an appealing story format for which there are no associated empirical data (such as descriptions of personal experiences or selections of famous people’s behaviours), and of theories that are described using compelling self-help terms (such as ‘the secret to success’). If the language describing the theory’s effect on achievement seems sensationalized (such as using words like ‘profound’) or if the single determinant is described as ‘sufficient’, researchers should compare these verbal claims to the numerical value of the effects.

Recognizing the shortcomings of theories of achievement creates a path forward for developing theories with better explanatory power. New theories of achievement should acknowledge the influences of multiple factors, including heritable traits that might interact with the environment differently across developmental stages and social contexts. New theories of achievement do not need to model all possible factors, but they should avoid simplistic explanations of achievement that overemphasize individual control. With careful scrutiny, scientists can avoid falling prey to cognitive fallacies when proposing explanations for success.

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Competing interests

The authors declare no competing interests.