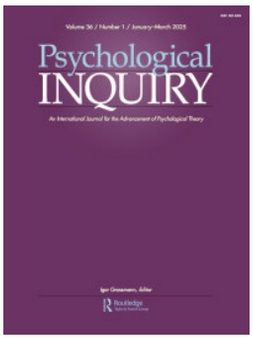

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Psychological Inquiry

An International Journal for the Advancement of Psychological Theory

ISSN: 1047-840X (Print) 1532-7965 (Online) Journal homepage: www.tandfonline.com/journals/hpli20

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To cite this article: Javier A. Granados Samayoa & Dolores Albarracín (2025) Understanding Belief-Behavior Correspondence: Beliefs and Belief-to-Behavior Inferences, Psychological Inquiry, 36:1, 1-22, DOI: 10.1080/1047840X.2025.2482343

To link to this article: https://doi.org/10.1080/1047840X.2025.2482343

PSYCHOLOGICAL INQUIRY
2025, VOL. 36, NO. 1, 1–22
https://doi.org/10.1080/1047840X.2025.2482343

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TARGET ARTICLE

Understanding Belief-Behavior Correspondence: Beliefs and Belief-to-Behavior Inferences

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ABSTRACT

Psychologists and other scholars have long studied the influence of beliefs on behavior, proposing models that illuminate aspects of the belief-behavior relation. However, prior psychological theories have not explained how a particular belief influences behavior. This limitation coincides with the assumption, common among both psychologists and lay observers of human behavior, that beliefs are powerful drivers of behavior. To improve our understanding of the belief-behavior association, we first show evidence that the association between beliefs and behaviors is, generally speaking, small ($r < .2$). We then define different types of beliefs (i.e., existence beliefs like "I believe in God," descriptive beliefs like "Magnolias are white," and outcome beliefs like "Vaccines save lives") and propose that beliefs have a causal influence on behavior when people form a *belief-to-behavior inference*. Belief-to-behavior inferences are generally probabilistic and are made when individuals have a behavioral (vs. informational) goal. These inferences are also more likely when individuals rely on beliefs that are closer to behavior (e.g., descriptive versus existence beliefs) within the belief-to-behavior inference chain. The model clarifies inferential processes for different belief types and makes novel predictions about the effects of goals and cognitive capacity on the belief-behavior correspondence. In addition, it integrates memory-based and online decision processes, independent activation of behavioral attitudes and intentions, and proceduralization of belief-to-behavior inferences.

KEYWORDS

beliefs; belief-behavior correspondence; belief-to-behavior inference; attitudes; intentions

For over a century, psychologists and other scholars have been interested in the influence of beliefs on behavior, often proposing models that explain some aspects of the belief-behavior relation. Journalists and lay observers of human behavior have also considered the belief-behavior relation, often assuming that beliefs are primary drivers of behavior. However, in this paper, we argue that prior psychological theories have not accounted for when a particular belief influences behavior or the cognitive processes at stake. Contrary to popular intuitions, the association between beliefs and behavior is often small and variable, which we view as an opportunity to develop a model to shed light on the mental processes linking beliefs to behavior. We propose that a *belief-to-behavior inference* (i.e., the reasoning that connects beliefs to behavior) is necessary for beliefs to exert causal impacts on behavior. We also ask what promotes making these inferences: What kinds of situations (e.g., having a goal to take action instead of gather information), what types of people (e.g., those who are motivated to act), and what kinds of beliefs (e.g., those with direct behavioral implications) are linked to the development of belief-to-behavior inferences? We propose that these belief-to-behavior inferences are made probabilistically, based on one's experience and through observation of other people. We also consider when these inferences become automated and what happens when new inferences are formed online, when people decide whether to enact a behavior.

Prior theory has indeed underscored the role of beliefs as precursors of behavior (Bandura, 1980; Fishbein & Ajzen, 1975; Prochaska et al., 1997; Rogers, 1975; Rosenstock, 1990). For instance, the belief that one controls behavior and the perception that one must avert a threat have each been identified as critical determinants of behavior in the context of social cognitive theory (Bandura, 1980) and protection motivation theory (Rogers, 1975). Additionally, Fishbein and Ajzen (1975, 2010) conceptualized beliefs as determinants of attitudes (i.e., evaluations of behaviors on a positive-negative dimension), norms (i.e., perceptions of others' beliefs about behavior), and perceived behavior control (i.e., the extent to which a person feels able to enact the behavior), which are the more immediate predictors of behavior.

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Despite important past research, the cognitive processes that lead from a particular belief to a behavior are not fully understood. According to Ajzen and Fishbein (1980), beliefs are integrated into an expectancy-value-type summary that shapes attitudes, norms, and perceived behavioral control. Frequently, people's attitude toward vaccination stems from the sum of the beliefs, like those pertaining to vaccines preventing disease and causing side effects, each weighted by each outcome's desirability. Similarly, vaccination norms often stem from the sum of the beliefs that one's friends and doctor want one to vaccinate, each weighted by one's motivation to comply with them. However, such integration may not always occur. People may think of a particular belief without thinking of a behavior, leading to no belief impact on behavior. Alternatively, they may think of one belief and choose to act on it, but this belief may remain separate from other beliefs that can guide this or related behavior. This paper addresses the issue of what motivational and cognitive processes make beliefs consequential for behavior, a problem that prior research on behavioral prediction has circumvented by simply recognizing that beliefs vary in "salience" and that only salient ones affect attitudes or other behavioral determinants (Ajzen & Fishbein, 1980).

One can speculate about the reasons why researchers have not sufficiently addressed the processes linking a belief to behavior. Ajzen and Fishbein (1980), for example, created a model to *predict* behavior from attitudes, norms, and perceived behavioral control. As such, they were not interested in explaining the cognitive processes at play, nor were they interested in understanding why or whether a *particular* belief affected behavior (Albarracín & Wyer, 2001; Albarracín, 2002).

Another reason may be the intuition that beliefs exert direct, strong influences on behavior, seemingly shared by lay observers of human behavior and psychologists. Journalists and the lay public often link problematic behaviors to beliefs. For example, a recent story on climate change reads, "Every falsehood, distortion, and conspiracy theory about climate change is an obstacle to meaningful climate action" (Turrentine, 2022). Similarly, a story about childhood vaccination claims, "Online anti-vaxxers, conflating Covid and MMR [conspiracy] theories, are convincing parents against immunizing their children" (Das, 2023). Both of these quotes illustrate the perception that a particular belief effectively shapes behaviors in the climate and health arenas.

Many scientists also view beliefs as a strong determinant of behavior. For example, Lee et al. (2022) stated:

> Health misinformation can kill people, both directly and indirectly. During a public health crisis such as the COVID-19 pandemic, exposure to misinformation about the virus' spread, symptoms of infection, testing opportunities, and prevention methods can lead to erroneous appraisals of the threat, maladaptive coping behaviors, and a range of fatal consequences.

In this description, health beliefs are described as "killing people" through "maladaptive coping behaviors" with fatal consequences. Moreover, in the introduction to an article presenting a theoretical model of the antecedents of conspiracy beliefs, Adam-Troian et al. (2023) stated that "[t]he 2010–2020 decade has affected Western societies with political events propelled in part by conspiracy beliefs" (p. 137). Here, conspiracy beliefs are highlighted as an important driver of rather complex political behavior.

Despite these intuitions, there are reasons to question beliefs as primary drivers of behavior. For example, although many of those who stormed the Capitol on January 6th believed that the "deep state" had conspired against Donald Trump, many more Americans with similar views did not act on this belief. More to the point, the vast literature on beliefs is well-positioned to provide precise estimates of the belief-behavior relation. In the health-behavior domain, the association between risky behavior and belief in a COVID-19 conspiracy varies from $r = -.04$ to $r = .20$ for cross-sectional measures and from $r = <.01$ to $r = .12$ for longitudinal measures (Pummerer, 2022; Study 3). In the pro-environmental-behavior domain, behavior correlates $r = .14$ with knowledge about climate change and $r = .24$ with denial of climate change (van Valkengoed & Steg, 2019). Furthermore, syntheses of belief-behavior correlations suggest that the average association is on the lower end of these ranges. Specifically, a second-order synthesis of meta-analyses of correlational studies estimated the average belief-behavior association at $r = .11$ for health behavior, $r = .07$ for environmental behavior, and $r = .17$ for all behaviors (Albarracín et al., 2024). These data suggest that although statistically significant, *belief-behavior correspondence*—which we define as the association (e.g., the correlation) between belief and overt behavior—is variable and almost always below the threshold of $r = .3$ set for medium effects by Cohen (1988). These effect sizes remain below even the threshold set for medium effects ($r = .2$) by Funder and Ozer (2019).

A possible explanation for the discrepancy between the intuitive view and the evidence above may be researchers' tendency to ignore behavior determinants they are not considering. For instance, environmental factors and compliance with the requests of others often drive behavior. Indeed, whether a person performs recommended health behaviors is primarily due to access to health services (Albarracín et al., 2024). In this case, a researcher who studies beliefs may inadvertently ignore external determinants of health behaviors. Similarly, focusing on a particular conspiracy belief may lead researchers to link it to behaviors that other beliefs may explain. Researchers may then conclude that people fail to vaccinate because they believe that vaccines are used to control the population. However, individuals may not vaccinate because they believe that vaccination is time-consuming or painful (Ulaszewska-Kieruzal et al., 2024).

In this paper, we argue that the intuitive view of belief as a precursor of behavior has critical limitations. As illustrated above, the intuitive view assumes strong and stable associations between beliefs and behaviors. However, meta-analyses show that this assumption is incorrect. The theoretical models that incorporate beliefs to predict behavior have either made peace with small associations or aggregated beliefs to predict attitudes (e.g., Albarracín, 2002; Fishbein & Ajzen, 2010). Even though researchers have investigated the variability of the attitude-behavior or norm-behavior association, they have not dedicated

Table 1. Belief type definitions and examples.

Definition	Examples	Representatives in the literature
Existence beliefs		
Judgments of the probability that an entity (Object; Person or Being; Behavior) exists.	**Object:** Magic brooms exist. **Person or Being:** God exists. **Behavior:** Flying a magic broom is real.	Conspiracy beliefs (Albarracín et al., 2021) Belief in God (Maiello, 2005) Belief in climate change (Leiserowitz, 2004) Belief in free will (Baumeister, 2008)
Descriptive Beliefs		
Judgments of a probability that an entity (Object; Person or Being; Behavior) has a certain quality.	**Object:** The vaccine is safe. **Person or Being:** God is omnipotent. **Behavior:** Vaccinating is safe.	Beliefs about an object having a property (Fishbein & Ajzen, 1975) Mindset that ability is fixed (Dweck, 2000) Stereotypes (Fiske & Taylor, 1991) Control beliefs (Ajzen, 1985) Cognitive trust (Johnson & Grayson, 2005) Self-concept (Gore & Cross, 2011)
Outcome beliefs		
Judgments of the probability that an entity (Object; Person or Being; Behavior) produces a certain outcome.	**Object:** The vaccine will save lives. **Person or Being:** God will grant me what I ask for. **Behavior:** Vaccinating will protect my family.	Outcome beliefs (Fishbein & Ajzen, 1975)

Note. Although we dedicate more attention to personal beliefs, each of these belief types has a normative parallel. For example, people can represent if most others belief that God exists, vaccines are safe, or vaccinating protects one's family. Any of these normative beliefs can enter belief-to-behavior inferences also.

their attention to the variability in the belief-behavior association. Thus, in the coming sections, we begin with a definition and an original taxonomy of beliefs and then describe theoretical principles about the processes involved in going from a *particular* belief to a behavior.

In our view, this paper goes beyond past scholarship in several ways. For example, past research has distinguished beliefs about objects (e.g., a car) from beliefs about behavior (e.g., purchasing a car; Ajzen & Fishbein, 1980). However, we go beyond those critical contributions by proposing that thinking about an object without a goal to act attenuates a causal impact of belief on behavior. This prediction contrasts with the possibility of fully automatic belief influences on behavior and establishes an important motivational precondition for a belief-to-behavior inference. We also propose that the length of the belief-to-behavior inference determines the impact of beliefs on behavior and that cognitive demands are more likely to disrupt longer (vs. shorter) inferential chains. Moreover, we integrate Bayesian learning (Jacobs & Kruschke, 2011) and highlight that different beliefs can produce different, potentially contradictory behaviors without the belief integration assumed by traditional behavior prediction models (Ajzen & Fishbein, 1980).

Defining and Proposing a Typology of Beliefs

Despite being a topic of discussion for many years, philosophers and cognitive scientists appear to only agree on the lack of a unitary perspective to understand beliefs (Musolino et al., 2022; Van Leeuwen & Lombrozo, 2023). Accordingly, there are different schools of thought for conceptualizing beliefs. For example, *dispositionalism* views beliefs as dispositions to act as if the content of the proposition in question were true (Marcus, 1990). That is, this perspective views the nature of beliefs as fundamentally relating to actual and potential behavior. Given that the current work and many other researchers are often interested in whether beliefs predict behavior, a definition that regards beliefs as a disposition to act is not appropriate because a relation between beliefs and behavior is presupposed. By contrast, *representationalism* conceptualizes beliefs as the mental content of a proposition (e.g., fridges keep food cold) stored in one's mind (Fodor, 1987; Schwitzgebel, 2022). Beyond any behavioral tendencies, the representational views focus on beliefs as existing in the mind of the person in question and storing the content of a given proposition. Our perspective more closely aligns with representationalism.

Regarding a formal definition, philosophers often use the term *belief* to refer to what we hold to be true (Schwitzgebel, 2023). This intuitive definition is useful, but we prefer to follow the social psychological tradition of conceptualizing a belief as a probability judgment that links a referent entity (e.g., person, place, object, or behavior) to an attribute or outcome (for similar definitions, see Albarracín, 2021; Eagly & Chaiken, 1998; Fishbein & Ajzen, 1975; Wyer & Albarracín, 2005), thus acknowledging degrees of belief rather than following an all-or-none conceptualization. Beliefs can include the conviction that something is not true and moderate or absolute certainty that it is. They are ubiquitous, ranging from the significant ones about the self or the world to the more mundane ones, such as the belief about the benefits of selecting a particular product brand. Moreover, some beliefs, like the belief in God, are unverifiable. Others are verifiable and may or may not correspond with the best available evidence.

We propose three types of beliefs that are relevant to the belief-behavior relation: (a) existence beliefs, (b) descriptive beliefs, and (c) outcome beliefs. Table 1 presents examples of each belief type. We define *existence beliefs* as beliefs that predicate the existence of an entity. These beliefs have been referred to as "beliefs in" in the philosophical and psychological literatures (Price, 1965; Wyer & Albarracín, 2005). Examples involve "I believe in God," "The election was fraudulent," and "I don't believe in climate change."

Another example of an existence belief concerns the existence of UFOs (Unidentified Flying Objects). Yet another kind of existence belief indicates whether a behavior is possible. A child might wonder if it is possible to ride a magic broom, which involves judging the probability that the behavior of magic broom flying exists. Both the UFO

and magic broom flying beliefs can have consequences for behavior. For example, someone can travel to Area 51 with the aim of verifying if UFOs exist and children can attempt to fly a broom to test flying. Lastly, belief in the "great replacement" conspiracy theory, the notion that "A group of conspirators is trying to replace White Americans," constitutes an existence belief. This belief may lead individuals to attend a protest or even engage in violence.

Descriptive beliefs predicate the qualities of an entity. "Magnolias are white," "Australians are brave," "exercising consistently is difficult," and "ability is fixed" illustrate descriptive beliefs. Stereotypes—one of the most well-studied kinds of descriptive beliefs—refer to beliefs about the characteristics of members of a particular group (Hilton & von Hippel, 1996). Within this literature, significant areas of focus have included the content of stereotypes (Fiske, 2002; Fiske, 2018), the processes by which stereotypes are formed, activated, and maintained (Banaji & Hardin, 1996; Devine, 1989; Hilton & von Hippel, 1996; Rivers et al., 2020), and the impact of stereotype activation on one's performance (Spencer et al., 2016; Steele & Aronson, 1995). Another well-studied descriptive belief is a growth mindset, which can be defined as the belief that one's abilities—often in the intellectual domain—can improve. By contrast, a fixed mindset is the belief that one's abilities are immutable, usually innate (Dweck, 2000; Yeager & Dweck, 2012). Research in this area has primarily focused on determining whether people's mindsets predict outcomes of interest (e.g., academic grades) and whether mindset interventions can optimize such outcomes (Yeager & Dweck, 2020).

Outcome beliefs predicate that a particular outcome will occur, thus dealing with causality. "Vaccines save lives" comprise beliefs that connect vaccines to an outcome. A person is more likely to have a positive attitude toward vaccination if she believes that vaccination will yield positive outcomes (e.g., "will give her peace of mind") and prevent adverse consequences (e.g., "will reduce the likelihood of infection"). Another person might believe attending a protest will empower them and counter a presumed conspiracy. Such beliefs are proposed to be key determinants of attitudes in prominent models of behavior (e.g., Fishbein & Ajzen, 1975), an issue we discuss presently.

Distinguishing Between Beliefs and Related Constructs

Conceptualizing the psychological processes that mediate the path from belief to behavior is important to building a complete psychology of belief. Fortunately, we can rely on existing literature to guide this effort. Beliefs vary in their evaluative implications.[1] The belief that "Intelligence officials are conspiring against their government" can quickly yield a negative evaluation of them. In contrast, the belief that "Vaccines save lives" can quickly yield a positive assessment of vaccines. A prominent social psychological tradition connected to beliefs is the study of *attitudes*, which we define as evaluations of an entity as good or bad (Albarracín et al., 2005; Fazio, 2007). For instance, a negative attitude toward state employees is the evaluation that they are evil, and a positive attitude toward receiving a vaccine is the evaluation that vaccinating is beneficial.

Social psychology has clearly addressed the impact of attitudes on behavior (Ajzen & Fishbein, 1980; Albarracín, 2021; Fazio & Zanna, 1981; Fishbein & Ajzen, 2010). However, attitude theory has generally not focused on beliefs because, unlike attitudes, beliefs are not evaluative and thus lack approach/avoidance implications for behavior (Albarracín, 2021; Fazio & Zanna, 1981; Fishbein & Ajzen, 1975). In this sense, the essential mechanisms by which beliefs drive behavior have not been fully conceptualized. We propose that beliefs affect behavior when people consider the implications of a belief for behavior and develop a belief-to-behavior inference. A belief-to-behavior inference is the reasoning that connects beliefs to behavioral attitudes (i.e., the evaluation of behavior as positive or negative) and behavioral intentions. Although alternative uses of the term "intention" exist, we use the "behavioral intention" (sometimes shortened to "intention") to refer to the willingness or expectation that one will perform a behavior (Fishbein & Ajzen, 1975, 2010). This belief-to-behavior inference requires awareness of the belief and the behavior, and it can be made when people first form a belief or later when they recall a belief from memory. Here, the attitude-behavior literature is of some value because it has posed important questions about attitudes: Under what conditions, for what kinds of attitudes, individuals, or behaviors do attitudes predict behavior? Attitudes are often based on beliefs (Anderson, 1971, 1973; Fishbein & Ajzen, 1975). The belief that a vaccine saves lives leads to the conclusion that immunization is desirable because saving lives is a positive outcome. However, attitudes are also based on affective feelings that directly guide our evaluations of objects and behaviors (Albarracín & Wyer, 2001; Albarracín & Kumkale, 2004; Schwarz & Clore, 1983).

Models of the attitude-behavior relation provide invaluable methods to predict behavior, typically by measuring immediate antecedents like attitudes and norms (Ajzen & Fishbein, 1980). Most relevant for the current purposes, such models posit that beliefs influence behavior. Specifically, different sets of beliefs, such as outcome beliefs, normative beliefs, and control beliefs (i.e., the judgment that one can execute a behavior if one wants to; Ajzen & Madden 1986), can influence behavior through mediating influences on behavioral attitudes, norms, and intentions.[2] Although reasoned action models do not detail the sociocognitive principles governing the storage and retrieval of beliefs, attitudes and intentions are an undeniable part of the pathway from belief to behavior.

[1]Here, we follow a tradition that distinguishes beliefs from evaluations (e.g., Fishbein & Ajzen, 1975), thus allowing us to study the relation between beliefs and attitudes as separate entities.

[2]Perceived behavioral control, which is a belief regarding one's ability to carry out a behavior (Fishbein & Ajzen, 2010), can also influence behavior directly. However, in the reasoned action approach, this effect is assumed to, at least in part, reflect the impact of actual behavioral control.

Table 2. Model principles and future research.

Principle	Comparison with predictions from prior models	Potential future research for novel principles
Initial formation of beliefs and belief-to-behavior inferences		
Principle 1. People can form a belief or belief-to-behavior inference. People who first create a belief about an object, person, or behavior may form an isolated belief or a belief-to-behavior inference. A belief-to-behavior inference, which typically happens probabilistically, involves considering the outcomes of the behavior and fosters behavior correspondence.	New	Induce beliefs and promote practical reasoning or not. Practical reasoning should lead to faster to report behavioral attitudes and intentions, as well as stronger belief-behavior relations.
Principle 2. The length of behavioral inferences modulates belief-behavior correspondence. When behavioral inferences are formed, shorter ones (e.g., from outcome beliefs to behavior) are easier to complete and produce stronger belief-behavior correspondence than longer ones (e.g., from existence beliefs to behavior).	New	Induce existence, descriptive, and outcome beliefs and compare the time required to report behavioral attitudes and intentions as well as the belief-behavior correlation.
Principle 3. Behavioral goals lead to the formation of belief-to-behavior inferences. People form a belief-to-behavior inference when they have a behavioral goal. Factors that promote behavioral goals include (a) forming a belief about a behavior, (b) receiving a behavioral recommendation or other behavioral information, (c) having a general action goal, as well as (d) experiencing emotions or (e) belonging to a group that promotes action.	New	Induce beliefs and manipulate either behavioral or informational goals. Then, compare the time required to report behavioral attitudes and intentions, as well as the strength of the belief-behavior relation.
Principle 4. Cognitive capacity interacts with goals and inferential chain length to determine the formation of belief-to-behavior inferences. Cognitive capacity may increase belief-behavior correspondence when people have a behavioral goal. Additionally, cognitive capacity may increase belief-behavior correspondence when the inferential chain is longer because reductions in capacity can disrupt a longer inference before it is completed.	New	Induce either descriptive or outcomes beliefs and introduce distraction or not. Compare the time required to report behavioral attitudes and intentions, as well as the strength of belief-behavior relation.
Principle 5. Different mental constructs in the inference chain can be stored and activated independently. People can store a belief, a belief-to-behavior inference, or a behavioral attitude or intention. The accessibility of these elements depends on how extensively each was processed initially. For example, a belief formed in relation to a particular belief-to-behavior inference may not influence other behaviors, while a behavioral attitude may influence behavior even after people change the beliefs that gave way to that attitude.	Integrates Wyer and Srull (1986)'s principle of functional independence of representations. Also integrates Schwarz's (Schwarz & Strack, 1991; Schwarz, 2007) attitude construction model and Wilson and Dunn's (1986) findings about the impact of reasons as a function of attitude accessibility	–
Principle 6. Inferences can become proceduralized. When people make the same inference repeatedly, this inference can proceduralize. Once proceduralized, people compile those inferences into a single belief-to-behavior unit that can automatically guide behavior.	Integrates proceduralization (Anderson, 1982; Fitts & Posner, 1967; Logan, 1988, 2002; Schneider & Shiffrin, 1977) and stereotype activation (Bargh & Ferguson, 2000; Kawakami et al., 2002) into belief-attitude-behavior models.	–

Before proceeding, we make one additional key distinction. Some scholars differentiate knowledge from beliefs, a distinction that originates in philosophy. For example, according to Plato, *knowledge* denotes factual statements, whereas *beliefs* are convictions with no evidence base. "The earth orbits around the sun" is an example of knowledge—defined as a set of propositions that, once understood, are entirely certain (Griffin & Ohlsson, 2001). In contrast, "I believe that the accused was the perpetrator of the crime" is an opinion, and as such, it can be argued, doubted, or withheld (Griffin & Ohlsson, 2001). However, psychologists typically refer to *knowledge* as the collection of representations stored in memory, including beliefs, attitudes, and relevant information. In this paper, we use the term *knowledge* in this latter sense.[3]

[3]Readers may consult Jackson (2020) for a different discussion of the distinction between *belief* and *credence*.

Our Model

We propose a theoretical framework about the formation of beliefs, the inferences that go from beliefs to behavioral attitudes, intentions, and behaviors, and the storage and later activation and use of beliefs, behavioral attitudes, and intentions. In so doing, we seek to shed light on how beliefs influence behavior. Our model comprises six hierarchically organized principles, which appear in Table 2. As indicated in the table, some of these principles follow from established research on attitudes and social cognition, whereas others are novel.

We postulate that beliefs affect behavior when people assess the implications of a belief for behavior and develop a belief-to-behavior inference. As mentioned, we define belief-to-behavior inference as the reasoning connecting beliefs to behavioral attitudes and intentions, thus driving behavior. The inference in question is not "logical," concerning what

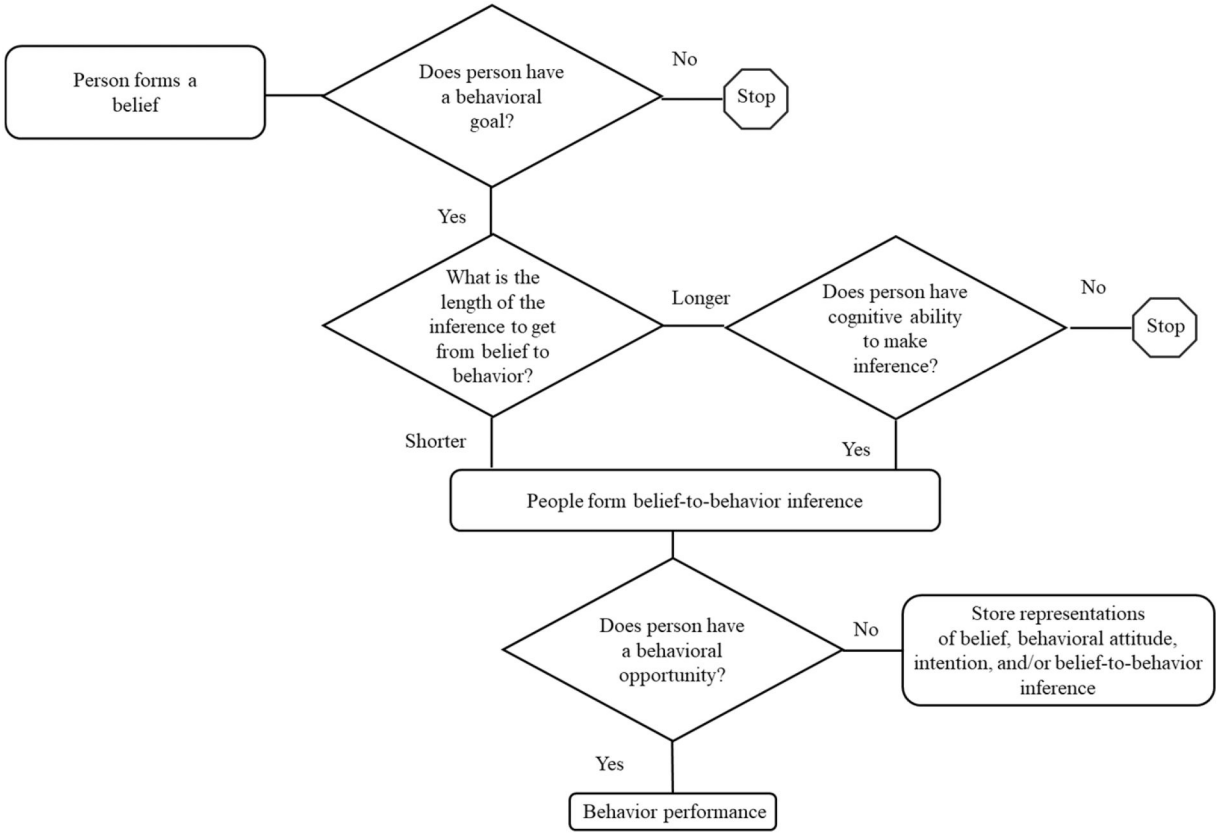

Figure 1. Graphical representation of the theoretical framework linking beliefs to behavior. This flowchart represents the sequence of processes involved in going from beliefs to behavior.

is accurate or valid, but rather "practical," regarding what one wants, should, or will do (Jones & Gerard, 1967). Moreover, our contention is not that people frequently form behavioral intentions by applying logical rules. Rather, individuals—even children—can and do reach certain inferences, including the ones we propose, based on simple reasoning (Johnson-Laird, 2005; Politzer et al., 2017). This reasoning is largely the result of probabilistic learning rather than logic or a careful integration of information.

Like other judgments, we propose that belief-to-behavior inferences and their components (e.g., behavioral intentions) can be brought to mind in real time. We also posit that belief-to-behavior inferences are made in response to a behavioral goal—in which people are focused on taking action rather than learning information—and are more likely when the chain of inferences between the belief and behavior is shorter. The cognitive resources and motivation to think about one's belief facilitate belief-to-behavior influences, mainly when the distance between the belief and the behavior is longer. These processes are graphically depicted in Figure 1, which contains details of what happens when people first form a belief and ends with storing that belief and representations associated with the belief-to-behavior inference in permanent memory.

As shown in Figure 1, the processes of interest begin with a person who forms a belief, activates a behavioral goal, and makes a belief-to-behavior inference. People who form a belief or belief-to-behavior inference may execute a behavior provided they have an opportunity to do so (see Figure 1). However, the belief and belief-to-behavior inference may be stored in memory, becoming part of memory-based processes (see Figure 1). People may later retrieve their prior belief from memory to construct a behavioral decision online. Alternatively, they may retrieve belief-to-behavior inferences or their behavioral attitude or intention and act on those bases. Furthermore, when a belief-to-behavior inference has been made repeatedly, the inference can proceduralize, becoming a belief-to-behavior compilation. When that happens, people can make decisions with limited cognitive capacity and motivation, which strengthens belief-behavior correspondence. Notably, our framework acknowledges the role of recursive processes in which the outcome of a behavior can also influence people's beliefs and subsequent belief-to-behavior inferences.

Formation of Beliefs Versus Belief-to-Behavior Inferences

We assume that people who first consider an issue can form just a belief or a belief-to-behavior inference, as described in Principle 1 and graphically represented in Figure 1. An inference is a form of reasoning in which a person uses information to go beyond that information to reach a new conclusion (Tversky, 2005). Thus, learning that "vaccines save lives" may lead people to form a belief in that proposition or other beliefs like "the vaccine will save my life." The inference can also lead to a behavioral intention like "I will vaccinate." Principle 1 follows.

Principle 1. People can form a belief or belief-to-behavior inference. People who first create a belief about an object, person, or behavior may form an isolated belief or a belief-to-behavior inference. A belief-to-behavior inference, which typically happens probabilistically, involves considering the outcomes of the behavior and fosters belief-behavior correspondence.

Even though it seems natural that a belief may be formed without considering a behavior, an implication of Principle 1 is that such a belief will not guide behavior. The possibility that beliefs may not affect behavior is illustrated by Bayesian models that portray beliefs as having a "mind-to-world direction," where the beliefs' purpose is simply "getting to know the world" (Yon et al., 2020). These models distinguish beliefs from "desires," which have a "world-to-mind direction," where the purpose is to change the world to obtain a reward (Yon et al., 2020). Within this Bayesian framework, causal Bayesian networks specifically model how people link their prior beliefs to perceptions, inferences, and behavior using probabilistic relations (for a comprehensive review of causal Bayesian cognitive models, see Sloman & Lagnado, 2015). Once these links are established, they guide subsequent connections between beliefs and behavior as people move about in the world.

Outcome beliefs are a central part of our framework. A belief-to-behavior inference involves outcome beliefs like "Vaccines save lives," behavioral attitudes like "Vaccines are good," and behavioral intentions like "I will vaccinate." For example, someone may think that "If vaccines save lives, vaccines are good" and "Vaccines save lives," concluding that "Vaccines are good." They may infer, "If vaccines are good, I will vaccinate," and "Vaccines are good." These additional inferences can lead to forming a behavioral intention, "I will vaccinate." This line of reasoning, which is generally made probabilistically, comprises a belief-to-behavior inference.[4]

Formation of Beliefs

We begin our analysis with the noncontroversial socio-cognitive assumption that beliefs are based on a subset of information accessible or available at the time rather than complete information (Fiske & Taylor, 1991; Higgins, 1996, 2012; Wyer & Srull, 1986). Knowledge activation mechanisms have long been the focus of cognitive and social-cognitive theories, from those based on a digital computer analogy to those inspired by the functioning of the human brain (Bassili & Brown, 2005; Cunningham et al., 2007; Wyer & Srull, 1986). Regardless of what structural metaphor is used, knowledge accessibility is greater when representations are frequently activated and have been accessed more recently (Fazio, 2007; Wyer & Srull, 1986). Knowledge accessibility is also greater when more retrieval cues appear in the environment or are chronically accessible for a particular person (Wyer & Srull, 1986).

The information people use to form beliefs may be organized, as with content presented in education, media, or explicit discussions of an issue. Experience with an issue can also create an organized set of propositions, as can observing the behaviors and outcomes of others (Bandura, 1980). However, a belief may also be formed from mere associations, such as linking the concept "true" and a proposition through priming (Cone et al., 2019) and from objectively irrelevant information (Schwarz, 2018). For example, affective feelings that a statement is easy to recall or understand often make it more believable (Schwarz, 2018).

In proposing organized and associative knowledge as sources of information, we are well-aligned with a strong tradition of research on mental models and associations (for mental models, see Craik, 1943; Johnson-Laird, 2005; see also Wyer & Srull, 1986; for associations, see Gawronski & Brannon, 2018). Although the formation of mental models is beyond the scope of this paper, knowledge presented in educational and media contexts often allows individuals to explain relations and make inferences (for outstanding treatments, see Craik, 1943; Johnson-Laird, 2005). For instance, information about disease transmission is generally communicated in school, where people develop a model about an infectious agent entering and multiplying within the body, activating immune mechanisms, producing symptoms, and moving to new hosts. However, as mentioned, belief formation has also been studied in the context of incidental information, such as fluency—the feeling of ease that arises when, for example, information is familiar or easy to recollect (Schwarz, 2018).[5]

Formation of Inferences

Reasoning is generally conceived of as either rule-based or probabilistic. Like other inferences, practical inferences can take the form of conditional, disjunctive, or categorical syllogisms; involve deduction (i.e., an inference in which if premises are true, the conclusion must be true), induction (i.e., an inference that generalizes a set of observations), or abduction (i.e., an inference that seeks the simplest and most likely explanation); and integrate specific beliefs or general heuristics as premises. For instance, in a practical conditional syllogism, "If vaccines save lives, they are good" and "Vaccines save lives" can lead to the conclusion that "Vaccines are good." In a practical categorical syllogism (for applications of categorical syllogisms to beliefs about groups, see Jones & Gerard, 1967), "Conservatives protest the election" and "I am a conservative" can lead to the conclusion that "I will protest the election." Thus, this practical reasoning can yield both behavioral attitudes and intentions.

[4]Importantly, the example above focuses on people's general beliefs about vaccines, which is a primary area of interest (Bussink-Voorend et al., 2022). However, it is possible for people to hold diverging beliefs about different vaccines. A person may, for instance, hold beliefs that the flu vaccine saves lives but believe that the COVID-19 vaccine produces unacceptable side effects. This would naturally yield different behavioral inferences for each vaccine.

[5]In addition to spontaneous associations between fluency and agreement, fluency may also enter inferences via a mental model of what is valid. However, this issue is outside the scope of this paper.

However, ample evidence suggests that people make syllogistic inferences probabilistically rather than in a rule-based fashion. When we receive new information about an issue, our conclusions follow predictions from conditional probabilities. For example, McGuire (1960, 1981) and Wyer (1974) used syllogisms to describe the influence of two beliefs on a third one and modeled this reasoning based on subjective reports of the probability of each statement. In both McGuire's and Wyer's models, two beliefs, *A* (antecedent) and *C* (conclusion), are related to each other through a syllogism of the form "*A*; if *A*, then *C*; *C*." Therefore, the probability of *C* results from the beliefs that "if *A* is true, *C* is true" and "*A* is true." This form of reasoning, however, is probabilistic, and McGuire modeled it as such. For example, believing "if a vaccine increases immunity to a virus, it will decrease infections" and "a vaccine increases immunity to the virus" should lead to the belief that "the vaccine decreases infections."

Although McGuire's model reasonably approximates how people form beliefs, Wyer (1970; Wyer & Goldberg, 1970) observed that *C* might be true for reasons other than premise *A*. That is, the probability of the conclusion may be due to not A ("not *A*; if not *A*, then *C*"). Hence, *P*(*C*) should be a function of the beliefs in these two premises, or:

$$P(C) = P(A)P(C/A) + P(\sim A)P(C/\sim A),$$

Where *P*(*A*) and *P*(∼*A*) [= 1−*P*(*A*)] are beliefs that *A* is and is not true, respectively. *P*(*C*/*A*) and *P*(*C*/∼*A*) are conditional beliefs that *C* is true if *A* is and is not true, respectively. For example, a vaccine might prevent deaths by reducing susceptibility to the virus, but so would reducing in-person social interactions. Thus, in estimating the probability of infection next year, one might consider the likelihood that the vaccine and other measures will decrease infection.

Our main departure from McGuire's (1960) and Wyer's (1974) models is that, as mentioned, our model concerns what in philosophy is referred to as "practical reason," the domain in which inferences can foster *behavioral* decisions (Atkinson et al., 2006; Macagno et al., 2017). People infer behavioral attitudes and intentions to arrive at behavior in these belief-to-behavior inferences. Evidence for our framework comes from an experiment conducted by Wyer and Goldberg (1970). In this research (Experiment 4), participants estimated the likelihood of different events. For example, they used 0 (*extremely unlikely*) to 10 (*extremely likely*) scales to rate the five statements, "Drug companies charge excessive prices for the pills they produce" (*P*[*A*]); "If drug companies charge excessive prices for the pills they produce, the size of their profits should be placed under the control of the federal government" (*P*[*A*/*C*]); "The size of drug companies' profits should be placed under the control of the federal government" (*P*[*C*]); "Drug companies do not charge excessive prices for the pills they produce" (*P*[∼*A*]) and "Even if drug companies do not charge excessive prices for the pills they produce, the size of their profits should be placed under the control of the federal government" (*P*[*C*/∼*A*]). Responses to these items thus provided all necessary estimates to fit Wyer and Goldberg's model, allowing them to fit their equation to predict endorsement of 'The size of drug companies' profits should be placed under the control of the federal government.' The 0 to 10 ratings were converted to a scale from 0 to 1, and results indicated that regressing *P*(*C*) on the predicted value produced minimal standard errors of .04. Additionally, as expected, introducing information to change *A* and not *A* led to changes in *P*(*C*).

Further evidence comes from a study that used Wyer and Goldberg's (1970) model to predict behavioral intentions. In research conducted by Jaccard and King (1977), the same model was used to predict smoking from beliefs about the attributes and consequences of smoking. For example, participants rated the likelihood that "Smoking cigarettes is bad for my health" (*P*[*A*]); "Suppose that smoking cigarettes is, in fact, bad for your health. How likely is it you would smoke cigarettes" (*P*[*C*/*A*]) and "Suppose that smoking cigarettes is not bad for your health. How likely is it that you would smoke cigarettes?" (*P*[*C*/∼*A*]). Respondents also rated the likelihood of "I intend to smoke cigarettes" (*P*[*C*]), which correlated $r = .69$ to $r = .82$ with the predicted values, with mean absolute deviations from .10 to .16.

Past research has shown that attitudes and intentions can be predicted from the probability of beliefs operating as premises. However, past research has not tested a longer inferential chain in which the impact of beliefs on intentions is mediated by attitudes, even though Wyer and Goldberg (1970) obtained a better fit for the prediction of attitudes from beliefs than Jaccard and King (1977) did for the prediction of intentions from beliefs. Also, this previous research selected beliefs with substantial evaluative implications, thus not examining the association between existence or descriptive beliefs without direct relevance to attitudes and intentions. Our framework considers these issues.

Table 2 presents a brief summary of future research that may directly test the novel principles proposed in this paper. Principle 1 predicts that individuals led to form beliefs will show a weaker belief-behavior correlation than those led to connect beliefs to behavior by engaging in practical reasoning. For instance, researchers could instill a belief (e.g., conspiracy belief) in a participant sample and then assign half of them to a practical reasoning condition. Practical reasoning could be manipulated via if-then statements that guide thinking about the consequences of the belief in question (practical reasoning condition) or not (control condition). Our model predicts a stronger impact of the induced belief on behavior in the practical reasoning condition.

An exciting aspect of probabilistic learning is the possibility of inverse inferences. For example, self-perception is a clear demonstration of an inference in which the conclusion affects the premise (Wyer & Albarracín, 2005). Specifically, people commonly engage in behaviors they like (Albarracín & Wyer, 2001; Bem, 1965). For example, people are more likely to eat whole-wheat bread when they like it than when they do not. As a result, they also use information about what they do (i.e., their behavior) to reach conclusions about their attitudes, engaging in reverse inferences (for reverse inferences in Bayesian models, see Gunji et al., 2017).

In this sense, people's behavioral attitudes, intentions, and behaviors should also be able to reinforce their beliefs (see also Albarracín & Wyer, 2001).

Impact of the Length of Belief-to-Behavior Inferences

Once we agree that people make belief-to-behavior inferences, key questions follow. For instance, do the different categories of beliefs in Table 1 vary in belief-behavior correspondence? How long does it take to go from each belief type to behavior? A belief-to-behavior inference involves outcome beliefs, behavioral attitudes, and intentions. Accordingly, we propose that the closer a belief is to an intention, the easier the belief-to-behavior inference and the stronger the belief-behavior correspondence.

Illustrations for Different Belief Types

Consider, for example, existence beliefs. Children may form beliefs that (1) "If God exists, He will grant me favors" and "God exists," concluding that "He will grant me favors." Then, (2) "If God will grant me favors, I will have positive outcomes" and "God will grant me favors," concluding that "I will have positive outcomes." Then, (3) "If I want God to grant me favors, I should pray," and "I want God to grant me favors," then "I will pray." In other words, the existence of God does not directly imply outcomes, but additional inferences can yield outcome beliefs, behavioral attitudes, and intentions.

The length of inferential chains may also be illustrated for descriptive beliefs such as stereotypes. As stereotypes are publicly discouraged in contemporary society, many emerge by association (for a review of associative processes, see Gawronski & Brannon, 2018). However, history has provided examples of how beliefs may explicitly legitimize discriminatory behaviors. For instance, 19th-century Darwinians claimed that men were naturally selected to be more competitive and thus more advanced intellectually than women (Bergman, 2002). Hence, people exposed to these ideas may have reasoned that (1) "If women are mentally inferior, admitting them to colleges would waste resources" and "Women are mentally inferior," leading to the conclusion that "Admitting women will waste resources." From there, the inference that (2) "If admitting women to college wastes resources, admitting them to college is bad" and "Admitting women wastes resources," leading to the conclusion that "Wasting resources is bad." Finally, (3) "If wasting resources is bad, women should not be admitted" and "Wasting resources is bad," concluding with the decision not to admit them.

Whereas the inference from belief to behavior is quite involved for existence and descriptive beliefs, outcome beliefs are more straightforward. The outcome belief, (1) "The vaccine saves lives," may be combined with "If a vaccine saves lives, it is beneficial" to conclude that "the vaccine is beneficial." Then, one may further reason, (2) "If a vaccine is beneficial, I will receive it" and "The vaccine is beneficial," concluding "I will receive the vaccine." Additionally, beliefs about what others do might similarly instill behavior. The beliefs (1) "If most people receive the vaccine, the vaccine is good" and "Most people receive the vaccine" will lead to the conclusion that "The vaccine is good." Then, people may reason, (2) "If a vaccine is good, I will receive it" and "The vaccine is good," hence "I will receive the vaccine." These examples illustrate belief-to-behavior inferences of different lengths, such as three sets of propositions for existence and descriptive beliefs and two for outcome beliefs, including those based on others' behavior.

To summarize, we propose that the impact of beliefs on behavior depends on the proximity of each type of belief in Table 1 to a behavior. As the above examples of different belief-to-behavior inferences suggest, believing that a vaccine prevents infection has more direct behavioral implications than believing in God. To move from God's existence to behavior, we need to understand what behavior God wants from us, identify the outcomes of performing that behavior, determine if those outcomes are positive or negative, and conclude with a decision to do what God wants. By contrast, the outcome belief that a vaccine prevents disease implies a behavior more directly because determining whether a vaccine prevents infection often suffices to evaluate immunization positively and form a behavioral intention. Therefore, we propose Principle 2, which states that shorter behavioral inferences are more likely to produce higher belief-behavior correspondence than longer ones.

> *Principle 2. The length of behavioral inferences modulates belief-behavior correspondence.* When behavioral inferences are formed, shorter ones (e.g., from outcome beliefs to behavior) are easier to complete and produce stronger belief-behavior correspondence than longer ones (e.g., from existence beliefs to behavior).

In research on belief system networks, Turner-Zwinkels and Brandt (2022) also predicted that change in such systems is proportional to the strength of connection or distance between a targeted attitude and non-targeted attitudes (see also Brandt & Sleegers, 2021; Dalege et al., 2017). Participants reported attitudes toward the war on terrorism, crime, aid to the poor, controlling immigration, and other issues at three points in time. Findings indicated that non-targeted attitudes that were closest to targeted ones thematically showed larger effects than more distal, thematically unrelated, non-targeted attitudes. These tests, however, did not concern the types of inferential belief-behavior chains we describe in this text but simply thematic similarity.

Future research could experimentally test our predictions by introducing messages to induce existence, descriptive, and outcome beliefs. One could then compare the effects of these messages on the time required to make each belief judgment, on reporting behavioral attitudes and intentions, and on behavior. For example, researchers could describe the existence of a medication for a disease, describe the properties of the medication, and detail the outcomes of using the medication. We would expect the effects of the messages on behavioral attitudes, intentions, and behavior to be weaker for existence and descriptive beliefs than for outcome beliefs. Evidence derived from this kind of experiment would be particularly well positioned to test Principle 2.

Table 3. Meta-analytic estimates of belief-behavior correspondence by belief type and research design.

Research design	Belief type	Specific belief	Citation	Effect size	OR	Extreme publication bias ruled out?
Correlation	Existence	Conspiracy beliefs	Granados Samayoa & Albarracín, 2024b	$r = .14$	1.67	NA
Correlation		Conspiracy beliefs	Stasielowicz, 2022	$\beta = .09$	1.39	Yes
Correlation		Religiosity (criminal behavior)	Baier & Wright, 2001	$r = -.12$	1.55	NA
Correlation		Religiosity (physical aggression)	Gonçalves et al., (2023)	$r = -.12$	1.55	NA
Correlation		Religiosity (sexual aggression)	Gonçalves et al., (2023)	$r = -.05$	1.2	NA
Correlation		Religiosity (domestic violence)	Gonçalves et al., (2023)	$r = -.05$	1.2	NA
Correlation		Religiosity (destructive behavior)	Cheung & Yeung (2011)	$z = -.17$	1.86	NA
Correlation		Religiosity (constructive behavior)	Cheung & Yeung (2011)	$z = .2$	2.07	NA
Correlation	Descriptive	Beliefs about qualities of condoms	Sheeran et al., 1999	$r = .05$	1.2	NA
Correlation		Beliefs about qualities of condoms	Sheeran et al., 1999	$r = .14$	1.67	NA
Correlation		Beliefs about qualities of condoms	Sheeran et al., 1999	$r = .1$	1.44	NA
Correlation		Beliefs about qualities of condoms	Sheeran et al., 1999	$r = .13$	1.61	NA
Correlation		Hostile sexism	Agadullina et al., 2022	$r = .26$	2.66	Yes
Correlation		Benevolent sexism	Agadullina et al., 2022	$r = .05$	1.2	Yes
Correlation		Gender stereotypes	Koch et al., 2015	$d = 0.08$	1.16	Yes
Correlation		Gender stereotypes	Koch et al., 2015	$d = 0.30$	1.72	Yes
Correlation		Gender stereotypes	Koch et al., 2015	$d = 0.32$	1.79	Yes
Correlation		Mindsets	Sisk et al., 2018	$r = 0.1$	1.44	No
Experiment		Mindsets	Sisk et al., 2018	$d = 0.08$	1.16	Yes
Experiment		Mindsets	Macnamara & Burgoyne, 2023	$d = 0.05$	1.12	No
Correlation	Outcome	Beliefs about recycling behavior	Geiger et al., 2019	$r = .26$	2.66	Yes
Correlation		Beliefs about condom use	Albarracín et al., 2001	$r = .34$	3.71	NA
Experiment		General behavior change	Borrelli et al., 2015	$r = .19$	2.02	NA

Note. Albarracín et al. (2024) synthesis reviewed every available meta-analysis of (a) correlational studies of behavioral prediction and (b) experiments to change behavior. Only research that measured behavior, rather than intentions or related variables, was included. The literature search was multi-pronged, including broad and specific keywords to inspect records in Web of Science. When it came to beliefs, keywords included "meta-analysis" and "behavior" combined with "knowledge or information or health education," "belief," "attitude," and "norm." However, each meta-analysis was carefully considered to ensure we synthesized evidence about belief measures. The searches were repeated with more specific keywords in popular areas, including "smoking," "weight," "physical activity," "recycling or climate," and "alcohol." The behavioral change experimental literature was identified with the keywords "meta-analysis," "behavioral change," "intervention," and "experiment or randomized controlled trial." The search was supplemented with the authors' knowledge of the literature and the top Google Scholar entries for infrequently represented areas. The data for this literature review were obtained between March and December 2023 and were not restricted to begin at any particular time.

The synthesis provided effect size estimates and indicated whether publication bias was a significant threat to the validity of those estimates. Effects were classified as negligible, small, medium, or large and expressed as Odds Ratios (ORs; see footnote to Table 3). The ORs were calculated to show a positive association between the belief measure and positive behavior or a positive effect of an intervention on positive behavior. For example, the effect of an intervention reporting a risk reduction (e.g., less energy use) was reverse-scored to reflect improvement in environmental behavior. When effect sizes were not originally reported as ORs, transformations were based on the formulas Borenstein and colleagues (2021) provided. Effects were extracted by one author and checked by at least a second author, with disagreements resolved by discussion or consultation with a third author.

Like all research, meta-analyses have limitations 22,3, including conflict of interest and publication or inclusion bias resulting from authors' motivation to overrepresent positive results (e.g., Borenstein et al., 2021; Page et al., 2021). Thus, Albarracin et al. (2024) determined whether extreme publication bias could be ruled out through conventional methods such as funnel plots, trim-and-fill statistics, Cochrane's assessment tool (i.e., more than 50% of the studies judged to be low in selective-reporting bias), or regressions that predict effect sizes from their variances and later readjust the effect sizes. They concluded that the extent of publication bias could not be determined when reports included no analyses, reported significant regression models but did not adjust the effect size, calculated failsafe N statistics, or used Cochrane's assessment tool but did not specifically report the results for selective reporting bias. Two raters made these decisions, and disagreements were again resolved through discussion. Determinations about publication bias are indicated in Table 3, organized according to whether the meta-analyses concerned correlational or experimental studies.

In lieu of such evidence, we presently leverage meta-analytic evidence in the next section to provide one test of this idea.

Belief-Behavior Correspondence for Different Beliefs

Principle 2 states that belief-behavior correspondence is inversely proportional to the length of the inference going from belief to behavior. We have also proposed that existence and descriptive beliefs implicate longer behavioral inference chains, whereas outcome beliefs implicate shorter ones. As a result, all else equal, existence and descriptive beliefs should have lower belief-behavior correspondence than outcome beliefs.

The best available evidence for the difference between existence or descriptive beliefs and outcome beliefs can be obtained from meta-analyses of different belief-behavior correlations. A recent second-order quantitative synthesis of determinants of and treatments to change behavior provides such evidence (Albarracín et al., 2024). Even though Albarracín et al.'s (2024) synthesis did not involve our behavior classification, we extracted relevant data provided to test the plausibility of Principle 2. This evidence is summarized in Table 3 (see caption for details regarding methods). We first review each entry and then quantitatively summarize the meta-analytic evidence by obtaining the average effect size and the range of effect sizes for each belief type. Notably, we benchmark the size of these effects against Cohen's (1988) standard in which effects are labeled as small ($r \geq .1$), medium ($r \geq .3$), or large ($r \geq .5$). We do wish to acknowledge that Funder and Ozer (2019) have proposed a different standard for effect sizes. We elected to use Cohen's benchmarks given their widespread use.

Our review of each meta-analysis begins with existence beliefs (see Table 3). As stated, existence beliefs include conspiracy theories and religious propositions, both of which feature prominently in societal discussions about whether

beliefs predict behavior. As shown in Table 3, the correlation between conspiracy beliefs and health-protection behaviors is $r = .14$ (Granados Samayoa & Albarracín, 2024b). This finding dovetails nicely with the findings of a continuous time meta-analysis of the relation between COVID-19 conspiracy beliefs and preventative behavior, in which endorsing COVID-19 conspiracy beliefs at an earlier timepoint had a ß = 0.09 with later preventative behavior (Stasielowicz, 2022). On average, the available evidence we extracted suggests that existence beliefs like conspiracy theories predict behavior modestly. Similarly, the correlation between religious belief and behavior ranges from approximately negligible—such as relations between religious belief and physical aggression, sexual aggression, or domestic violence ($rs = -.12, -.05, -.05$, respectively; Gonçalves et al., 2023; see also Baier & Wright, 2001)—to small, such as the correlation between religious belief and both destructive () and constructive behavior ($z = -.17$ and $z = .2$, respectively; Cheung & Yeung, 2011). Thus, although existence beliefs can sometimes correlate with behavior at a magnitude deemed small, a substantial proportion of the obtained relations involved negligible associations.

Descriptive beliefs, including stereotypes and mindsets, also garner a great deal of attention in discussions of societal ills and how to help people achieve their goals. As is the case with existence beliefs, descriptive beliefs have notoriously small average associations with behavior. According to one meta-analysis, beliefs about the properties of condoms have negligible to small associations with condom use (*r*s ranging from .05 to .14; Sheeran et al., 1999). Stereotypes also have small average belief-behavior correspondence effect sizes. For example, a meta-analysis of the effects of sexism found that measures of hostile and benevolent sexism correlate $r = .26$ but $r = .05$ with violence against women (Agadullina et al., 2022). Also, a meta-analysis of the influence of gender stereotypes on employment contexts revealed an average negligible effect of $d = 0.08$ ($r = .04$) and small behavioral biases when men chose employees for male-dominated jobs and when women chose employees for female-dominated ones ($d = 0.30$ [$r = .15$] and 0.32 [$r = .16$], respectively; Koch et al., 2015).

Other descriptive beliefs, such as mindsets (see Table 1), have similarly weak belief-behavior correspondence. In meta-analytic examinations, the growth mindset correlates $r = .10$ with improved performance in academic settings (Sisk et al., 2018) and interventions to change this mindset have a negligible impact on behavior ($d = 0.05$ [$r = .03$]; Macnamara & Burgoyne, 2023; $d = .08$ [$r = .04$]; Sisk et al., 2018; for a review, see Albarracín et al., 2024).

Importantly, an examination of meta-analytic effect sizes suggests that outcome beliefs correlate more strongly with behaviors than either existence or some descriptive beliefs. For example, the belief that recycling affects one's emotions (e.g., reducing guilt) predicts recycling behavior at $r = .26$ (Geiger et al., 2019). Similarly, in a meta-analysis by Albarracín et al. (2001), measures of beliefs in the outcomes of using condoms multiplied by evaluations had sizable associations with condom use ($r = .34$). Also, motivational interviewing—a program that confronts participants with the outcomes of their behavior—typically induces some changes in behavior in part via shifts in outcome beliefs (Miller & Rollnick, 2012). For instance, considering the data from a review of the impact of behavioral change interventions (Albarracín et al., 2024), the effect of motivational interviewing was as high as $r = .19$ (Borrelli et al., 2015).

As a summary of the available meta-analytic evidence, the correlations we just reviewed show variability that aligns with our predictions (see Table 3) and are synthesized in Figure 2. Taking all effect sizes into account, existence beliefs had an average $r = .12$ with behavior. Focusing only on those effect sizes for which extreme publication bias could be ruled out yielded an average $r = .09$ for the relation between existence beliefs and behavior. Moreover, we found no meta-analysis of interventions designed to change existence beliefs and measuring behavior. Descriptive beliefs had an average $r = .12$ with behavior when considering all effect sizes, and an average $r = .13$ when only considering studies without extreme publication bias. Intervention studies to change descriptive beliefs had an $r = .09$ impact on behavior across all effect sizes and $r = .12$ after ruling out extreme publication bias. Outcome beliefs had an average $r = .30$ with behavior considering all effect sizes and $r = .26$ after ruling out extreme publication bias. Intervention studies to change outcome beliefs had an $r = .19$ impact on behavior, although extreme publication bias could not be ruled out for this single effect size. All in all, these data support the notion that shorter belief-to-reasoning chains, such as those in outcome beliefs, produce weaker belief-behavior correspondence than do longer ones. In the future, the same predictions could also be tested experimentally (see Table 2).

Motivational and Capacity Factors Involved in Forming Belief-to-Behavior Inferences

Up to this point, we have reviewed the formation of belief-to-behavior inferences and how the length of the inference chain affects belief-behavior correspondence. However, belief-to-behavior inferences also depend on whether people are motivated and able to think about their beliefs and behavior. This leads us to consider how goals and capacity affect belief-behavior correspondence.

Behavioral Goals in Forming Belief-to-Behavior Inferences

We propose that belief-to-behavior inferences are made when people have a behavioral goal rather than an informational one. We define behavioral goals as aiming to determine the implications of a belief for a behavioral decision. In contrast, an informational goal involves determining if a particular statement is true or false or understanding the details of a relation or phenomenon. We also propose that people activate behavioral goals when they consider information about behavior or when situational or personal factors activate the goal. For example, some beliefs pertain to the behavior itself, have direct behavioral implications, or evoke thoughts of behavior. The belief that vaccines prevent infections is semantically associated with the goal of

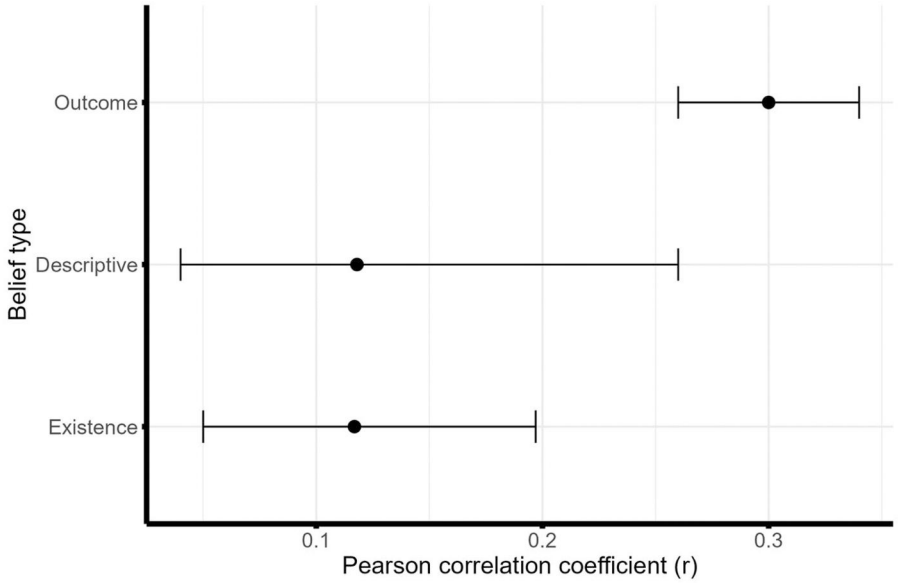

Figure 2. Graph of average meta-analytic effect sizes for the relation different belief types and behavior. Point estimates represent average effect size for correlational studies assessing the relation between beliefs and behavior. The width of the bars represents the minimum and maximum effect size values.

performing a behavior to avoid infection. In contrast, the assumption that the earth is flat or that UFOs exist is relatively devoid of behavioral implications. Also, situations and personal characteristics can prompt behavioral goals. For instance, a hospital manager analyzes vaccine safety information to improve care, whereas a student considers the same information to learn it.

Behavioral goals may be activated by the content of beliefs. Ajzen and Fishbein's (1980; Fishbein & Ajzen, 2010) principle of compatibility—the greater measurement correspondence observed when the psychological predictor of interest (e.g., beliefs, attitudes, intentions) matches the behavioral criterion in terms specificity along the dimensions of the action, target, context, and time associated with the behavior—is incorporated into our proposed goal-driven processes. In our context, compared with the belief that "God exists," the descriptive belief "Attending religious services is difficult" predicts behavior more strongly because the belief describes the behavior. For example, perceiving that eating organic vegetables is controllable correlates with eating them at $r = .33$ (Scalco et al., 2017), and perceiving that sun protection behaviors like wearing sunscreen are controllable correlates with them at $r = .30$ (Bamberg & Möser, 2007). Future research should experimentally separate the presence of behavioral content and the length of the belief-to-behavior inference to quantify their relative impact (see Table 2).

In addition to the belief content itself, factors that promote behavioral goals include (a) introducing a behavioral recommendation or other behavioral information (Albarracín, 2021), (b) general behavioral goals (Albarracín et al., 2008; Albarracín & Handley, 2011), (c) experiencing emotions that motivate a behavioral response, and (d) being affiliated with a group that is motivated to act. These factors are covered in Principle 3.

> *Principle 3. Behavioral goals lead to the formation of belief-to-behavior inferences.* People form a belief-to-behavior inference when they have a behavioral goal. Factors that promote behavioral goals include (a) forming a belief about a behavior, (b) receiving a behavioral recommendation or other behavioral information, (c) having a general action goal, as well as (c) experiencing emotions, or (d) belonging to a group that promotes action.

The impact of having a behavioral goal can be seen through manipulations of behavioral relevance in a series of experiments conducted by Albarracín and Kumkale (2003). In these studies, which were designed to test the impact of affect in persuasion, participants were presented with messages about instituting comprehensive exams at the university while believing that they would have to vote on the policy or not. The messages described the benefits of the exam policy, and participants completed measures of beliefs in the outcomes of instituting the exams. The results indicated that participants who thought they would have to take the exams were more likely to form beliefs in the outcomes of the exams, as indicated by the difference between strong and weak arguments on these cognitions. For example, in Experiment 1, the difference in an index of cognitions related to the message (with possible scores ranging from −25 to +25) was 20.3 when participants thought they would have to vote to implement the exams but 12.3 when they did not expect to vote on the exam policy. In Experiment 2, the difference was 6.4 when participants thought they would have to vote on the exam policy, but 4.8 when they did not have this expectation.

Findings about the impact of direct experience on attitudes can also be interpreted as related to a behavioral goal. For example, in experiments conducted by Regan and Fazio (1977), some participants played with a set of puzzles (direct experience) while others saw the same puzzles already solved by another person (no direct experience). After this manipulation, researchers measured how interesting each type of puzzle was and gave participants 15 minutes to play with the puzzles if they wanted to. As hypothesized, attitudes

(i.e., the interest ratings) predicted actual playing behavior when participants had direct experience with the puzzles. In this case, even though direct experience can provide more concrete information, which is the classic explanation for those findings, and thus increases confidence and clarity, a behavioral goal may be an essential element in obtaining information to decide what to play or how long to do so. In the future, researchers should be able to more precisely manipulate behavioral goals to test these predictions with beliefs instead of attitudes and separate the effects of direct experience of the impact of a behavioral goal (see Table 2).

The consequences of thinking that one might need to vote on a policy or acquire direct experience with an object may be contrasted with the effect of a more general goal to think about the information at hand. For example, people are motivated to analyze information more when they have a higher (vs. lower) need for cognition (Cacioppo & Petty, 1982). However, a study by Wallace (2003) measured the attitude-behavior association for different need-for-cognition levels, finding similar associations across them. For example, in Experiment 1, the attitude-behavior associations were respectively $r = .58$ and $r = .53$ for higher and lower need for cognition at Time 1, and respectively $r = .59$ and $r = .61$ at Time 2, suggesting that the tendency to think carefully about an issue is not as crucial as is the goal to decide a future behavior.

The impact of behavioral goals can also be gauged by analyzing the relation between beliefs and behavior among people who differ in behavioral goals. In one large study examining the predictors of COVID-19 vaccination (Granados Samayoa & Albarracín, 2024a), participants in an initial wave of data reported their beliefs in different outcomes of receiving a COVID-19 booster vaccine (e.g., avoiding illness, experiencing side effects [reverse scored]) and their intentions to receive a COVID-19 booster in the future. Four months later, participants reported whether they had received a COVID-19 booster in the time that elapsed between measurement occasions. The results revealed that among people who reported weaker behavioral intentions at the outset, baseline outcome beliefs did not significantly predict their vaccination behavior at follow-up. However, among people with stronger intentions, outcome beliefs significantly predicted actual vaccination months later.

Another noteworthy aspect is that having a general action goal—which is the motivation to do something without clarity of what that is (Albarracín et al., 2008)—increases the tendency to form beliefs and attitudes about a message one encounters. Priming a general action goal with words like "go" increases elaboration (i.e., consideration of the merits of an issue) of informational messages about vegetarianism (Albarracín et al., 2008), implying that the general action goal induces more specific behavioral considerations. However, this happens only when participants do not have a prior attitude (Albarracín & Handley, 2011). When they have previously formed an attitude, they rely on it.

Additional illustrations of the possible impact of behavioral goals come from research on persuasive communications or interventions with varying numbers of behavioral recommendations. A synthesis of health-promotion interventions making zero, one, or more recommendations revealed that a higher number of recommendations (Dai et al., 2020; Sunderrajan et al., 2021; Wilson et al., 2015) increases the impact of the program on behavioral and clinical changes. Not only is making zero recommendations the least effective, but adding each recommendation makes the intervention more impactful. Although indirect, the data suggest that beliefs with multiple behavioral implications are likely to promote behavioral goals and, consequently, belief-to-behavior inferences.

Critical to this analysis are the emotional factors that might instill behavioral goals. Research suggests that delusions are more likely to affect behavior when they are linked to negative affect (Buchanan et al., 1993; Poupart et al., 2021). But how might emotion lead to better belief-behavior correspondence? Emotions are tightly linked to motivation as people seek to either alleviate negative affect or amplify positive affect through avoidance or approach behavior (e.g., Elliot et al., 2013; Phaf et al., 2014). That is, if people feel strongly about an issue, they are more likely to want to act on it, particularly when they feel approach emotions. For example, relative to sadness, an avoidance-oriented emotion, anger—an approach-oriented emotion—is associated with the formation of implementation intentions (Maglio et al., 2014). One potential source of such negative emotions is the experience of reactance—the unpleasant state that motivated people to restore a sense of freedom after experiencing threats in this domain (Brehm, 1966; Brehm & Brehm, 1981; Steindl et al., 2015). Accordingly, people who feel coerced may be more likely to develop behavioral goals and form belief-to-behavior inferences.

The importance, extremity, and confidence of a belief are also related to emotions, which may increase belief use in a belief-to-behavior inference. Supporting this point, greater importance of beliefs about the self predict greater emotional and motivational investment in these beliefs (Pelham, 1991). Additionally, beliefs are more impactful when people see their thoughts as valid (Briñol & Petty, 2022). For instance, thoughts generated in response to a persuasive message change attitudes when people regard those thoughts as valid (Briñol & Petty, 2003). Similarly, delusions held with conviction are more consequential (Taylor et al., 1994) and predict poorer emotional and behavioral functioning (Chadwick & Lowe, 1990; Combs et al., 2006; Haddock et al., 1998).

Lastly, there is indirect evidence that social identity influences a person's behavioral orientation. For example, identification with a Ukrainian group favoring closer ties with the European Union was associated with greater justification of protest activity by that group, and this effect was mediated by conspiracy beliefs (Chayinska & Minescu, 2018).

Cognitive Capacity in Forming Belief-to-Behavior Inferences

One aspect of making a belief-to-behavior inference for the first time is that the belief needs to be the focus of attention.

A longstanding tradition of research suggests that intentional behavior poses cognitive demands (Bargh, 1997). Similarly, a common assumption related to ability is that people must be aware of their thoughts' propositional contents for these contents to influence behavior (Dulany, 1968; Newell & Shanks, 2014; Shanks & Newell, 2014). Even though individuals are largely unaware of the cognitive processes (i.e., the specific operations of the mind) leading to their decisions (Bargh, 1997; Dulany, 2011; Gawronski et al., 2006; see Sklar et al., 2021, for a discussion of unawareness of mental processes and awareness of mental content), for beliefs to influence behavior, conscious awareness of the *belief* is necessary (Dulany, 1968; Newell & Shanks, 2014; Shanks & Newell, 2014).

Our framework also details how cognitive capacity can affect the relation between beliefs and behavior. Cognitive capacity is defined as the mental resources and skills needed to think and make judgments. Variables that can influence cognitive capacity include situational factors like the level of distraction in an environment and individual factors such as knowledge, intelligence, and processing speed (Toplak et al., 2014). People are known to process information elaboratively when they are capable and motivated to think about an issue (Albarracín, 2002, 2021; Chaiken, 1980; Petty & Cacioppo, 1986). For example, Craik and Lockhart (1972) argued that when information is processed deeply, such as when a phrase is read to gauge its meaning rather than its font, the information is analyzed, thought about, and associated with prior knowledge, resulting in better recall.

Our predictions concerning cognitive capacity build on Principle 3. We propose that greater elaboration will lead to higher belief-behavior correspondence when those beliefs are processed with a behavioral goal in mind. For example, a person without a behavioral goal may learn about a disease's cellular and molecular pathogenesis but not necessarily think of how to prevent it. As details about the disease might produce descriptive beliefs without thinking about what to do, greater ability to think about the information in this fashion may attenuate the relation between beliefs and behavior. In contrast, greater capacity should promote belief-behavior correspondence when people process information with a behavioral goal and are thus more likely to make belief-behavior inferences.

> *Principle 4. Cognitive capacity interacts with goals and inferential chain length to determine the formation of belief-to-behavior inferences.* Cognitive capacity may increase belief-behavior correspondence when people have a behavioral goal. Additionally, cognitive capacity may increase belief-behavior correspondence when the inferential chain is longer because reductions in capacity can disrupt a longer inference before it is completed.

Notably, the belief-behavior relation has been indirectly addressed in the elaboration likelihood model (Petty & Cacioppo, 1986). According to this theory, attitudes based on higher elaboration are expected to predict behavior more strongly. However, some beliefs receive considerable attention yet fail to predict behavior. For example, accuracy prompts, which elicit careful consideration of evidence, produce strong differentiation in beliefs in accurate (vs. false) headlines (Arechar et al., 2023). However, the same accuracy prompts have small effects on the behavior of *sharing* accurate (vs. false) headlines (Arechar et al., 2023), implying that well-elaborated beliefs do not always affect behavior and require particular goals to do so.

Other beliefs that receive considerable attention without having a large effect on behavior involve, for example, risk estimates. Even though risks are central to media coverage of diseases, risk perceptions are a surprisingly modest predictor of health behavior. Even in the meta-analysis that provides the most substantial estimates (Brewer et al., 2007), the average behavior associations with susceptibility and severity beliefs are $r = .24$ and $r = .16$, respectively. Therefore, understanding the person's goal when they think about risk is critical to explain why a belief that receives attention may have no consequences for behavior.

As shown in Principle 4, we propose that the impact of cognitive capacity on the belief-behavior correspondence will be greater when the belief-to-behavior chain is longer. This follows directly from Principle 3, which states that longer behavioral inferences are more likely to be disrupted than shorter ones. Considering the vulnerability of longer inferences, a chain composed of five statements is more likely to influence behavior when people have the time and capacity to think about the issue than when they do not. Correspondingly, disruptions in cognitive capacity should be less influential for a chain composed of only two statements.

Despite intense interest in the psychology of beliefs in recent years, we have yet to be aware of evidence directly testing Principle 4. Thus, we recommend experimental research on this principle, perhaps in the context of introducing messages that manipulate existence, descriptive, and outcome beliefs (see Table 2). A possible test of this principle would be to cross such a message manipulation with manipulation of situational distraction, such as introducing an interesting conversation or secondary task immediately following the presentation of the message. We predict that the behavioral impact of messages describing a new medication or its properties (i.e., those instilling existence or descriptive beliefs) will be disrupted to a greater extent than another message describing the medication outcomes or how many people use the medication.

Storage in Permanent Memory, Belief Change, and Proceduralization

Up to this point, our discussion has centered on beliefs and belief-to-behavior inferences formed online (see Figure 1). However, most information is processed in the context of prior beliefs. Thus, we are also interested in the storage and later retrieval of prior beliefs, behavioral attitudes, or behavioral intentions. Additionally, we are interested in how belief-to-behavior inferences incorporate prior representations and how belief-to-behavior inferences proceduralize.

Storage and Independent Activation of Beliefs, Behavioral Attitudes, and Behavioral Intentions

As shown in Figure 1, people who form a belief without linking it to a behavioral decision will store a corresponding belief in memory However, when people store a belief-to-behavior inference, the entire inference or some components (e.g., a behavioral attitude and intention) may be more accessible in memory. As a result, a belief, a behavioral attitude, or a behavioral intention may be activated independently, without the entire inference being recalled, particularly when forming a behavioral intention requires effort (Craik & Lockhart, 1972) while encoding the belief is relatively automatic (Gilbert, 1991). This is stated in Principle 5.

> *Principle 5. Different mental constructs in the inference chain can be stored and activated independently.* People can store a belief, a belief-to-behavior inference, or a behavioral attitude or intention. The accessibility of these elements depends on how extensively each was processed initially. For example, a belief formed in relation to a particular belief-to-behavior inference may not influence other behaviors, while a behavioral attitude may influence behavior even after people change the beliefs that gave way to that attitude.

This principle is important in several ways. First, when behavioral attitudes and intentions become more accessible, they become independent and are activated separately from the beliefs that created them. Thus, our model explains situations where only attitudes and intentions are retrieved because they are more accessible than beliefs. Just like attitudes may be retrieved automatically when repeatedly expressed (Powell & Fazio, 1984), so may beliefs. Our model also explains how belief-to-behavior inferences can be automatically reinstated when they have been repeated and proceduralized.

Another implication of Principle 5 is that if a belief is formed in the process of making decisions about sharing information, the belief's impact on behavior might be minimal. For example, social media users who receive information typically consider whether it might be attractive to their social networks. Thus, beliefs formed when considering entertaining others are unlikely to influence behaviors beyond sharing. These relatively simple hypotheses have yet to be tested, but researchers should determine how those goals affect the correspondence between beliefs and behaviors. Another important implication is that, for example, intentions to share information may continue to influence behavior even after people change the beliefs that gave way to those intentions due to independent activation.

A recent demonstration of the dynamic of retrieval of attitudes and intentions comes from a study of "bypassing," which involves highlighting beliefs not previously introduced to change a behavioral intention (Calabrese & Albarracín, 2023). In a series of experiments (Granados Samayoa & Albarracín, 2025), participants read news headlines introducing initial misinformation about fictitious objects (e.g., a fake chemical called "TSF") that were either positive or negative ("The chemical TSF causes anxiety"), followed by either a correction ("The chemical TSF does not cause anxiety"), a bypassing message ("The chemical TSF reduces the price of goods"), or control information. Correction and bypassing both attenuated the impact of misinformation on relevant attitudes and intentions relative to the control condition, and importantly, bypassing was superior to correction in this regard. In addition, some of the experiments manipulated whether participants formed an attitude toward using the object in question when they first received the misinformation. Specifically, some participants focused on whether the object was good or bad, others focused on whether the headline was accurate, and a third group received no instructions. As hypothesized, bypassing was more effective than correction when participants had only formed *beliefs* in the initial information, which was either in the accuracy-goal condition or the control condition. Presumably, in these conditions, participants used the new, more accessible beliefs to form an attitude toward supporting or opposing the use of the chemical. However, when participants had previously formed attitudes and intentions to support or oppose the use of the chemical, they could retrieve those attitudes independently. Accordingly, they were not affected by the provision of new beliefs in the bypassing message.

Another implication of the independent retrieval of both beliefs and behavioral intentions or attitudes is the possibility of interactive effects when different representations are activated jointly. For example, beliefs and affective reactions to a group have been shown to combine to influence judgments (Gawronski & Bodenhausen, 2011). Likewise, attitudes and norms are not independent and may exert joint effects on behavior (Lewis et al., 2015; Miniard & Cohen, 1979). Using an example from conspiracy beliefs, people who believe in a voter fraud conspiracy theory and have a positive attitude toward attending a protest may be more likely to protest when their friends and family support the behavior. Indeed, attitudes toward a behavior interact with social norms to increase attitude-behavior correspondence (Acock & DeFleur, 1972). This interaction is present for dietary behavior, where the relation attitude-behavior correlation is stronger when participants perceive social support for eating a healthy diet (Povey et al., 2000; see also Terry et al., 2000). Additionally, moral norms moderate the relation between attitudes toward marijuana use and intentions to use marijuana. Specifically, the attitude-intention association is strongest when the moral norms against using marijuana are more relaxed (Conner & McMillan, 1999; see also Grube & Morgan, 1999).

Principle 5 is also an acknowledgment that people sometimes construct a new attitude online (e.g., Wilson & Dunn, 1986). First, when beliefs are formed independently or when a prior belief-to-behavior inference is no longer accessible, people are likely to make belief-to-behavior inferences anew. Consistent with this possibility, attitude construction models (Schwarz, 2007) have explained that people often compute their attitudes on the fly based on information they retrieve from memory or encounter in their environments. For example, when people are asked to consider the reasons for their attitudes toward different types of beverages or games,

the correspondence between those attitudes and behavior is lower (Wilson & Dunn, 1986; see also Millar & Tesser, 1986). Presumably, analyzing reasons leads individuals to form attitudes based on temporarily accessible considerations, and these new attitudes, rather than the previous ones, drive behavior. However, this effect is not present when prior attitudes are highly accessible and remain influential even in the presence of different beliefs (Hodges & Wilson, 1993). People who need to make a behavioral decision may form a new belief-to-behavior inference online, reducing the behavioral impact of prior beliefs in favor of those just considered.

Proceduralization

A final consideration within our framework concerns how belief-to-behavior inferences are stored. On the one hand, if these inferences are stored as declarative knowledge, people may retrieve them and the associated behavioral attitude or intention when they become relevant to a future decision. On the other hand, if the inferences proceduralize, the belief-to-behavior inference can be compiled into an efficient production (Anderson, 1982). This possibility is summarized in Principle 6 below.

> *Principle 6. Inferences can become proceduralized.* When people make the same inference repeatedly, this inference can proceduralize. Once proceduralized, people compile those inferences into a single belief-to-behavior unit that can automatically guide behavior.

Principle 6 is connected to Anderson's (1982) notion that skill acquisition involves a shift from declarative knowledge to procedural knowledge, defined as a set of "if-then" production rules (see also Fitts & Posner, 1967; Schneider & Shiffrin, 1977; see Langan-Fox et al., 2002, for a review). Applied to the case of belief-to-behavior inferences, an individual may have the following set of propositions in mind: "If a vaccine has side effects, then I will miss work," "If I miss work, I will lose my job," and "If the vaccine can make me lose my job, then I will not receive it." Over time, this set of inferences may be compiled into a more straightforward inference stating, "If a vaccine has side effects, I will avoid it."

Initially, any process involving declarative knowledge requires paying attention to ensure one implements the process without errors. However, according to Anderson (1982), proceduralization evolves from a declarative process into an association in which one step of the process cues the other, with some parts of the process being declarative and others associative. This process is followed by knowledge compilation, which involves a proceduralization that inserts declarative knowledge as part of the procedure and a composition process that collapses multiple steps into a single step. However, Taatgen and Anderson (2002) later replaced these two processes with a single mechanism. For example, as illustrated by Taatgen and Lee (2003), if one needs to add three numbers (1, 2, and 3), one may initially retrieve declarative knowledge that provides the answer to $1 + 2 = 3$ and then may further retrieve declarative knowledge about $3 + 3$, arriving at 6. This computation initially involves several rules:

Rule 1: If the objective is to add three numbers, retrieve the sum of the first two numbers.
Rule 2: If the objective is to add three numbers and the sum of the first two has been retrieved, then retrieve the sum of this result and the third number.
Rule 3: If the objective is to add three numbers, and the sum of the first two and the third number has been retrieved, then the response is the retrieved sum.

However, with practice, these rules are condensed to a smaller number of rules. For example, Rules 1 and 2 can lead to "If the objective is to add 1, 2, and a third number, then retrieve the sum of 3 and the third number." Meanwhile, Rules 2 and 3 can lead to: "If the objective is to add three numbers and the third number is 3, and the sum of the first two numbers is 3, then the response is 6." With even more practice, all three rules may be combined: "If the objective is to add 1, 2, and 3, then the response is 6."

Competing models explain skill acquisition as a function of a race between processes. Specifically, Logan (1988, 1992, 2002) posited that people first execute a skill via the application of an algorithm (e.g., multiplying two numbers together). Every time a skill is performed, the experience of performing the skill is stored in memory in the form of a so-called instance. With practice, people can retrieve such instances from memory. These two processes—the operation of the algorithm and the retrieval of concrete instances—are proposed to run in parallel, with memory retrieval becoming dominant as experience accrues. A skill is said to become automatic when it is based on direct retrieval from memory. Regardless of the specific model applied, our main contention is that people can compile belief-to-behavior inferences into a single belief-to-behavior unit that can then automatically guide behavior.

Sharing information on social media might be an interesting case involving belief-to-behavior compilations (Ceylan et al., 2023). According to Ceylan et al. (2023), social media users who report sharing messages in an automatic, mindless way are more likely to share messages they perceive to be false or inconsistent with their beliefs. However, interventions can introduce accuracy cues to guide how information is shared. In those cases, habitual sharers asked to think about accuracy are more likely to share accurate information than nonhabitual ones (Ceylan et al., 2023). However, in Ceylan et al.'s (2023) study, the accuracy cue is introduced in the environment. However, Principle 6 implies that the cue could also be internal. That is, one may recall a belief repeated that triggers behavior automatically.

Conclusions

Even though beliefs have long been a subject of interest, understanding their impact on behavior has perhaps never been more important. A great deal of interest surrounds, for example, whether beliefs about climate change affect

environmental behaviors and whether conspiracy beliefs promote extremist behavior. However, the evidence of a small and variable belief-behavior association suggests the need to better explain the processes that link beliefs to behavior.

The theoretical framework we outlined proposes different types of beliefs (see Table 1) and describes the formation, storage, and recall of either beliefs or belief-to-behavior inferences. When beliefs are formed, having a behavioral (vs. informational) goal, having formed a belief-to-behavior inference, and a shorter distance between the belief and behavior in the inference determine the influence of belief on behavior in interaction with cognitive capacity. However, the relation between beliefs and behavior also depends on independently retrieved beliefs, behavioral attitudes and intentions, and proceduralized inferences. Our model also proposes factors that promote behavioral goals and integrates memory-based versus online construction of beliefs when a behavioral decision is made.

Before proceeding to a discussion of implications, we wish to briefly touch on some potential criticisms of our theoretical model. First, some readers may quarrel with our typology of beliefs and the idea that inferential length moderates the formation of belief-to-behavior inferences (Principle 2). Admittedly, creating a typology of the diversity of possible beliefs is difficult. We carefully considered how to best carve the literature on beliefs and arrived at our typology by integrating existing distinctions (e.g., Price, 1965) with other prominent kinds of beliefs (i.e., outcome beliefs; Fishbein & Ajzen, 1975) that seemed relevant to behavior. However, we welcome discussion and evidence about alternative classifications.

Second, skeptical readers may counter that the brain is geared toward action (e.g., Pezzulo et al., 2017), making beliefs automatically drive behavior. This notion runs counter to Principles 1 and 3. In this paper, we rely on several observations to support our proposition that belief-to-behavior inferences are crucial to understanding the belief-behavior relation and that behavioral goals moderate the formation of such inferences. First, the human mind is sufficiently complex to hold beliefs that serve social functions (Singh, 2024) without affecting overt behavior. Moreover, our assertion that people can hold beliefs without linking them to action fits nicely with the concept of "conspiracy hobbyists," which is a term colloquially used to describe those who believe conspiracy theories, but are simply curious to learn about them without, for example, joining an anti-vaccine protest.

Lastly, a crucial notion in our model is that people connect beliefs to behavior by engaging in practical reasoning leading to belief-to-behavior inferences. We can envision readers objecting to this aspect of our model given evidence suggesting that people are generally poor at logical reasoning. As noted earlier, however, our theoretical model concerns itself with practical reasoning, which refers to reasoning related to what one wants, should, or will do (Jones & Gerard, 1967). Although people may struggle with logical reasoning, people can and do reason about their behavior.

Implications of the Model

The purpose of our model is multifaceted. First and foremost, we sought to identify when beliefs influence behavior and the processes by which they do so. Certainly, the current model needs to undergo more extensive testing to verify its validity (see Table 2). For example, future research should test whether practical reasoning, rather than other mental processes like belief rehearsal, strengthens the belief influence on behavior. However, part of our motivation for developing our framework was to not take belief-behavior correspondence for granted and interest behavioral scientists in researching the underlying processes. Although exceptions certainly exist (e.g., Obaidi et al., 2022; Winter et al., 2022), up to this point, the behavioral research concerning conspiracy beliefs, for example, can largely be described as studying *whether* a belief-behavior relation exists. As we reviewed in the introduction, numerous high-quality meta-analyses have examined whether beliefs predict behavior, providing evidence from which to draw conclusions. However, the field would benefit from a deeper exploration of *how* and *when* beliefs influence behavior.

Developing a comprehensive theoretical framework to understand how beliefs influence behavior represents an important milestone for the basic science of beliefs. Additionally, testing and refining the theoretical principles outlined in this manuscript may also inspire interventions to bolster the impact of beliefs on personally and socially beneficial behavior or reduce belief influences on detrimental behaviors. For example, belief-based health interventions may promote behavior if bolstered by behavioral goals that encourage practical reasoning. Another approach may be to assess what belief-to-behavior inferences a population has formed and to decouple belief from behavior without necessarily contradicting the beliefs. Yet another may be to delay detrimental behavior by lengthening belief-to-behavior inferences and introducing doubt at earlier points of the chain.

Acknowledgements

The authors thank Bertram Gawronski, Russell Fazio, Alan Lambert, Joseph Sommers, and Robert S. Wyer for outstanding comments on an earlier version of this manuscript.

Disclosure statement

No potential conflict of interest was reported by the authors.

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