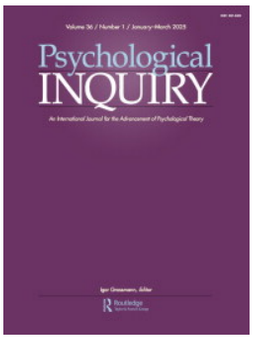

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COMMENTARIES

Beliefs, Behaviors, and the Inferences That Bind Them: Scrutinizing the Mechanism of Action

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An assumption of many social psychology theories is that beliefs exert causal effects on behavior, and that interventions designed to influence beliefs can alter behavior as a result. These theories and their assumptions have increased in popularity in recent years among both academics and the public (Macnamara et al., 2023; Macnamara & Burgoyne, 2023b). Granados Samayoa and Albarracín propose a model for understanding the link between belief and behavior; that is, when we should expect beliefs to have stronger versus weaker effects, or no effect at all. The target article provides a new lens by which to examine contemporary belief theories by proposing a specific mechanism of action: the *belief-to-behavior inference*.

The authors of the target article propose that beliefs influence behavior when the person holding the belief has formed a belief-to-behavior inference. In other words, the belief holder must engage in inferential reasoning that links a belief to a specific behavior (e.g., "If I believe X, then I will do Y"), and it is the act of establishing this inferential chain that allows beliefs to influence behavior.

The Belief-to-Behavior Inference Model (Granados Samayoa & Albarracín, this issue) integrates the roles of goals, memory, attitudes, and cognitive capacity on belief-to-behavior inferences, making at least two important contributions that we detail below. Nevertheless, although thought-provoking, their model has substantial room for improvement. In the latter half of this commentary, we identify potentially faulty assumptions and challenges to falsifiability that could either undermine their model or strengthen it through critical discourse. For now, we argue that the Belief-to-Behavior Inference Model should serve as a starting point, both for evaluating current belief theories and for developing revised general belief models.

Important Contributions of the Model

Articulating Mechanisms of Actions

One important contribution of the Belief-to-Behavior Inference Model is its emphasis on the mechanism of action. As Granados Samayoa and Albarracín point out, researchers who theorize that a particular belief affects behavior have failed to describe the process by which they hypothesize those beliefs affect behavior. Without articulating the processes, the assumptions, associations, and mechanisms cannot be empirically tested. Put differently, without a framework specifying the causal link, theorists can make broad and flexible claims without compelling evidence.

Illustrating this lack of articulation in the literature, Yan & Schuetze (2023) make the case that mindset theory has failed to specify an empirically supported pathway from endorsing a growth mindset to academic achievement. They describe several process models that have been recently proposed to explain how mindsets might influence achievement[1]. Because the process models differ substantially in terms of the number and kind of moderators, mediators, outcomes, and the nature of mindset's effects (e.g., direct, indirect, both), there are multiple ways to find support for the theory, even in contradictory ways. For example, some mindset process models depict a downstream increase in positive beliefs, others a downstream decrease in negative beliefs; some depict links to achievement through changes in behavior, others assume increases in achievement can happen without any change in behavior. This flexibility provides a menu of pathways for researchers to choose from depending on their preferred process model or the observed pattern of results. Yan & Schuetze (2023) conclude that mindset theory is underspecified, which leads to research that is neither predictive nor pragmatic.

Here, we describe two process models of growth mindset's theorized influence on academic achievement to illustrate why the field needs a framework for linking beliefs to other outcomes. The differences in these process models are striking, especially because they were proposed by the same authors in the same year using the same data.

In the first process model, there is no behavior that links growth mindset to academic achievement. Here, Dweck and Yeager (2019) suggest that growth mindset is negatively associated with two maladaptive beliefs—(1) that failure is attributable to one's traits (trait failure attribution), and (2) that effort indicates a lack of intelligence (negative effort belief). They also suggest growth mindset is negatively associated with (3) a maladaptive motivation: a goal to avoid

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[1]We note that Granados Samayoa and Albarracín use academic achievement as an example of behavior when describing growth mindset's influence on behavior. We question this characterization. Academic achievement is likely the outcome of behavior (e.g., studying), ability (e.g., cognitive capacity), environment (e.g., the effectiveness of the teacher), opportunity (e.g., access to educational resources), and their interactions.

"looking dumb" by avoiding performance (performance avoidance goal). They suggest that these two maladaptive beliefs and maladaptive motivation are in turn negatively associated with two outcomes: challenge-seeking behavior and academic performance, and that mindset is directly positively related to those outcomes (see Figure 1, Panel A). Importantly, there is no link between challenge-seeking behavior and academic performance in the process model.

In contrast, in the second process model, behaviors are key aspects of the process model. Here, Yeager, Dweck, and colleagues (Yeager et al., 2019) suggest that growth mindset fosters an adaptive motivation (i.e., learning goal orientation), which leads to behaviors such as seeking out learning opportunities and persevering when struggling. They propose that a learning goal orientation and its associated behaviors reinforce one another, and can be further reinforced by school context, leading to enhanced academic achievement (see Figure 1, Panel B). In this process model, behaviors are the most proximal antecedents of academic achievement, but they are distal associates of growth mindset.

We do not think that the multiple conflicting process models that have been offered for growth mindset would exist if researchers developed their hypotheses with Granados Samayoa and Albarracín's Belief-to-Behavior Inference Model in mind. Specifically, each process model would need to specify the belief-to-behavior inference that constitutes the mechanism of action and empirically test it. Providing greater specificity might allow well-defined, evidence-based theories to gain traction, and reduce the number of ill-defined theories with shifting explanations entering the literature.

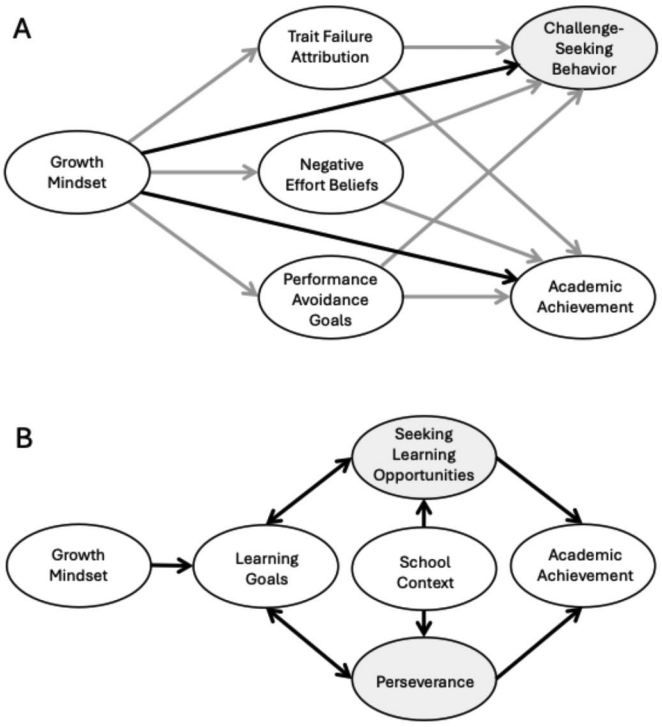

Figure 1. Two example process models of growth mindset to academic achievement.
Note. Gray arrows = negative associations. Black arrows = positive associations. Gray ovals = behaviors. Panel A: Hypothesized process model from Dweck and Yeager (2019) illustrating no behavioral link between growth mindset and academic achievement. Panel B: Hypothesized process model from Yeager et al. (2019) illustrating behavioral links between growth mindset and academic achievement.

Further, asking researchers to articulate a process model a priori and test that model protects against having an unfalsifiable (i.e., unscientific) theory. As a case in point, consider the two contradictory process models of growth mindset shown in Figure 1. Perhaps both models are valid because there are multiple routes by which a belief can be linked to behavior. Or perhaps different individuals create different routes. The belief-to-behavior pathway may be nuanced, complex, individualized, and influenced by multiple factors. However, if a theory is to explain a belief's influence on behavior, it must be principled. In other words, if paths can vary across individuals or situations without constraints, then no set of results could exist that could disprove a theory—in this case, the theory is meaningless.

Rather, we recommend that belief theorists test whether their belief-to-behavior theory represents a universal psychological process, and, if it does not, that they examine potential moderators that may explain contextual or between-person differences in belief-to-behavior routes. The theory is then strengthened with evidence of replicability. A claim that a process is universal is best supported with evidence of replication in a different context or with a different population. A claim that a process differs by context or among individuals is best supported by evidence of replication within the same context or population.

The target article makes clear that belief theorists have often failed to hypothesize and test assumptions, associations, and mechanisms. By proposing a framework for theorists to specify causal links, researchers can better test a theory's claims. Such empirical evidence will either strengthen currently held views or lead to the development of new, stronger theories to explain how beliefs influence behavior.

Length of the Inferential Chain

The second important contribution of the Belief-to-Behavior Inference Model is the proposition that the longer the inferential chain, the weaker the relationship will be between holding a specific belief and performing a specific behavior. This proposition tracks mathematically. In almost every process model, causal links fall well short of perfect associations (Hilgard, 2021). As such, with each downstream link in the chain, error variance will increase, and the amount of variance explained by the belief will decrease (Hilgard, 2021). Thus, unless belief theories claim near-perfect associative links, they cannot both propose that a belief affects a myriad of downstream outcomes, *and* that the belief exerts a profound effect on all of them—this cannot be true.

In the case of growth mindset, theorists have proposed that one's mindset creates entire "psychological worlds" (Dweck, 2009, p. 4, see also Dweck, 2007, 2008; Yeager & Dweck, 2012) by forming the core of how people make sense of other beliefs, goals, motivations, behaviors, achievement, personality, and social development (Dweck, 2017; Dweck & Yeager, 2019; Yeager & Dweck, 2012). The myriad

hypothesized outcomes suggests that more distal outcomes will have less and less variance explained by mindset.

One example of a process model that includes some of the hypothesized components of a "psychological world" is described as follows: Growth mindset leads people to hold learning goals, which in turn leads them to embrace challenges, persist, view effort as beneficial, learn from criticism, and feel inspired from others' success, which leads to higher achievement, all of which leads to a sense of free will (see Figure 2, adapted from an infographic on MindsetWorks, LLC's website [a company co-founded by Dweck] at https://www.mindsetworks.com/Science/Impact, retrieved February 7th, 2025). This process model is ambiguous, but suggests either (a) that a growth mindset produces learning goals, which leads to a host of behaviors, beliefs, and feelings, which leads to a performance outcome, all of which leads to a greater sense of free will (i.e., multiple three-length connections), or (b) that each behavior, belief, and feeling produces its own link to the next outcome, for a total of eight links between mindset and a sense of free will (see Figure 2, Panel B). We note that the association between growth mindset and its most proximal consequence in this model, learning goal orientation, is modest: $r = .10$ to .20 (see Burgoyne et al., 2020; Burnette et al., 2013; Payne et al., 2007). Logically, effects might diminish to inconsequentiality before reaching more distal outcomes.

Indeed, the evidence suggests that for growth mindset, the belief itself may be an unnecessary precursor to the key outcome (Macnamara et al., 2023a, Macnamara & Burgoyne, 2023b). That is, effectively changing students' mindsets does not appear to be the critical ingredient in growth mindset interventions (Macnamara et al., 2023a, Macnamara & Burgoyne, 2023b; Sisk et al., 2018). Rather, most growth mindset interventions introduce other differences between the treatment and control groups besides teaching about

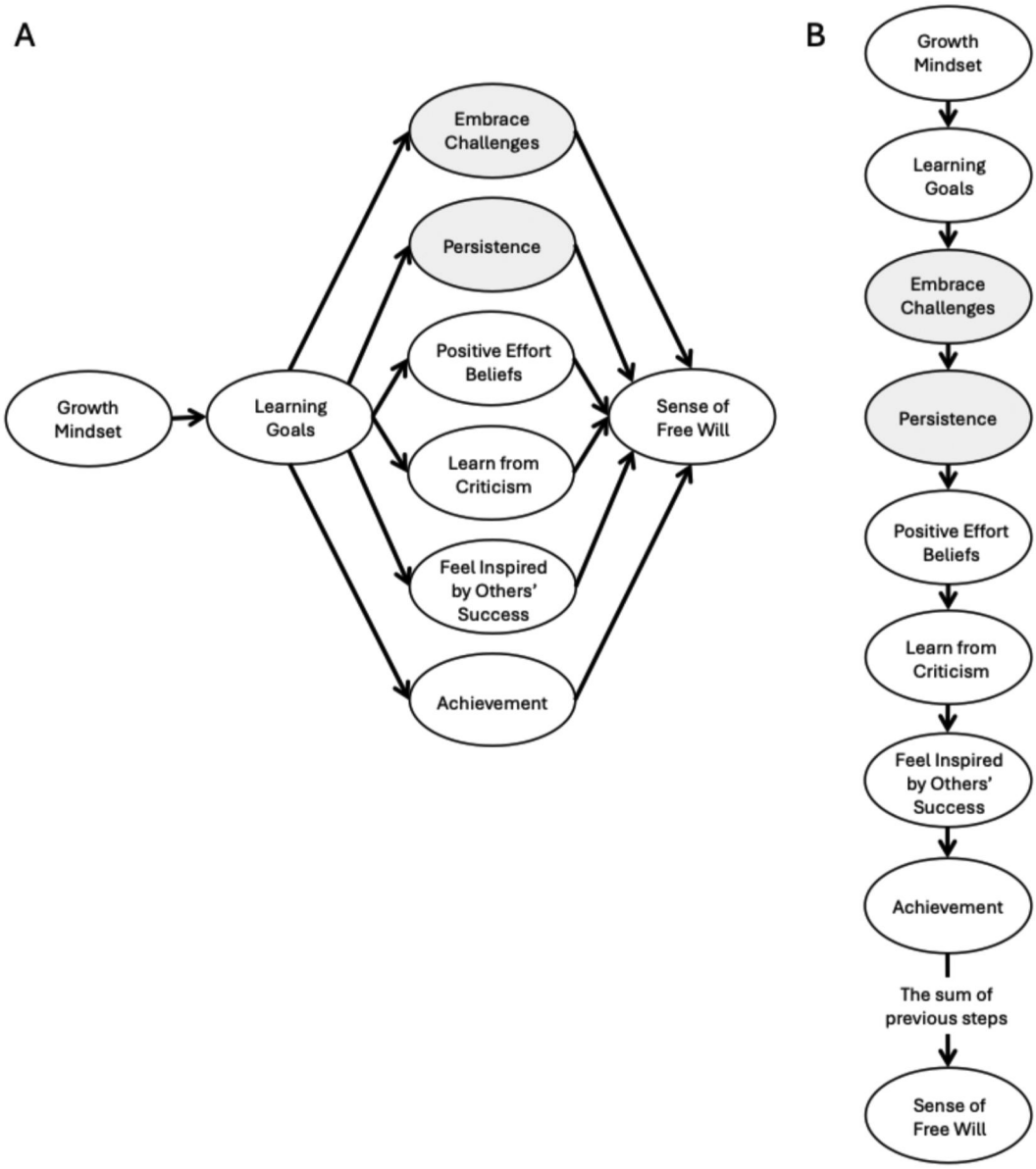

Figure 2. Two interpretations of a proposed process model from growth mindset to a sense of free will.
Note. Gray ovals = behaviors. Panels A and B: Two interpretations of a process model depicted at https://www.mindsetworks.com/Science/Impact with either multiple three-length links from growth mindset to a sense of free will (Panel A) or a single eight-length chain (Panel B).

mindset, such as offering additional encouragement, teaching study strategies, and/or providing extra tutoring time (Macnamara & Burgoyne, 2023b). When these other factors are controlled for there is no observed effect on academic achievement (Macnamara & Burgoyne, 2023b).

The more proximal antecedents of the key outcome (e.g., studying → academic achievement, receiving tutoring → academic achievement) may be the only significant links in the chain. Stated differently, one might be able to remove growth mindset from the process model without loss of explanatory power regarding academic achievement. Evidence for theories will be improved if process models are tested with and without the hypothesized originating belief, rather than assuming that the originating belief is necessary for the rest of the process to occur.

Scrutinizing the Mechanism of Action

The ideas offered in the target article evoke critical inquiry into the link between belief and behavior. As we discuss above, there are benefits to this new lens: The model raises questions and challenges assumptions that robust psychological theories should be able to address, becoming stronger in the process. Nevertheless, we view this new lens as a starting point—a necessary one, but an imperfect one. Specifically, there are several questions about the nature of the belief–behavior link that we think warrant further evaluation and scrutiny.

One issue is the direction of causality implied by the Belief-to-Behavior Inference Model. In their target article, the authors claim that under some circumstances, beliefs can cause behavior—but what about the opposite? In the presence of cognitive dissonance, individuals can alter their beliefs to accord with their behaviors (Festinger, 1957; see Harmon-Jones & Mills, 2019, for a review). This "rationalization after the fact" may be a common occurrence (Jarcho et al., 2011). Indeed, some argue that our rationalizations provide the illusion of control over decisions that were made before we had conscious awareness of them (Sapolsky, 2024). Though the target article acknowledges the role of recursive processes, such that the outcome of a behavior can influence one's beliefs, it does not describe how feedback loops or bidirectional effects are integrated into the model or its principles.

In general, the portrait of the human reasoner whose behavior follows rationally from inferences that stem from their beliefs seems at odds with what we know about decision making: Humans are flawed, imperfect reasoners (Tversky & Kahneman, 1974). Though Granados Samayoa and Albarracín note that people are poor at logical reasoning and instead focus on practical reasoning, this seems like a fruitful area of inquiry for validating or improving upon the proposed model. Specifically, more evidence is needed that people reason and make decisions in this manner and that it is consistent with different types of beliefs.

We would also encourage future frameworks to define "behavior" in more specific terms. Though most examples in the target article refer to outwardly observable actions (e.g., getting a vaccine), they also refer to outwardly observable outcomes (e.g., academic achievement). Additionally, in other subdisciplines, such as cognitive psychology, "behavior" is sometimes also used to refer to internal mental processes, such as thinking or problem solving (Overskeid, 2000). Well-defined terms will help avoid confusion in the literature, particularly if a theory is to be evaluated or applied outside its original subdiscipline.

Finally, the idea that cognitive capacity moderates the belief-to-behavior inference, seems reasonable if one accepts the premise that a belief must be the focus of attention for an inferential chain to be formed. However, this assertion poses challenges for falsifiability. A belief theorist could offer a process model by which a belief influences behavior—but if the links are weaker than expected, the theorist could assert that this weak association is due to situational factors lowering people's cognitive capacity. We argue that if a theory takes as a premise that cognitive capacity moderates the belief–behavior correspondence, then cognitive capacity should be measured, or, better yet, manipulated, to test such an assumption. More broadly, any proposed moderator should be tested rather than assumed in the absence of consistent results.

Conclusion

Belief theories can offer intuitive, culturally fluent explanations of human behavior that are likely to be embraced and unlikely to be scrutinized (Macnamara et al., 2023; Oyserman et al., 2023). A framework for evaluating belief–behavior correspondences could challenge assumptions of widely-accepted theories. Such a framework could lead to a recalibration of the field, where theorists begin to test the process by which they assert that a belief exerts influence on behavior using a principled approach.

The current framework offers a starting point. We think that much work is necessary for the current Belief-to-Behavior Inference Model to be the well-reasoned and principled approach the field needs. But we hope that its introduction to the literature serves as an impetus for this work, ultimately leading to better specified, evidence-supported theories of how beliefs affect behaviors.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

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