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ABSTRACT

This research examines how consumers judge a product's effectiveness based on its legal status. Across eight pre-registered experiments, we find that consumers tend to believe legal products are less effective than illegal ones. Even when observing identical, objective product outcomes (e.g., equal weight loss from a drug), consumers perceive reduced product benefits from a product described as legal (vs. illegal). We test an account of why this belief occurs. When a product is legal, consumers infer that the government allows broad access to it, which they associate with lower product strength. In contrast, illegal products, which consumers presume are harder to access, are viewed as higher in product strength. This strength inference leads consumers to believe a legal product produces smaller effects than an illegal product—both smaller positive effects (lower efficacy) and smaller negative effects (lower harm). Supporting this theory, the impact of legality on perceived efficacy is eliminated if legal and illegal products are described as equally accessible or equally strong. We further demonstrate that these beliefs influence consumer choice. Given the significant health and economic consequences of illegal product consumption, this research has important implications for consumers, marketers, public health professionals, and policymakers.

Keywords: legality, lay beliefs, efficacy, safety, product evaluations, health decision-making

In the United States alone, over 30 million individuals (11.2% of the population over the age of 12) report recent use of illegal drugs (CDC, 2017). Even when a class of products is legalized, illegal markets, and therefore use of illegal drugs, often persist. For example, although marijuana is legal in California, there were more illegal than legal sellers of marijuana in the state as of 2019 (Romero, 2019). The continued existence of these illicit markets has economic implications, such as loss of tax revenue (Report, 2018), and the use of illegal products has important consumer welfare implications. Although illegal product use is somewhat prevalent, it remains unclear what consumers believe about these products and how their interest is influenced by the legality of the product. Consider the case of Cannabidiol (CBD), a chemical found in marijuana. Before 2018, the sale of CBD was illegal in many U.S. states. Still, CBD was sought after and often touted for its potential benefits for treating anxiety, seizures, pain, insomnia, and other ailments (Kohn, 2016). In recent years, products containing CBD have become legal and widely available, which likely made the drug appear safer and more socially acceptable to consumers (Kosterman et al., 2016; Schuermeyer et al., 2014). But might the fact that CBD is now legal also affect consumers' beliefs about its promised benefits?

The current research systematically examines the relationship between product legality and perceptions of efficacy. There are many domains, such as health, wellness, and personal care, wherein product efficacy plays a key role in consumer preference and purchase likelihood (Lai, 1995; Polman et al., 2022). Across a variety of these products (e.g., pain relievers, teeth whiteners, and weight loss supplements), we find that people believe the same product is less effective if it is legal as opposed to illegal. In fact, even when viewing *identical information* about a product's effects (e.g., the same before and after photos), individuals who were told that

the product was legal report fewer benefits (i.e., reduced efficacy) than those who were told it was illegal.

We propose that when consumers encounter a legal (vs. illegal) product, it shapes their subsequent inferences. Specifically, when consumers learn that a product is legal, they focus on the idea that the government has chosen not to restrict access to it. This leads them to infer that the product must be weaker. These judgments about product strength then influence their beliefs about its outcomes: consumers assume that weaker products will have smaller consequences—both in terms of lower efficacy (smaller positive outcomes) and reduced harm (smaller negative outcomes). In short, when consumers learn a product is legal (vs. illegal), they infer it has been made widely accessible by the government, which leads them to conclude it is weaker and, therefore, less effective. Said differently, when consumers learn a product is illegal (vs. legal), they infer it has been made less accessible by the government, which leads them to conclude it is stronger and, therefore, more effective. This "legal-is-less-effective-than-illegal" belief has important implications for consumer interest in illegal products, offering practical insights for policymakers and public health professionals.

LAY BELIEFS ABOUT LEGALITY

Whereas legal products are broadly those that can be bought and sold under the law, illegal products are those for which buying or selling is explicitly forbidden. There are many factors affecting the legality of a product, ranging from micro-level concerns about the product's consequences for its users (e.g., safety and effectiveness) to more macro-level social and political concerns. Agencies like the U.S. Food and Drug Administration (FDA) allow products (e.g.,

drugs, cosmetics, foods, and other goods) to be sold if the benefits are deemed to outweigh the harms. In the United States, when the FDA approves a drug for use, they first run clinical trials to measure both safety and effectiveness and determine whether the drug has sufficient benefits to go to market (NIH, 2016). Therefore, a product could be prohibited because it is unsafe or because it is not sufficiently effective. Other times, products may be illegal for reasons completely divorced from safety and efficacy evaluations. For instance, the sale of phosphate laundry detergents was banned in some states to reduce water pollution (Mazis et al., 1973) and the trade of rhino horn, which was traditionally used for medicinal purposes, was banned to protect endangered rhinoceros populations (Hsu, 2017). Although many products can be deemed legal or illegal, here we focus on products that are regularly conceptualized by lay consumers in terms of safety and efficacy (e.g., drugs and cosmetics) as opposed to other goods (e.g., stolen art or counterfeit handbags). While a great deal of research has examined why products are legalized, less is known about consumers' lay beliefs surrounding legality.

Consumers often lack complete information about their product choices, either because attributes cannot be observed or because procuring attribute information is effortful. In situations where attributes are not easily observed, consumers often make inferences about these attributes based on their lay beliefs. For example, a consumer might infer that a product is high quality because it has a warranty (Boulding & Kirmani, 1993), or infer that a food is less tasty because it is healthy (Raghunathan et al., 2006). Oftentimes, these beliefs involve looking at an easily observable attribute (e.g., whether there is a warranty) to make an inference about a difficult-to-observe attribute (e.g., product quality). In the present paper, we examine lay beliefs about products based on the attribute of legality—whether a product is legal or illegal.

On the one hand, one possibility is that consumers believe legal products are both safer, and more effective, than illegal products. Consumers might assume that legalized goods have passed a government evaluation process and are therefore overall "better," whereas illegal products are worse across all attributes. If legality is viewed as a positive attribute (and illegality as a negative attribute), then legality might lead to inferences consistent with a halo effect. The halo effect and the affect heuristic (Chernev & Blair, 2020; Nisbett & Wilson, 1977; Slovic et al., 2007) predict that when consumers view one positive attribute (e.g., legality) they will be more likely to infer other positive attributes (e.g., efficacy). In line with this account, individuals tend to believe that brand medications are both safer and more effective than generic medications (Tootelian et al., 1988). It is, therefore, plausible that if consumers perceive legality as a positive attribute, they may perceive legal goods as better on other attributes, such as being safer and more effective. Conversely, consumers may then perceive illegal goods more negatively on other attributes, such as being less safe and less effective.

On the other hand, it's also plausible that consumers will not infer that greater safety will entail greater efficacy—as is the case with some classes of products. In the context of sustainability, for example, sustainable goods are perceived as safer but also *less* effective than their conventional counterparts (Luchs et al., 2010). This research introduces the possibility that, analogously, consumers may view legal goods as safer but less effective than illegal goods. We test and find evidence for this hypothesis through a series of controlled experiments using a variety of products. We also examine why this belief emerges and focus on the role of product strength as a driver of beliefs about safety and efficacy.

HOW BELIEFS ABOUT PRODUCT ACCESSIBILITY AND STRENGTH AFFECT EFFICACY PERCEPTIONS

Why would consumers believe that legal products are not only safer, but also less effective, than illegal products? To answer this, we consider the inferences consumers draw about accessibility, strength, and ultimately safety and efficacy when they learn a product is legal or illegal. First, we propose one possibility is that consumers interpret the government's decision to legalize a product as an indication that it is suitable for broad public access.[1] At the same time, consumers may associate illegality with restricted access.

Second, we propose that consumers make inferences about a product's strength based on these beliefs about accessibility. Consumers often form lay beliefs about strength attributes, believing, for example, that natural (vs. unnatural) products are less potent (Scott et al., 2020). In this case, based on their belief that the government has deemed a product as suitable for broad access, consumers may infer that such a product is weaker. Consumers may draw these conclusions from observed patterns in the marketplace, where stronger products are often subject to government restrictions while weaker products are not. For example, quantity limits are placed on certain stronger products, such as cold medicines containing pseudoephedrine (FDA, 2017), and there are often government-imposed restrictions on higher-strength liquors compared to lower-potency alcohols like beer and wine (Butera, 2023). These everyday examples may reinforce the belief that restricted access correlates with greater potency. As a result, consumers

[1] Of course, there are many reasons for which a product might be more or less accessible—for instance, a product might be less accessible due to a supply chain issue or even an ingredient having a bad growth season. In the context of the current research, we propose that when seeing a product that is legal (vs. illegal), consumers focus on the government's role in choosing whether to make it more (vs. less) accessible.

may generalize this association: legal products, by virtue of being more accessible, are perceived as weaker, whereas illegal products, restricted by law, are seen as stronger.

This lay belief that more accessible products are weaker may be true in some product categories. Previous research in criminology warns that as law enforcement efforts to reduce access towards a prohibited substance increase, the strength of the substance often increases as well, because distributors find it safer and more profitable to transport more concentrated substances (Mosher & Akins, 2020). This was seen in the increased popularity of (highly potent) whiskey as opposed to (less potent) beer during Prohibition (Gray, 2010). While more accessible products are often less potent, the reverse can also be true. In unregulated markets, sellers may reduce the potency of restricted substances by diluting them with cutting agents to increase profit (Solomon & Hayes, 2017), and lab tests show that legal marijuana available in Colorado is nearly twice as strong as illegal marijuana of past decades (ElSohly et al., 2016). However, we suggest that consumers, on average, rely on a belief that more accessible products are weaker and restricted products are stronger, overapplying this belief to contexts where it is inaccurate.

Third, we propose that, if consumers infer that legal products have been deemed more suitable for broad access and therefore are weaker than illegal products, this may influence the perceived risks and benefits of legal and illegal products. Specifically, we suggest that this "legal equals weaker" inference leads people to believe legal products will produce smaller positive consequences (i.e., will be less effective) and smaller negative consequences (i.e., will be less harmful). To understand how product strength influences perceptions of other attributes, such as efficacy, we build on recent work examining how consumers make judgments about a product's strength (Keren & Teigen, 2001; Kupor & Laurin, 2020; Sussman & Oppenheimer, 2020). For example, Kupor and Laurin (2020) found that consumers believe products with more probable

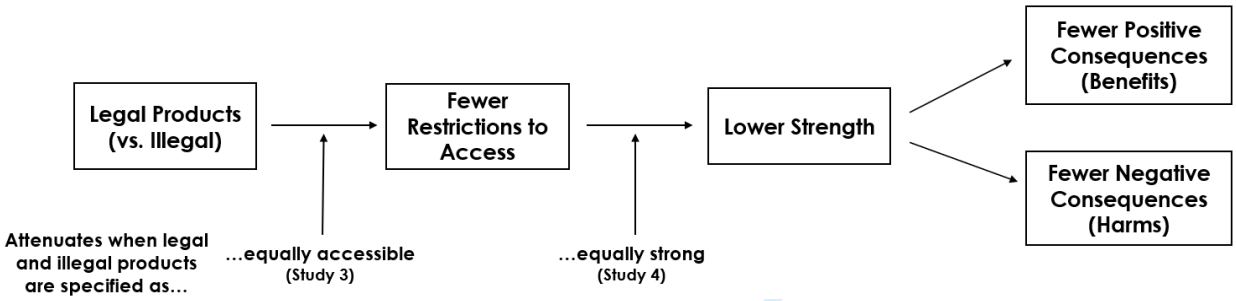
outcomes will generate larger outcomes, due to the belief that these products have more powerful antecedents. This work concludes that a product's perceived power thus influences magnitude judgments of the product's positive and negative consequences (benefits and harms). Similarly, in the present work, we propose that the lower perceived strength of legal products explains consumers' perception that legal products have smaller consequences—both smaller positive consequences (lower benefits) and smaller negative consequences (less harm).

Of note, strength and efficacy are distinct constructs (Waldman, 2002). An effective product can be defined as one that adequately accomplishes its purpose and produces its intended result. "Effectiveness" is specific to a desired result (e.g., reducing pain). On the other hand, a strong product is one that produces a powerful physical or chemical effect. Strength is more general. A strong product creates large outcomes, which could be positive or negative and could be related or unrelated to the intended outcome. Indeed, efficacy and strength often diverge. For example, some things are strong and ineffective. Viagra (sildenafil) is a strong drug, but it failed clinical trials initially because it was deemed ineffective for its original intended use (hypertension and angina; Perel, 2023). Potency and efficacy can also diverge due to heterogeneous reactions to medications like anti-depressants. Two people could take an equal dosage of an antidepressant with substantially different results (Maslej et al., 2020). It may be effective for one individual, relieving them from their depression, and be ineffective for another, failing to relieve their symptoms or even worsening them. A product can also be less strong while remaining effective. For example, people regularly seek gentle and effective skin cleansers, such as a product that reduces breakouts without irritating the skin.

Our conceptual model in Figure 1 outlines our theory. Specifically, we propose that because people infer that a legal product has been made widely accessible, this leads them to

assume it is lower in strength, and, consequently, they believe these products will lead to smaller outcomes (both positive and negative). One corollary of this theory is that if a legal and illegal product are specified as equal in strength, the difference in efficacy should be attenuated or eliminated. Thus, based on our theory, we expect that providing information about product strength will moderate the legality-efficacy relationship. Therefore, we predict that providing information about product strength will moderate the relationship between legality and perceived efficacy. Additionally, because we propose that consumers view illegal products as stronger due to government-imposed access restrictions, we expect that equating information about product accessibility will also reduce the perceived differences in strength and efficacy.

FIGURE 1
CONCEPTUAL MODEL



THE CURRENT RESEARCH

In eight pre-registered studies, we find that consumers consistently believe that legal products are less effective than illegal products for a range of intended uses, including relieving pain, whitening teeth, growing longer eyelashes, and losing weight. In Studies 1A-1C, a product with the same objective information about outcomes (e.g., before and after photos) is perceived as less effective when described as legal (vs. illegal). Next, we examine consumer inferences about product strength as a mechanism via mediation (Study 2) and moderation (Studies 3 and

4). Consumers tend to believe legal products are weaker and therefore believe that use of legal products will cause fewer positive consequences (legal is less effective) and fewer negative consequences (legal is safer; Study 2). Consistent with findings from other lay theories—where consumers may draw incorrect inferences from superficial cues or stereotypes (Cronley et al., 2005; Haws et al., 2017; Kardes et al., 2004; Nisbett & Ross, 1980; Nisbett & Wilson, 1977)—we find that providing disconfirming evidence moderates this effect. Specifically, informing participants that the government limits access to a product (whether legal or illegal; Study 3) or that legal and illegal products are equally strong (Study 4) leads consumers to perceive legal products as just as effective as illegal products.

Due to consumers' interest in product safety and efficacy, these inferences based on legality have important consumer implications, which we test in additional studies. Studies 5A and 5B examine consumption consequences in a hypothetical experiment and a field setting. Consumers are less interested in legal products, and more interested in illegal ones, when prioritizing product effectiveness (Study 5A). We also find that fewer consumers click on an ad for a legal product when it is described as more effective than legal (vs. illegal) alternatives (Study 5B).

All studies were pre-registered; all study materials, data, code, and pre-registrations are publicly available on ResearchBox (https://researchbox.org/2126). For studies that exclude participants using pre-registered attention checks, we find consistent effects (statistically significant effects remain significant and in the same direction) when all participants are included.

STUDY 1: LEGAL PRODUCTS ARE LESS EFFECTIVE

In Studies 1A-1C, we test our central hypothesis, that consumers believe legal products are less effective than illegal products. Adapting stimuli from previous experiments (Kupor & Laurin, 2020), we designed conservative tests of the lay belief that legality indicates lower efficacy. In each of these studies, participants judged the effectiveness of a product whose outcomes could be objectively observed or described. This builds from prior research, which shows that even when outcomes are objective, individuals often rely on their pre-existing beliefs to form judgments (Goksel et al., 2022). In fact, even clinicians given evidence-based health information display bias in both their diagnoses (Kim & Ahn, 2002) and their perception of intervention efficacy (De Kwaadsteniet & Hagmayer, 2018). In the present research, participants were told that a product was either legal or illegal. They then either read identical numerical information about the product's effect and were asked to visually describe the results (Study 1A) or viewed identical visual stimuli depicting the product's effect and were asked to report the magnitude of the results (Studies 1B and 1C). We predicted that despite both conditions receiving identical information about drug effects, those in the legal (vs. illegal) condition would report that the drug had a smaller effect on weight loss (1A), eyelash lengthening (1B), and teeth whitening (1C).

STUDY 1A: WEIGHT LOSS AND MUSCLE ENHANCEMENT DRUG

Study 1A tests the existence of this belief—legal products are less effective than illegal ones—by providing participants with identical numerical information about the effect of a weight loss and muscle enhancement drug. Participants were asked to report their estimate of the

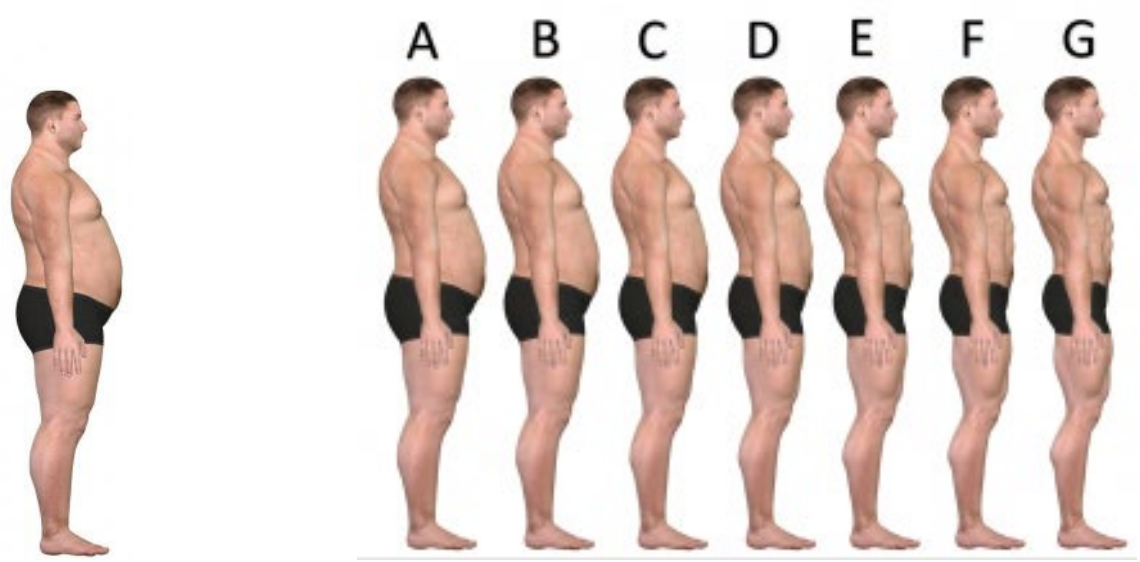
drug's effect by selecting from a series of before and after photographs. We predicted that, despite reading identical information about the effect of the drug, participants would select a photograph depicting a smaller difference (i.e., less weight loss and muscle enhancement) if they read that the drug was legal (vs. illegal).

Method

As outlined in our pre-registered research plan (https://aspredicted.org/3FC_NKN), we aimed to recruit 900 participants from Prolific and ended up with a sample of 901 participants (M_{age} = 38.69 years, 49.28% female, 49.06% male, 1.66% other).

Participants were randomly assigned to one of three conditions and read about a drug that was either 1) legal, 2) illegal, or 3) unspecified legality (control). Participants were asked to imagine, "For the past eight months, a friend has been taking a weight loss and muscle enhancement drug that they bought online." Those not in the control condition also read, "This weight loss drug is [legal/illegal] in the United States." All participants viewed a picture of an individual and were told that it was a picture of their friend prior to taking the drug. Participants then read, "Your friend is 5'11''." After taking the drug for eight months, he went from 26% body fat to 16% body fat." On the same page, participants saw seven photos of the same man lined up from highest to lowest body fat, labeled A-G (see Figure 2). They were asked, "Which of the pictures from the lineup do you think would most accurately show the results of your friend using the weight loss and muscle enhancement drug?"

FIGURE 2
STUDY 1A STIMULI



Results

All photos in the series were re-coded as numbers (1 = least change, 7 = most change). A between-subjects ANOVA revealed a significant main effect of legality, ($F(2, 898) = 3.75$, $p = .024$). Despite reading identical outcome information about the individual's body fat reduction in both conditions, participants selected an "after photo" that showed less physical change in the legal condition ($M_{Legal} = 3.95$, $SD = 1.15$) than in the illegal condition ($M_{Illegal} = 4.21$, $SD = 1.37$; $t(604) = 2.46$, $p = .014$, $d = .20$). In other words, those in the legal (vs. illegal) condition believed that the drug was less effective.

In the control condition, in which legality was not mentioned, participants believed the drug was less effective than in the illegal condition ($M_{Control} = 3.99$, $SD = 1.17$; $t(599) = 2.11$, $p = .035$, $d = .17$). There was a non-significant difference between the control and legal conditions ($t(593) = .35$, $p = .73$), which may be due to an assumption that, unless otherwise specified, products are likely legal. Indeed, in the control condition, we asked participants whether they believed the drug was legal or illegal and the majority (63.05%) reported that they believed the drug was most likely legal.

STUDY 1B: EYELASH LENGTHENING PRODUCT

Study 1B tested the belief that legal (vs. illegal) products are less effective with a different product (an eyelash lengthening serum). Whereas in Study 1A participants were given identical *numerical* information about the effect of a drug and then asked to judge its effectiveness, Study 1B examined whether this belief persists when individuals view identical *visual* information (in this case, a before and after photograph of the serum's results) and report the numerical magnitude (the length of the eyelashes in the after photograph). We predicted that, despite seeing identical before and after photos, participants would report a smaller numerical difference (i.e., less eyelash growth) if they were told that the serum was legal (vs. illegal).

Method

As outlined in our pre-registered research plan (https://aspredicted.org/blind.php?x=ua9zk8), we aimed to recruit 300 participants from Amazon's MTurk through Cloudresearch and 301 completed the survey. We excluded those who failed the attention check (n = 8), leaving us with a sample of 293 participants (M_{age} = 37.16 years, 58.02% female, 41.30% male, .68% other).

Participants were randomly assigned to either read about a legal or illegal product. They were asked to imagine the following, "An acquaintance recently bought an eyelash serum, which claims to give users longer, fuller eyelashes in 16 weeks. The eyelash serum is [legal/illegal] in the United States. Below are the results of this acquaintance using the [legal/illegal] eyelash serum for 16 weeks. Please carefully examine this picture as we will ask you about it on the following page." Participants then viewed two photos of eyelashes, the one on top labeled "0

weeks" and the one below labeled "16 weeks" (these stimuli were previously used by Kupor and Laurin, 2020; see ResearchBox for survey materials).

On the following page, participants read, "Before using the [legal/illegal] eyelash serum, your acquaintance's eyelashes were about 0.4 inches long. Please estimate how long her eyelashes were after 16 weeks of using the [legal/illegal] eyelash serum." They could then select a value from 0.40 to 0.85 inches to describe the eyelash length in the "after" photo, by increments of 0.05 inches.

Results

The responses were recoded to reflect perceived eyelash growth. We calculated perceived eyelash growth by subtracting the initial length of the lashes (.40 inches) from each participant's estimate of the final length of the eyelashes (between .40 and .85). Perceived growth therefore ranged from 0 to .45 inches. As predicted, despite seeing the same before and after photos, participants who read about the legal eyelash serum judged the individual's eyelashes as having grown less (M_{Legal} = .19 inches, SD = .10) than those who read that the serum was illegal ($M_{Illegal}$ = .22 inches, SD = .11; $t(291) = 2.14$, $p = .033$, $d = .25$).

STUDY 1C: TEETH WHITENING PRODUCT WITH INCENTIVIZED EFFICACY ESTIMATES

In Study 1C, we used an incentivized task to test the belief that legal products are less effective than illegal products. In this study, participants were presented with visual outcome information about the effectiveness of a product: pictures of a fictional acquaintance's teeth before and after teeth whitening. Later, they were paid a bonus if they correctly indicated the color of this acquaintance's teeth in the "after" photo. Similar to Studies 1A and 1B, this study

offers a conservative test of our hypothesis. The outcome information was objective and identical across conditions—participants received the same details, with the only difference being whether they were told the product was legal or illegal. Furthermore, this experiment was incentive-compatible such that participants were given a financial reward if they selected the accurate after photo. We predicted that participants who read that the teeth-whitening product was legal would choose a less-white shade as the "after" photo (i.e., lower product effectiveness).

Method

As outlined in our pre-registered research plan (https://aspredicted.org/blind.php?x=53vh4f), we aimed to recruit 300 participants from Amazon's Mturk through Cloudresearch and ended up with a sample of 306 participants. We excluded participants who failed the attention check (n = 6), leaving us with a sample of 300 (M_{age} = 37.13 years, 50.00% female, 50.00% male).

Participants were assigned to either read about a legal or illegal product. They were asked to imagine the following: "An acquaintance has been using a teeth-whitening product that they purchased online. This teeth-whitening product is [legal/illegal] in the United States. Below is a picture of the acquaintance before and after they began using the [legal/illegal] teeth-whitening product. Take a close look at these pictures as you will be asked about them on the next page." Participants viewed a photo of a smile that was labeled "before" on the left and "after" on the right. The teeth on the "before" side were more yellow and on the "after" side were whiter (see ResearchBox for survey materials).

Participants then went to the next page and saw a series of eight color swatches from dark yellow to bright white. Participants were asked, "Based on the previous picture, which of the following matches your acquaintance's teeth after using the [legal/illegal] teeth whitening

product?" Participants were incentivized to be accurate—they read that they would receive a 10-cent bonus if they chose the correct shade.

Results

The colors in the series were re-coded as numbers (1 = darkest yellow, 8 = brightest white). Despite seeing the same photos, participants in the legal condition, on average, selected a color swatch depicting a lower magnitude of teeth whitening (M_{Legal} = 6.67, SD = 1.23) than those in the illegal condition ($M_{Illegal}$ = 7.05, SD = 1.00; $t(298) = 2.98$, $p = .003$, $d = .34$).

Discussion

Studies 1A-1C offer evidence that consumers use knowledge about a product's legality to make inferences about the product's efficacy. Participants indicated that a product was less effective when it was described as legal, whereas they ascribed greater benefits or effectiveness to the products when they were described as illegal, despite viewing the exact same stimuli (e.g., before and after images) across conditions.

The results of these initial three studies offer a rigorous and conservative test of this lay belief for several reasons. First, information about legality was experimentally manipulated, and other information was held constant (including the objective outcomes of the products). Second, the efficacy was readily observed and described for these products, reducing ambiguity. We expect that, in most cases that consumers encounter, efficacy evidence is ambiguous, and prior research suggests the impact of such biases is even stronger under ambiguous or uncertain conditions (Kruger et al., 2004; Tversky & Kahneman, 1974). Therefore, reducing ambiguity makes the test more conservative. Third, we find this effect persists even when individuals are financially incentivized to accurately report the product's effectiveness. In other words, this

belief influences judgments even when participants are extrinsically motivated to provide the correct answer.

Studies 1A-1C also show the robust influence of legality on efficacy perceptions across operationalizations. Legal products were perceived as less effective across a variety of efficacy measures (i.e., numerical estimates and visual estimates) and across a variety of products (i.e., teeth whitener, weight loss drug, and eyelash serum). We consistently find that, despite receiving identical stimuli and information in both conditions, consumers who were told that a product is legal (vs. illegal) perceived that the product produced smaller benefits. Next, we begin to examine the psychological mechanism underpinning this effect.

STUDY 2: THE MEDIATING ROLE OF PRODUCT STRENGTH

We designed Study 2 with several goals in mind. First, whereas Studies 1A-1C tested participants' perceptions of the outcomes of legal versus illegal products used by other people, Study 2 tests what participants predict will happen if they themselves use a legal versus illegal product. Second, we test our prediction that consumers judge legal products as having both smaller positive consequences (effectiveness) and smaller negative consequences (safety concerns). Third, in Study 2 we test the mediating role of perceived product strength for both positive and negative consequences. Finally, we generalize our findings by examining whether these effects extend to an additional, important product: pain relief medication. We hypothesized that participants anticipate a legal product to be less effective, but also safer than an illegal product, and that this effect is mediated by perceptions of product strength.

Method

As outlined in our pre-registered research plan (https://aspredicted.org/blind.php?x=ae3633), we aimed to recruit 400 participants from Amazon's Mturk through Cloudresearch and ended up with a sample of 406 participants. We excluded participants who failed the attention check (n = 22), leaving us with a sample of 384 (M_{age} = 38.73 years, 53.13% female, 45.05% male, 1.82% other).

Participants were assigned to read about either a fictional legal or illegal product. They were asked to imagine the following: "Stava is a beverage made from Piper Methysticum, a plant native to the western Pacific Islands. Stava is typically used as a medicinal pain reliever." Participants then read, "Stava is [legal/NOT legal] in the United States." Participants responded to several items regarding their perceptions of the product (all randomized). Our main dependent variable of interest was perceived effectiveness ("How effective do you think Stava will be at reducing your pain?"). We also asked about strength perceptions using two items ("How strong do you think Stava is?" and "How potent do you think Stava is?"; r = .81, p < .001) and safety concerns using two items ("How unsafe do you think Stava is?" and "How concerned would you be about the side effects of Stava?"; r = .61[2], p < .001). All items were asked on 7-point scales (from "Not at all" to "Very"). Finally, participants answered the following attention check: "Which of the following is true about the beverage Stava?" ("Stava is legal" or "Stava is NOT legal").

Results

As predicted, participants believed the legal product would not be as strong as the illegal product (M_{Legal} = 4.08, SD = 1.27 vs. $M_{Illegal}$ = 4.93, SD = 1.06; t(382) = 7.11, p < .001, d = .73).

[2] We pre-registered analyzing these two safety concern items separately if r < .70. The results are similar whether the items are analyzed separately or combined. Therefore, for the sake of brevity and consistency with other studies in this paper, we use the composite measure.

Consistent with our hypothesis, participants believed the legal product would be less effective (M_{Legal} = 4.22, SD = 1.37) than the illegal product ($M_{Illegal}$ = 4.71, SD = 1.21; $t(382) = 3.67$, $p < .001$, $d = .37$). Also, consistent with our theory, safety concerns were reduced for the legal (vs. illegal) product (M_{Legal} = 3.64, SD = 1.35 vs. $M_{Illegal}$ = 4.49, SD = 1.22; $t(382) = 6.49$, $p < .001$, $d = .66$).

Mediation. We conducted a mediation analysis to examine the role of perceived strength in the effect of legality on perceived effectiveness. This analysis (10,000 resamples) revealed that strength perceptions significantly mediated this relationship (indirect effect = -.58, 95% CI = [-.76, -.41]). We found that learning a product is legal (vs. illegal) decreased strength perceptions (a = -.85, $p < .001$), which then decreased effectiveness judgments ($b = .68$, $p < .001$). The relationship between legality and effectiveness no longer reached statistical significance when strength was included in the model ($c' = .09$, $p = .417$; see Figure 3).

We also conducted a mediation analysis to examine the role of perceived strength in the effect of legality on safety concerns. This analysis (10,000 resamples) revealed that perceptions of strength significantly mediated this relationship (indirect effect = -.24, 95% CI = [-.36, -.12]). We found that learning a product is legal (vs. illegal) decreased strength perceptions (a = -.85, $p < .001$), which reduced safety concerns ($b = .28$, $p < .001$). The relationship between legality and safety concerns remained significant (albeit smaller) when strength was included in the model ($c' = -.62$, $p < .001$; see Figure 3).

FIGURE 3
MEDIATING ROLE OF STRENGTH ON EFFICACY AND SAFETY CONCERNS

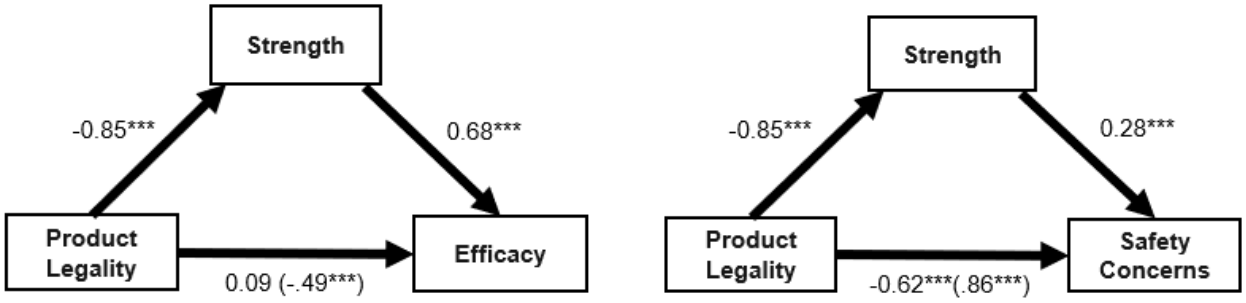


Figure 3: The relationship between product legality and judgments of efficacy and safety concerns as mediated by perceived product strength. Total effect is in parentheses.

Discussion

Study 2 complements Studies 1A-1C, providing further evidence for the relationship between legality and beliefs about efficacy. Whereas Studies 1A-1C measured the impact of legality on *perceptions* of efficacy after being given objective outcome information, Study 2 demonstrates the influence of legality on *predictions* of product efficacy. We found that participants, on average, predict a legal (vs. illegal) pain reliever will be less effective and also report lower safety concerns about the legal product. Moreover, consistent with our proposed framework, we find that perceptions of product strength mediate the relationship between legality and predicted consequences for both positive outcomes (effectiveness) and negative outcomes (safety concerns).

We also used this data to test an alternative mechanism, that safety drives the relationship between legality and efficacy, which we call the safety mechanism account. We tested this possibility in exploratory (not pre-registered) analyses, but did not find evidence for it. Safety concerns did not significantly mediate the relationship between legality and efficacy (indirect effect = .03, 95% CI [-.06, .14]). According to this model, legality did reduce the perception that a product was unsafe (a = -.85, p < .001). However, viewing a product as more unsafe did not then significantly alter perceived efficacy (b = -.04, p = .436). Moreover, the correlation between

safety concerns and perceived efficacy was negligible here (r = .021, p = .683). Therefore, we find not only strong evidence for our proposed strength mechanism (a significant indirect effect via strength) but also do not find evidence for an alternative account of safety as a mechanism. Next, we continue to test our proposed mechanism through moderation.

STUDY 3: MODERATION BY ACCESS INFORMATION

In Study 2, we found mechanistic evidence through mediation. Consumers tend to believe legal products are weaker, and this belief leads to lower efficacy perceptions. We designed Studies 3 and 4 to further examine why consumers infer legal products are less effective than illegal ones, using a moderation technique (Spencer et al. 2005). Here we directly test the role of inferences about restricting access in the model laid out in Figure 1. We hypothesized that consumers focus on one key aspect of legality—that legal products are made broadly accessible—leading to the inference that these products are likely weaker and therefore less effective. Thus, in this study we assess whether informing participants that the government limits access to a product (whether legal or illegal) will attenuate our effects, leading legal and illegal products to be seen as similarly strong and therefore similarly effective.

Method

As outlined in our pre-registered research plan (https://aspredicted.org/26J_TZK), we aimed to recruit 1200 participants from Prolific and 1208 completed the survey. Following our attention check, we ended up with a sample of 1142 participants (M_{age} = 41.45, 55.95% female, 41.51% male, 2.54% other).

Using a 2 (legal vs. illegal) x 2 (control vs. access) between-subjects design, we tested whether the relationship between legality and perceived efficacy attenuates when participants are informed that the government limits access to a drug. Specifically, participants read the same information about "Stava" from Study 2 in all conditions. Then, those in the access condition (but not in the control condition) read, "The government strictly limits access to Stava." All participants next read "Stava is [legal/NOT legal] in the United States."

Participants responded to several items regarding their perceptions of the product (randomized). Our main dependent variable of interest was perceived effectiveness ("How effective do you think Stava will be at reducing your pain?"). We also asked about strength perceptions using the two items used in Study 2 ("How strong do you think Stava is?" and "How potent do you think Stava is?"; $r = .90$, $p < .001$).

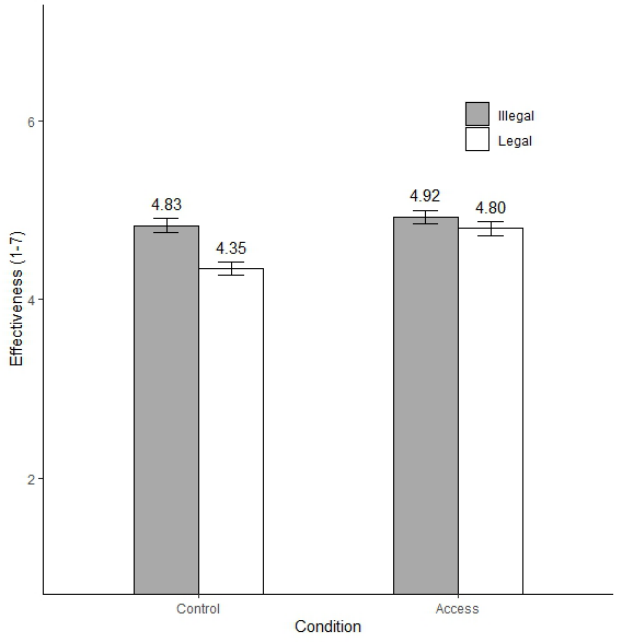
Results

Strength. A 2 (legal vs. illegal) × 2 (control vs. access) ANOVA on strength revealed a significant main effect of legality, $F(1, 1138) = 74.27$, $p < .001$, $\eta_p^2 = .06$, and a significant main effect of access information, $F(1, 1138) = 23.17$, $p < .001$, $\eta_p^2 = .02$, qualified by a significant interaction, $F(1, 1138) = 7.49$, $p = .006$, $\eta_p^2 = .01$. In the control condition, participants viewed Stava as weaker when it was legal ($M_{Legal} = 4.26$, $SD = 1.28$) than when it was illegal ($M_{Illegal} = 5.12$, $SD = 1.27$; $t(577) = 8.11$, $p < .001$, $d = .67$). This difference was smaller, though still statistically significant, when we specified that the government limits access to this product ($M_{Legal} = 4.83$, $SD = 1.34$ vs. $M_{Illegal} = 5.27$, $SD = 1.26$; $t(561) = 4.04$, $p < .001$ $d = .34$).

Effectiveness. A 2 (legal vs. illegal) × 2 (control vs. access) ANOVA on efficacy revealed a significant main effect of legality, $F(1, 1138) = 15.90$, $p < .001$, $\eta_p^2 = .01$, and a significant main effect of access information, $F(1, 1138) = 12.89$, $p < .001$, $\eta_p^2 = .01$, qualified by a

significant interaction, $F(1, 1138) = 5.18$, $p = .023$, $\eta_p^2 = .01$ (see Figure 4). In the control condition, participants viewed Stava as less effective when it was legal ($M_{Legal} = 4.35$, $SD = 1.26$) than when it was illegal ($M_{Illegal} = 4.83$, $SD = 1.36$; $t(577) = 4.42$, $p < .001$, $d = .37$). There was no longer a statistically significant difference in effectiveness when we specified that the government limits access to this product ($M_{Legal} = 4.80$, $SD = 1.31$ vs. $M_{Illegal} = 4.92$, $SD = 1.30$; $t(561) = 1.16$, $p = .245$).

FIGURE 4
STUDY 3: EFFECTIVENESS AS A FUNCTION OF LEGALITY AND ACCESS



NOTE: Error bars represent standard errors of the mean.

Moderated mediation. We conducted a moderated mediation analysis (Model 7; Hayes, 2017) to further test our proposed mechanism. We set legality as the independent variable, perceived effectiveness as the dependent variable, and perceived strength as the mediator. The experimental manipulation of access information was a moderator variable (on the a-path between legality and perceived strength). The model supported our hypothesized moderated mediation (index of moderated mediation = 0.31, 95% CI [0.09, 0.53]). Legality had a significant

indirect effect on effectiveness via strength, and that indirect effect was conditional on the access information. In the control condition, there was a significant indirect effect of legality on effectiveness via strength (indirect effect = -0.64 (95% CI [-.79, -0.48]). There was a smaller, but still significant, indirect effect in the condition where access was specified (indirect effect = -0.33 (95% CI [-0.49, -0.17]).

Discussion

Study 3 provides evidence that consumers specifically consider beliefs about product access when evaluating the strength and efficacy of legal and illegal products. We show that legal products are considered less strong and less effective at baseline, but when we inform participants that the government limits access to a legal product, participants believe it is as strong and effective as an illegal product with the same access description. In other words, while legality information may lead to a host of inferences, we find that consumers consider the government's choice to restrict access to illegal products—and offer broad access to legal products—when forming beliefs about the product's strength, and therefore its efficacy.

STUDY 4: MODERATION BY STRENGTH INFORMATION

In Study 4, we directly test the role of product strength through moderation. We provide identical product strength information in the legal and illegal conditions. If consumers' strength inferences drive efficacy beliefs (as we posit), then providing identical product strength information across these conditions should attenuate the effect.

Method

As outlined in our pre-registered research plan (https://aspredicted.org/3YN_5RZ), we recruited 800 participants from Prolific who completed the survey. We excluded participants who failed the attention check (n = 35), leaving us with 765 participants (M_{age} = 38.55, 46.67% female, 50.72% male, 2.61% other).

Using a 2 (legal vs. illegal) x 2 (control vs. strength-specified) between-subjects design, we tested whether the relationship between legality and perceived efficacy would be moderated by providing information about a drug's strength (i.e., potency). Participants were randomly assigned to read about the same fictional legal (vs. illegal) pain reliever used in Studies 2 and 3. In the control condition, there was no additional strength/potency information. In the strength-specified condition, we provided information about strength/potency by adding the following: "Drugs are often evaluated in terms of their potency.[3] The potency of drugs is measured by how much is required to produce an effect in a single cell. For Stava, it takes 500 mg to produce a response. As a reference, a typical illegal pain reliever also requires about 500 mg to cause an effect."

Participants responded to several items (randomized) regarding their perceptions of the product. Our main dependent variable of interest was perceived effectiveness ("How effective do you think Stava will be at reducing pain?"). We also asked about strength perceptions using the two items used in previous studies ("How strong do you think Stava is?" and "How potent do you think Stava is?"; r = .84, p < .001). Finally, participants answered the following attention check: "Which of the following is true about the beverage Stava?" ("Stava is legal" or "Stava is NOT legal").

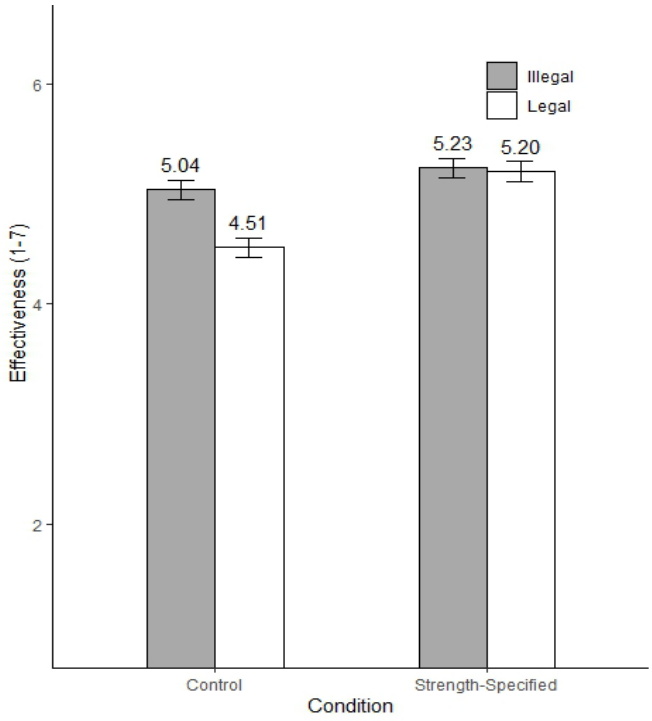
[3] This study describes a measurement method (mg to produce response) based on the measurement of potency in bioassays. Therefore, we thought it was more accurate to use the word "potency" (vs. "strength") in this study's stimuli.

Results

Strength. A 2 (legal vs. illegal) × 2 (control vs. strength-specified) ANOVA on strength revealed a main effect of legality, $F(1, 761) = 12.96$, $p < .001$, $\eta_p^2 = .02$, and a main effect of condition (whether or not strength is specified), $F(1, 761) = 20.89$, $p < .001$, $\eta_p^2 = .03$. We also found a significant interaction, $F(1, 761) = 13.51$, $p < .001$, $\eta_p^2 = .02$. In the control condition, participants viewed Stava as weaker when it was legal ($M_{Legal} = 4.19$, SD = 1.21) than when it was illegal ($M_{Illegal} = 4.85$, SD = 1.21; $t(383) = 5.33$, $p < .001$, $d = .54$). There was no significant difference in perceived strength when the strength of the product was specified ($M_{Legal} = 4.94$, SD = 1.31 vs. $M_{Illegal} = 4.93$, SD = 1.28; $t(378) = -.06$, $p = .949$).

Effectiveness. A 2 (legal vs. illegal) × 2 (control vs. strength-specified) ANOVA on efficacy revealed a main effect of legality, $F(1, 761) = 9.21$, $p = .003$, $\eta_p^2 = .01$, and a main effect of condition (whether or not strength is specified), $F(1, 761) = 23.72$, $p < .001$, $\eta_p^2 = .03$, qualified by a significant interaction, $F(1, 761) = 7.34$, $p = .007$, $\eta_p^2 = .01$ (see Figure 5). In the control condition, participants viewed Stava as less effective when it was legal ($M_{Legal} = 4.51$, $SD = 1.25$) than when it was illegal ($M_{Illegal} = 5.04$, $SD = 1.22$; $t(383) = 4.16$, $p < .001$, $d = .42$). There was no longer a statistically significant difference in effectiveness when strength was specified ($M_{Legal} = 5.20$, $SD = 1.33$ vs. $M_{Illegal} = 5.23$, $SD = 1.25$; $t(378) = .22$, $p = .829$).

FIGURE 5
STUDY 4: EFFECTIVENESS AS A FUNCTION OF LEGALITY AND STRENGTH



NOTE: Error bars represent standard errors of the mean.

Moderated mediation. We conducted a moderated mediation analysis (Model 7; Hayes, 2017) to further test our proposed mechanism. We set legality as the independent variable, perceived effectiveness as the dependent variable, and perceived strength as the mediator. The experimental manipulation of control versus strength-specified was a moderator variable (on the a-path between legality and perceived strength). The model supported our hypothesized moderated mediation (index of moderated mediation = 0.50 (95% CI [0.23, 0.76]). Legality had a significant indirect effect on effectiveness via strength, and that indirect effect was conditional on the experimental condition (strength-specified vs. control). In the control condition, conceptually replicating Study 2, there was a significant indirect effect of legality on effectiveness via strength (indirect effect = -0.49, 95% CI [-0.67, -0.31]). However, in the strength-specified condition, this indirect effect was no longer significant (indirect effect = .01, 95% CI [-0.19, 0.20]).

Discussion

If, as we predict, strength perceptions drive consumer beliefs about a product's efficacy, then offering equivalent strength information in the legal and illegal conditions should moderate the effect of legality on effectiveness. Indeed, we find in Study 4 that describing the legal product as equally potent to illegal alternatives boosts the perceived strength and efficacy of the legal product, such that the legal product is viewed as about as effective as the illegal product.

Note that in Studies 1A-1C, we presented the same objective outcomes (e.g., before and after photos) for legal and illegal products, and participants perceived legal products as less effective. In Study 4, however, when we explicitly specified that legal and illegal products were both as strong as a typical illegal product, participants viewed them as similarly effective. A key difference between these designs is that Studies 1A-1C provide evidence about outcomes of one product without any other reference product, allowing participants to interpret these outcomes using their own beliefs. As these studies used between-participants designs and lacked a comparison product, prior beliefs about legal product strength could influence how participants assessed efficacy, as seen in other research on biases (e.g., Goksel et al., 2022; Kupor & Laurin, 2020). By contrast, Study 4 directly targeted and disconfirmed participants' beliefs about product strength by providing a clear comparison, which may have limited participants' flexibility in interpretation, aligning efficacy judgments more closely between conditions.

Studies 3 and 4 offered evidence for the roles of access and strength by moderating these parts of the process (see also Figure 1). Equating access (Study 3) or strength (Study 4) leads to the perceived efficacy of legal and illegal products becoming more similar. In a Supplemental Study, we also used this design and logic to test an alternative account, which is that legality changes safety perceptions, which change efficacy beliefs. We have already seen some evidence

inconsistent with this account—in mediation models, safety did not mediate our effect (see Study 2 discussion). However, we continued to test this account by directly manipulating safety perceptions and assessing the downstream consequences on efficacy perceptions.

To test this alternative account, wherein legality affects efficacy perceptions via safety beliefs, we ran an additional pre-registered study (N = 747, see Supplementary Study 1 in ResearchBox). In this 2 (legal vs. illegal) x 2 (control vs. specified-unsafe) between-subjects design, participants were randomly assigned to read about the same fictional legal (vs. illegal) pain reliever used in Studies 2-4. In the specified-unsafe condition, participants were additionally informed that the product is unsafe ("A recent drug safety assessment determined that Stava is relatively unsafe and causes negative side effects."). Our manipulation was successful. The legal and illegal products were considered significantly more unsafe in the specified-unsafe condition than the control condition (*p*s < .001). The legal and illegal products were also viewed as more similar in safety when they were both specified as unsafe (i.e., the effect of legal vs. illegal on safety perceptions was significantly attenuated when they were specified-unsafe, $p = .025$). However, these changes in safety perceptions did not cause changes in efficacy perceptions. In conflict with a safety mechanism account, learning that the drug was unsafe did not increase its perceived efficacy (and, in fact, directionally decreased it, $p = .161$). Moreover, consistent with our proposed strength mechanism account, we found that in both the control and specified-unsafe conditions, the legal products were viewed as both less effective (*p*s < .01) and less strong (*p*s < .001) than the illegal products, and there was a non-significant interaction of the unsafe manipulation for both strength and efficacy (*p*s < .3). Finally, we found that strength mediated the effect of legality on efficacy, whereas safety concerns did not mediate this effect (conceptually replicating our supplemental analyses in Study 2's discussion. See ResearchBox

for full results and for a full discussion of analyses relating to a safety mechanism). The results of Supplementary Study 1 provide evidence inconsistent with an account of safety as a mechanism of this effect, but consistent with our account of strength as a mechanism.

STUDY 5: CONSEQUENCES OF CONSUMER BELIEFS ABOUT THE EFFECTIVENESS OF LEGAL AND ILLEGAL PRODUCTS

The previous studies demonstrated that consumers tend to believe legal products are less effective than illegal ones. In Studies 5A and 5B, we test how this belief can have consequences for consumer behaviors.

STUDY 5A: INCREASED INTEREST IN AN ILLEGAL PRODUCT WHEN EFFECTIVENESS IS DESIRED

Study 5A extends our previous findings by demonstrating that consumers not only believe that legal products are less effective than illegal ones, but that this belief can influence consumer choice. Of course, there are many considerations that might come to mind when choosing whether to use a legal versus illegal product. Illegal product usage involves running afoul of the law in a way that legal product usage does not, typically putting the user at risk of punishment or even incarceration. Additionally, illegal products might be viewed as less safe (see Study 2), or more difficult to obtain, also changing their appeal. While these different factors might limit consumers' interest in illegal products, illegal products are nonetheless used at least some of the time. Illegal markets persist, suggesting there are reasons for consumers to be

drawn to illegal products—as previously mentioned, 11.2% of the US population over the age of 12 report recent use of illegal drugs (CDC, 2017).

We test in Study 5A whether the present research can shed light on one factor leading people to choose illegal over legal products. Our previous studies show that consumers infer that one advantage of illegal products is that they are more effective. In this study, we test the prediction that increasing the importance consumers place on efficacy should increase the appeal of the illegal (vs. legal) product. This study thus demonstrates both an instance when consumers would be particularly interested in illegal products and how their lay beliefs about a product's effectiveness influence their preferences.

Method

As outlined in our pre-registered research plan (https://aspredicted.org/X33_YGC), we aimed to recruit 600 participants from Amazon's MTurk through CloudResearch and ended up with a sample of 606 participants (M_{age} = 39.52, 54.38% female, 44.96% male, .66% other).

In a 2-cell between-subjects design, we tested consumer interest in a legal and an illegal product. In the scenario, to mitigate concerns about punishment and participants' ability to obtain the product, we asked participants to imagine that they were in a foreign country where both products were legal. Specifically, all participants read the following: "Imagine that you are on a vacation in a foreign country and you sprain your ankle, the pain is fairly noticeable and getting in the way of enjoying your trip. You tell an acquaintance who informs you about two pain treatments that you've never heard of before. Both can be found in a local drugstore in this foreign country. One of the treatments is legal in the United States. The other treatment is NOT legal in the United States." In the efficacy priority condition we added, "Suppose your top priority is to get the product that most effectively reduces the pain you are experiencing. That is

to say, above all else you want a product that will reduce the pain you are experiencing." In both conditions, participants then answered the question, "Given this scenario, which treatment would you try?" ("Legal Treatment" or "Illegal Treatment").

Results

In line with our prediction that consumers should be more likely to prefer an illegal product if they are prioritizing effectiveness, 20.06% of participants chose the illegal product in the efficacy priority condition, whereas only 11.27% chose the illegal product in the control condition (χ^2 (1) = 7.94, p = .005).

Discussion

Study 5A shows one implication of our finding that legal products are perceived as less effective than illegal products. U.S. consumers were more likely to state that they prefer a product that has been deemed illegal in the United States when prioritizing efficacy. We propose that while both products were accessible in this scenario, consumers infer that if the U.S. government has deemed that only one should be accessible (i.e., legal), then it is likely weaker and therefore less effective. There are many factors that consumers take into consideration when selecting health and wellness products (e.g., safety, criminal penalties), but we find that when consumers are particularly interested in a product's benefits (e.g., when in pain), these inferences may negatively affect their preference for legal products.

STUDY 5B: FIELD STUDY

In Study 5B, we aimed to demonstrate an additional consumer consequence linked to the belief that legal products are less effective than illegal products. To do this, we test the

consequence of the inference that legality indicates lower efficacy in a field setting. Of course, experimentally testing preferences for illegal products in the field is challenging as we cannot ethically (or credibly) advertise for an illegal product. Further, as described in Study 5A, while illicit product use is relatively prevalent, most consumers will likely be deterred by the potential criminal and social ramifications of indicating interest in illegal consumption. We therefore took a different approach. We tested preferences for legal products only, but we used legal or illegal products as a reference point.

Our previous studies suggest that legal products are perceived as less effective than illegal ones. One corollary of this belief is that consumers should believe that something labeled as "even more effective than most illegal products" will have greater benefits than something labeled as "even more effective than most legal products." That is, if consumers think legality indicates lower efficacy, a product believed to be *even more* effective than an illegal (vs. legal) product should be viewed as more effective (i.e., more likely to achieve its desired outcomes). We therefore expected that, due to this lay belief, consumers would be more interested in finding out about treatments that are "more effective than most illegal" products relative to treatments that are "more effective than most legal" products.

Method

We conducted a test comparing two advertisements using Facebook's "A/B test" function. We acknowledge that a limitation of this study is that Facebook handles recruitment and assignment to advertisement conditions, and therefore we do not know exactly what population Facebook recruits from to create an audience that views the ads or how the random assignment is conducted.

The advertisements had to do with coping with anxiety during the COVID-19 pandemic (see Figure 6). The text above the image read "A better way to reduce anxiety during these unprecedented times" and clicking on the ad directed participants to the Centers for Disease Control webpage about coping with stress during COVID-19. The advertisements were run between June 16, 2020 and June 19, 2020. We used the following specifications: A/B Test variable was set to creative (which allowed us to test different advertisements) with the campaign objective of traffic (clicks to go to a website). The schedule was $50 daily budget spent on advertisements, split evenly across ads. The audience was individuals 18 years or older, living in the United States, Language = English (UK) or English (US). We chose to only place advertisements on Facebook (not on Instagram), and on both mobile and desktop devices. Finally, we turned off campaign budget optimization. We set optimization for ad delivery to link clicks.

FIGURE 6
PICTURE OF ADVERTISEMENTS USED IN THE LEGAL (LEFT) AND ILLEGAL (RIGHT) CONDITIONS, STUDY 5B

Results

As outlined in our pre-registration (https://aspredicted.org/blind.php?x=xx5sb2), we examined the number of "clicks (all)" out of the number of "impressions." (Clicks (all) are the total number of clicks on an advertisement, and impressions are the total number of times the ad is displayed on a screen). Therefore, we rely on the simplifying assumption that impressions are independent of each other and clicks are independent of each other, though we cannot confirm that in the current design. Overall, the ads performed better than average at 5.89%—the average click-through rate for Facebook ads is less than 1% (Kumar, 2019). The click-through rate for the more-effective-than-illegal advertisement was 6.31% (512 clicks/8117 impressions). The click-through rate for the more-effective-than-legal advertisement was 5.45% (416 clicks/7636 impressions). That is, people were more likely to click on the more-effective-than-illegal advertisement compared to the more-effective-than-legal advertisement ($\chi^2(1) = 5.09$, $p = .024$).

Discussion

Studies 5A and 5B demonstrate downstream behavioral consequences of the belief that legal products are less effective than illegal products. While there are many reasons that consumers avoid illegal products, we showed in Study 5A that U.S. consumers display an increased interest in a product that is illegal in the United States if they are prioritizing product effectiveness. That is, in line with the finding throughout our studies that legal products are perceived as less effective, consumers may be willing to overlook other concerns about illegal product use if they have a strong desire for efficacy. Notably, while we see an increase in the choice of the illegal product, the majority of participants still chose the product that is legal in the United States. Of course, the choice to use legal or illegal products is likely multiply determined, and consumers may be taking other factors (e.g., safety; Scott et al., 2020) into consideration. In Study 5B, we posited that if consumers believe legal products are less effective than illegal ones,

advertising something as more effective than an illegal (vs. legal) product should be a stronger efficacy signal. Consistent with this theorizing, people were more likely to click on an advertisement for a treatment claiming to be more effective than most illegal supplements relative to an advertisement for a treatment claiming to be more effective than most legal supplements.

GENERAL DISCUSSION

This investigation reveals that consumers typically believe legal products are less effective than illegal products. Studies 1A-1C established the existence of a consumer lay belief, finding that even when consumers view identical information about a product's consequences, they perceive fewer benefits when told the product is legal (vs. illegal). Next, we demonstrated the role of strength perceptions. We found that consumers often believe legal products are weaker and therefore lead to reduced consequences (both lower benefits and lower harm; Study 2). However, moderating those strength beliefs by either 1) informing consumers that the government restricts access to the product (whether legal or illegal; Study 3) or 2) providing equivalent information about product strength (Study 4), attenuated the effect of legality on perceived efficacy. Finally, across two studies, we documented consumer consequences that emerge due to the belief that legal products are less effective. Study 5A showed that consumers who are particularly interested in an effective product are more likely to choose an illegal (vs. legal) product. Study 5B then found that consumers in the field clicked on an ad more frequently when the advertised product was described as more effective than illegal (vs. legal) alternatives.

Theoretical Implications

The current work contributes to a broad literature on the effect of lay beliefs on consumer decision-making. Consumers regularly rely on their lay theories to make inferences about product attributes. When information about one attribute is missing, consumers often use information about another attribute to make inferences (Broniarczyk & Alba, 1994). For example, consumers tend to infer that unhealthy food taste better (Haws et al., 2017; Raghunathan et al., 2006), and that more expensive products are higher quality (Gneezy et al., 2014; Rao, 2005; Rao & Monroe, 1989). In the present case, we document that people infer that legal products are less effective than illegal products. We are the first, to our knowledge, to document this belief and examine why it occurs.

This work further builds on existing literature examining the relationship between two key attributes of consumer interest: safety and efficacy. This relationship is not clearly established, with some work finding safer products are believed to be *less* effective (Luchs et al., 2010), and other research finding safer products are believed to be *more* effective (Tootelian et al., 1988). Consistent with this latter work, the halo effect and affect heuristic (Chernev & Blair, 2020; Nisbett & Wilson, 1977; Slovic et al., 2007) would predict that positive evaluations of safety might lead to more positive evaluations of efficacy. However, we find this not to be the case for consumer beliefs about product legality. In fact, we find that safety and efficacy perceptions are not significantly correlated in studies in which we manipulate legality and measure both variables (Study 2: $r = .017$, $p = .75$, Supplementary Study 1: $r = .002$, $p = .96$). Furthermore, directly manipulating safety perceptions did not significantly increase or decrease efficacy perceptions (Supplementary Study 1). Instead, we believe that when consumers think about product legality, they consider how broadly accessible these products are and that leads to inferences about product strength. Specifically, consumers infer that legal products are likely

weaker, and therefore both safer and *less* effective. Given the importance of safety in consumer decisions (Scott et al., 2020), it is also possible that safety judgments have a direct effect on efficacy perceptions in some contexts, though we do not find evidence for that in this paper.

Finally, this work contributes to research on illegal goods. While extant work examines economic and health consequences of illegal product consumption, there is limited empirical work on consumer beliefs about legal versus illegal products. However, some qualitative work has explored consumers' illicit behaviors and responses to illegal products (Goulding et al., 2009). For example, recent interviews on consumer responses to market legitimacy show that consumers who are unfamiliar with cannabis express more favorable views towards the drug when it is aligned with more "legitimate" products (e.g., when cannabis is sold in packaging that looks like coffee packaging; Huff et al., 2021). Our work experimentally investigates consumer responses and inferences based on product legality, providing further insight into consumer beliefs in this sensitive and important area.

Practical Implications

Consumers are often drawn to products for their promised benefits. For instance, consumers who desire a substance to numb pain, increase focus, or become intoxicated may seek out products they believe will be the most efficacious—whether they are legal or illegal. Consumers may therefore be more willing to seek out and use products that are illegal if they believe these substances are more likely to provide them with their desired benefits, as we see in Study 5A. Given that proponents of drug prohibition fear that legalization will lead to an increase in accessibility and use, it may be worth considering that consumers tend to believe products that are legal are less effective. Indeed, one reason that consumers use illicit anabolic steroids to gain

muscles (Kanayama et al., 2010; Mayo, 2019) or purchase illegal weight loss pills to slim down (Cosslett, 2018) could be that they believe these products will better help them achieve their goals than legal alternatives. Understanding how legality affects our beliefs about product effectiveness is critical, as judgments of effectiveness not only determine consumer preferences but can also change the actual effect of a product, as documented in research on the placebo effect (Irmak et al., 2005; Shiv et al., 2005).

Our finding, that consumers tend to believe legal products are less effective than illegal products, has important implications for public health and marketing. For instance, many public health campaigns educate individuals about safety concerns related to illegal drugs. To better understand current messaging from public health organizations, we had a hypothesis-blind research assistant collect 100 recent drug-related public health campaigns (see ResearchBox for full list) and categorize them by primary message. Of these, the majority (62%) focused on health or safety risks, while only one campaign message focused on the effectiveness of the drug ("Opioids are largely ineffective for low back pain"). Our research finds that individuals already believe illicit drugs are less safe, but, importantly, they also believe these drugs will have greater benefits. Thus, we propose that messages aimed at reducing perceived effectiveness may be a worthwhile (and currently rare) messaging approach. Combatting effectiveness beliefs—or highlighting the efficacy of a legal alternative—may help to decrease consumer interest in potentially harmful illegal drugs.

We examine this implication in a pre-registered study (Supplementary Study 2; https://aspredicted.org/Y3V_WC7) of undergraduates at a large public California university. We tested the efficacy of public health advertisements on reducing these undergraduates' interest in illegal prescription stimulants. We studied this population because the prevalence of illegal

prescription drug misuse is highest among young adults between the ages of 18 and 25; with over 11 percent reporting the misuse of prescription drugs in the past year (SAMHSA, 2021). Further, the primary motive for nonmedical use of stimulants is to enhance concentration while studying (Edinoff et al., 2022).

We propose that while most public health campaigns focus on safety concerns to reduce interest in a substance, targeting efficacy beliefs may be a more fruitful approach. This is because, as we show in our studies, individuals already believe that illegal products are relatively unsafe, but they also believe that illegal products may offer greater benefits—a belief that is not always accurate. Thus, we predicted that correcting this mistaken belief via a message about the product's effectiveness (as opposed to the common approach of focusing only on safety) may be particularly impactful on individuals' interest in using an illegal product.

As pre-registered, participants in this study who responded that they had never been diagnosed with ADHD (N = 754 out of 966; M_{age} = 20.54 years, 58.43% female, 40.90% male, .66% other) were shown one of three advertisements: control, unsafe, or ineffective. In all conditions they saw an image of prescription drugs and read, "Considering using Adderall as a study enhancer? Did you know that using Adderall without a prescription is illegal?" In the unsafe condition, the advertisement additionally read, "Adderall is also unsafe when used for nonmedical purposes. Research finds that Adderall can cause a range of side effects from irritability to heart attacks." In the ineffective condition, the advertisement additionally read, "Adderall is also ineffective at improving academic performance when used for nonmedical purposes. Research finds that individuals using Adderall without ADHD did not perform better on cognitive tests—they only thought they did."

Participants reported less interest in using Adderall in the ineffective condition than in the control condition ($M_{Control}$ = 2.56, SD = 1.88, vs. $M_{Ineffective}$ = 2.17, SD = 1.76; $t(492) = 2.40$, $p = .017$, $d = .22$). There was also a directional decrease in interest between the ineffective and unsafe conditions (M_{Unsafe} = 2.40, SD = 1.91; $t(504) = -1.41$, $p = .16$, $d = .12$). We found a non-significant difference between the unsafe and control conditions ($t(506) = .98$, $p = .33$). Participants believed that Adderall was significantly less effective in the ineffective condition than the other two conditions ($ps < .001$); there was a non-significant difference in safety perceptions across all three conditions ($ps > .26$; See Supplementary Study 2 in ResearchBox for full results). These findings are in line with our proposal. Individuals already believe that illegal drug use is unsafe, so messaging about illegal drugs being unsafe may be less likely to change beliefs and interest. However, shifting effectiveness beliefs may be both possible and have an impact on consumer interest in using potentially dangerous illegal products. We hope that future research will continue to test the potential of this messaging.

Future Directions

We hope that this research can be generative in terms of suggesting new potential policies to test (see above discussion) and new avenues for both academic inquiry and practical application. Practical applications might include developing targeted educational campaigns that emphasize the proven effectiveness of legal products, potentially reducing consumer reliance on illegal alternatives. By studying new communication strategies and expanding our understanding of the interplay between legality and perceived efficacy, we can contribute to more informed consumer choices and enhanced public health outcomes.

In this research, our experiments focus on non-prescription consumable products.

However, given our finding that illegal products are perceived as more effective due to inferences about accessibility, it follows that other products with limited access (such as prescription drugs) may be viewed as stronger and therefore both more effective and less safe. Expanding this work to investigate perceptions of prescription medication could be an important area for future research. Furthermore, future work might investigate beliefs about products where other types of accessibility is limited, such as regulating the age of users (e.g., when one can purchase nicotine products) or where and at what quantity products are available (e.g., substances that can only be purchased in certain stores or at certain quantities). Another possibility is that perceptions of legal and illegal products may differ on other attributes beyond accessibility and strength. For instance, illegal products might evoke associations with novelty or exclusivity, which could, in turn, influence perceptions of effectiveness. Future research could examine how inferences about other attributes of illegal products may impact consumer beliefs about efficacy. Our studies are also limited to participants from the United States. Beliefs about legality and the government's role in limiting access to products may differ in important ways outside of the United States. Additional research is required to understand how people from other countries make inferences about legality and effectiveness.

Another possible direction for future research is to explore the relationship between safety and efficacy more deeply. Interestingly, in this paper, we repeatedly find evidence for no significant effect, overall, of safety concerns on perceived efficacy. That is, manipulating safety did not cause efficacy to significantly increase or decrease (Supplemental Study 1); safety perceptions were not correlated with efficacy perceptions (Study 2 and Supplemental Study 1); and the indirect effect of legality on efficacy via safety was not significant in mediation models (Study 2 and Supplemental Study 1). We believe this provides strong evidence against safety as

the mechanism driving the effects observed in this paper. However, we cannot rule out that safety may alter efficacy in other contexts, or that safety may alter efficacy in different conflicting ways which results in a null effect overall (i.e., competing indirect effects). Indeed, we present some preliminary (not pre-registered) evidence about conflicting indirect effects of safety on efficacy in the supplemental materials (see ResearchBox). In sum, we think the relationship between safety and efficacy is a promising direction for future research.

Conclusion

Across eight pre-registered studies, we find that consumers tend to believe that legal products are weaker than illegal products, and therefore expect, and perceive, that legal products will have smaller consequences—both positive (fewer benefits) and negative (fewer safety concerns). Conversely, consumers typically perceive illegal products as stronger, leading to the belief that they have both greater benefits and greater risks. We find this effect across a range of products, even in contexts where it is objectively untrue. We demonstrate that this belief affects consumer behavior in a field setting and has implications for both consumer interest in illegal products and for improving public health campaigns. This research sheds light on an important lay belief about product legality, with significant implications for consumer interest and behavior.

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