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Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople

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Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople

Abstract

Objectives: Pragmatic randomized controlled trials (pRCTs) are essential for determining the real-world safety and effectiveness of healthcare interventions. However, both laypeople and clinicians often demonstrate experiment aversion: preferring to implement either of two interventions for everyone rather than comparing them to determine which is best. We studied whether clinician and layperson views of pRCTs for Covid-19 or other interventions became more positive early in the pandemic, which increased both the urgency and public discussion of pragmatic randomized controlled trials.

Design: Randomized survey experiments

Setting: A large academic medical center in the Northeastern U.S., online research participant platform

Participants: 2,149 clinicians and 2,909 laypeople in 2020 and 2021

Main outcome measures: Participants read vignettes in which a hypothetical decision-maker who sought to improve health could choose to implement intervention A for all, implement intervention B for all, or experimentally compare A and B and implement the superior intervention. Participants rated and ranked the appropriateness of each decision. Experiment aversion was defined as the degree to which a participant rated the experiment below their lowest-rated intervention.

Results: In a survey of laypeople, compared to pre-pandemic results from the same vignettes, we found no decrease in aversion to experiments involving catheterization checklists and hypertension drugs. Nor were either laypeople or clinicians less averse to Covid-19 versions of these vignettes. Finally, both laypeople and clinicians, on average, exhibited aversion toward other Covid-19 experiments (comparing different vaccines, and different proning, school reopening, and mask protocols). Across all vignettes and samples, 28% to 57% of participants expressed experiment aversion, whereas only 6% to 35% expressed experiment appreciation by rating the trial higher than the participant's highest-rated intervention.

Conclusions: Advancing evidence-based medicine through pRCTs will require anticipating and addressing experiment aversion among patients and healthcare professionals.

Registration: https://osf.io/u945y/?view_only=a901fde13ddb423899074eb79964c6cd

Summary box

Strengths and limitations of this study

- The decision-science approach used in this paper enables assessment of aversion towards pragmatic randomized controlled trials (pRCTs) in large and diverse samples of laypeople and clinicians.
- The size of the experiment aversion effect is assessed in eight pRCT vignettes in the layperson sample and four pRCT vignettes in the clinician sample. The vignettes describe a range of pRCTs from pharmaceutical medical interventions to non-pharmaceutical medical interventions to public health interventions, and within and without the context of the Covid-19 pandemic.
- The large sample sizes ensured sufficient statistical power to detect experiment aversion in each vignette and sample.
- The samples may not perfectly represent all healthcare professionals or members of the general public.
- Participants expressed attitudes and judgments about the appropriateness of carrying out pRCTs or implementing policies, but were not in a position to make a real decision to execute the pRCTs or policies.

INTRODUCTION

Pragmatic randomized controlled trials (pRCTs) are crucial for understanding how to safely, effectively, and equitably prevent and treat disease and deliver healthcare. Randomized evaluation is the gold standard in medicine, largely because it permits one to infer that an intervention caused an outcome, such as efficacy. Randomized experiments have repeatedly upended conventional clinical wisdom and the results of observational studies [1,2] and are urgently needed to evaluate new technologies [3,4]. Compared to more explanatory trials, trials that are further towards the pragmatic end of the spectrum [5] evaluate effectiveness of the intervention in more real-world contexts. Such pragmatism is critical for ensuring that causal evidence from randomized evaluation speaks to the effects of interventions in the circumstances in which they would be implemented (or maintained).

Yet despite their importance to healthcare quality and safety, pRCTs often prove controversial—even when they compare interventions that are within the standard of care or are otherwise unobjectionable, and about which the relevant expert community is in equipoise. Several recently published pRCTs—including SUPPORT [6], FIRST [7], and iCOMPARE [8]—have received considerable criticism from physician-scientists, ethicists, and regulators [9,10] and in the public square [11–14]. Although criticisms of pRCTs can be complex, nuanced, and sometimes valid, many appear to reflect a rejection of the very idea that a randomized experiment was conducted, as opposed to simply giving everyone one of the interventions that was trialed. Our research applies concepts and methods from the behavioral and decision sciences to systematically explore whether, when, and why people might genuinely object to running pRCTs in healthcare, public health, and other domains.

In prior studies—inspired by several “notorious pRCTs,” including technology industry “A/B tests” [15–17]—we confirmed that substantial shares of both laypeople and clinicians can be averse to randomized evaluation of efforts to improve health [18,19]. People rated a pRCT designed to compare the effectiveness of two interventions as significantly less appropriate than the average appropriateness of implementing either one, untested, for everyone. We called this phenomenon the “A/B effect” [18]. In some cases, the lower average rating of an experiment could be driven not by dislike of experiments, per se, but by many raters’ belief that one of the experiment’s arms is inferior to the other [18,19]. Importantly, such beliefs are often based on intuition rather than evidence and have the potential to undermine evidence-based medicine. Yet this form of experiment rejection is not illogical, given the individual’s own beliefs. We also, however, documented a more peculiar (if no less dangerous) phenomenon of “experiment aversion,” which occurred when people rated the pRCT as significantly less appropriate than implementing *their own* least-preferred intervention contained within the trial. In this pattern of decision-making, in other words, people who perceive that one intervention is good and the other is less good prefer that everyone receive the less good (or even bad) intervention rather than half the people receiving the better one, and without comparing the two to determine whether one is really better than the other [19]. Such judgments could reflect a more general skepticism about or opposition to pRCTs, at least within specific domains of inquiry. For instance, people may be averse to the inequality or disparate treatment that is necessarily (temporarily) imposed by any RCT (pRCT or otherwise), the uncertainty signaled by agents (often trusted experts) who decide they do not already know what works and need to conduct a pRCT, the process of assigning people to treatments “randomly” as opposed to using expert judgment, or something else viewed as undesirable. Both patterns of negative sentiments about experiments can impede efforts to assure and improve health outcomes.

The Covid-19 pandemic presented the potential for an inflection point in attitudes towards pRCTs. In April 2020, 72 Covid-19 drug trials were already underway [20] and more traditional, explanatory RCTs became daily, front-page news. Because explanatory and pragmatic RCTs share many key features that participants in our prior research often cited as partial explanations for their lower ratings of experiments—including random assignment to different conditions [18]—that sustained exposure to explanatory RCTs might have educated people about the value of healthcare pRCTs, too, and/or made them seem less exceptional and more normative. Our previous research also suggests that another cause of experiment aversion is an illusion of knowledge—a (mis)perception that experts already must know what works best and should simply implement those interventions without further study. But Covid-19 was a novel disease, and—at least in the case of pharmaceutical interventions—no sensible person thought the correct treatments were already obvious. People therefore may have been less averse to Covid-19 pRCTs (e.g., trials comparing Covid-19 proning protocols or masking rules) than to pRCTs that test interventions for familiar conditions or problems, such as hypertension or hospital-acquired infections. On the other hand, because of the urgency attached to Covid-19, people may have been *more* averse to Covid-19 RCTs, being even less inclined to risk giving someone a treatment that might turn out to "lose" in a comparison study [21,22]. Finally, even if the pandemic did not affect public attitudes towards explanatory or pragmatic RCTs, it could have affected the attitudes of clinicians, many of whom were involved in Covid-19 research. Because clinicians strongly influence whether particular RCTs are conducted (both explanatory and pragmatic), their attitudes matter.

Here, we investigated attitudes towards pRCTs in the first year of the pandemic by conducting a series of preregistered studies between August 2020 and February 2021. First, we used decision-making vignettes from our previous work to ask whether the extraordinary publicity around (primarily explanatory) Covid-19 RCTs reduced general healthcare experiment aversion by the public. Next, we adapted these vignettes to determine whether the public was averse to pRCTs on pharmaceutical and/or non-pharmaceutical interventions (NPIs) for Covid-19. Finally, we recruited two large clinician samples to investigate how their attitudes compared to those of laypeople. All three studies were randomized survey experiments in which participants first read about a decision-maker faced with a problem who either implemented one of two interventions (A or B) or ran an experiment to compare them (and then implemented the superior one). Participants then evaluated how appropriate each of those three decisions was.

METHODS

Lay Sentiments About pRCTs

In August 2020, we used the CloudResearch service to recruit 700 adult crowd workers on Amazon Mechanical Turk living in the U.S. to participate in a brief online survey (see Table S4 for detailed description of the lay participant sample, including education, income, and political ideology). These services provide samples that are broadly representative of the U.S. population and are well-accepted in social science research as providing as good or better-quality, diverse samples of research participants than common convenience samples such as student volunteers, with results that are similar to probability sampling methods [23–25]. We included laypeople as participants in our studies because they are typically included in pRCTs as patients or (in the case of some public health pRCTs and pRCTs in other domains) as members of the public and are therefore important stakeholders.

Each participant first read a vignette that described a problem that the decision-maker could address in one of three ways (see Table 1 for examples; see pp. 8-13 and Table S3 in the Supplemental Materials [SM] for text and motivations for all vignettes): by implementing intervention A for all patients or relevant members of the public (A); by implementing intervention B for all patients or relevant members of the public (B); or by conducting an experiment in which patients or relevant members of the public are randomly assigned to A or B and the superior intervention is then implemented for all (A/B). Next, following standard methods in social and moral psychology for evaluating decisions [26], participants rated each option on a scale of appropriateness from 1 (“very inappropriate”) to 5 (“very appropriate”), with 3 as a neutral midpoint. Participants then rank-ordered the options from best to worst and provided demographic information.

Participants were randomly assigned to read one of two vignettes: (1) In Best Anti-Hypertensive Drug, some doctors in a walk-in clinic prescribe “Drug A” while others prescribe “Drug B” (both of which are affordable, tolerable, and FDA approved), and “Dr. Jones” prescribes either A for all his hypertensive patients, B for all those patients, or runs a randomized experiment to compare the effectiveness of A and B. (2) In Catheterization Safety Checklist, a hospital director similarly considers two locations where he might display a safety checklist for clinicians—on badges or posters—or does an experiment to decide (see Table 1). All vignettes describe an RCT that is highly pragmatic in nature (i.e., high on PRECIS-2 eligibility, recruitment, setting, organization, follow-up, and primary outcome domains [5]). For instance, all patients with the relevant condition who attend the clinic/hospital for care become members of the trial and the trial is situated within the clinic/hospital where their care would typically take place. (Similarly, in the public health scenarios, all students in the school district and all residents of the state where these trials occur are included in the trial.) In addition, our vignettes are silent about whether consent will be obtained. Trials that include only those who opt into them are less pragmatic if they are testing the effectiveness of an intervention that would be imposed on people as a matter of policy or practice. IRBs customarily waive consent when it would make low-risk pRCTs impracticable, including by rendering the results uninformative about how an intervention would fare in practice [27]. In separate work, we found that substantial shares of people object to such experiments even when we specify that consent will be obtained [28].

Table 1

Vignette text for Catheterization Safety Checklist and Ventilator Proning

	Catheterization Safety Checklist	Ventilator Proning
Background	Some medical treatments require a doctor to insert a plastic tube into a large vein. These treatments can save lives, but they can also lead to deadly infections.	Some coronavirus (Covid-19) patients have to be sedated and placed on a ventilator to help them breathe. Even with a ventilator, these patients can have dangerously low blood oxygenation levels, which can result in death. Current standards suggest that laying ventilated patients on their stomach for 12-16 hours per day can reduce pressure on the lungs and might increase blood oxygen levels and improve survival rates.
Intervention A	A hospital director wants to reduce these infections, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All patients having this procedure will then be treated by doctors with this list attached to their clothing.	A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 12-13 hours per day.
Intervention B	A hospital director wants to reduce these infections, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All patients having this procedure will then be treated in rooms with this list posted on the wall.	A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 15-16 hours per day.
A/B test	A hospital director thinks of two different ways to reduce these infections, so he decides to run an experiment by randomly assigning patients to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After a year, the director will have all patients treated in whichever way turns out to have the highest survival rate.	A hospital director thinks of two different ways to save as many ventilated Covid-19 patients as possible, so he decides to run an experiment by randomly assigning ventilated Covid-19 patients to one of two test conditions. Half of these patients will be placed on their stomach for 12-13 hours per day. The other half of these patients will be placed on their stomach for 15-16 hours per day. After one month, the director will have all ventilated Covid-19 patients treated in whichever way turns out to have the highest survival rate.

We define the “A/B Effect” as the degree to which participants’ ratings of the A/B test were lower than the average of their ratings of implementing A and B [18]. “Experiment aversion” is the degree to which participants rated the A/B test lower than their own lowest-rated intervention (either A or B for each person) [19]. “Experiment appreciation” is the opposite: the degree to which the experiment is rated higher than each participant’s highest-rated intervention. For all measures, we calculated Cohen’s d. We analyzed data using R version 4.3.0. (See SM for details of samples, statistical power, and data analyses.) [Blinded for review] IRB determined that these surveys were exempt (IRB# 2017-0449).

Lay Sentiments About Covid-19 pRCTs

Between August 2020 and January 2021, we recruited 2,209 additional laypeople in the same manner described above. They read, rated, and ranked six new vignettes involving Covid-19 interventions (N = 339–450 per vignette). Four vignettes were based on Covid-19-related interventions that were discussed, tested, and/or implemented at the time: Masking Rules (which described two masking policies, of varying scope); School Reopening (two school schedules designed to increase social distancing); Best Vaccine (two types of vaccine—mRNA versus inactivated virus); and Ventilator Proning (two protocols for positioning ventilated Covid-19 patients; see Table 1). The other two vignettes—Intubation Safety Checklist and Best Corticosteroid Drug—were adapted from the first study to apply to Covid-19.

Clinician Sentiments About Covid-19 pRCTs

Between November 2020 and February 2021, clinicians (14% physicians, 10% physician assistants, 68% nurses of all levels, 8% other) in a large academic medical center in the U.S. read, rated, and ranked one of four Covid-19-related vignettes (Masking Rules: n = 349;

Intubation Safety Checklist: n = 271; Best Corticosteroid Drug: n = 275; Best Vaccine: n = 1254) from the second study (see Table S5 for detailed description of the clinician sample, including research methods training and experience and number of years in the medical field). (In these samples, because survey responses were made fully anonymous to encourage greater participation and honest responding, we were unable to restrict participation in later waves to clinicians who had not participated in earlier waves. Therefore, some clinicians who completed the Best Vaccine vignette may have earlier completed the Masking Rules, Intubation Safety Checklist, and Best Corticosteroid Drug vignettes.)

RESULTS

Lay Sentiments About pRCTs

We found substantial negative reactions to A/B testing in both vignettes (Table 2A), replicating our pre-pandemic findings [18,19]. Although in most cases the mean rating of the A/B test was near the neutral midpoint, implementing policies was substantially preferred to A/B testing (Figure 1A) and large proportions of participants objected to the A/B test (Figure 1B). In Catheterization Safety Checklist (Figure 1A), we found evidence of the A/B Effect: participants rated the A/B test significantly below the average ratings they gave to implementing interventions A and B (d = 0.69, 95% CI: (0.53, 0.85); Table S6A). Here, 41% ± 5% (95% CI) of participants expressed experiment aversion (rating the A/B test lower than their own lowest-rated intervention; d = 0.25, 95% CI: (0.11, 0.39); Table S6A). When ranking the three options from best to worst, only 32% placed the A/B test first, while 48% placed it last (Table S6A).

We also observed an A/B Effect in Best Anti-Hypertensive Drug (Figure 1B); d = 0.52, 95% CI: (0.36, 0.68); Table S6A), where 44% ± 5% also expressed experiment aversion (d = 0.46, 95% CI: (0.30, 0.52); Table S6A). Notably, participants were averse to this experiment even though there is no reason to prefer “Drug A” to “Drug B,” and patients are effectively already randomized to A or B based on which clinician happens to see them—which occurs wherever unwarranted variation in practice determines treatments, such as walk-in clinics and emergency departments. Here, however, similar proportions of people ranked the A/B test best and worst (50% vs. 45%; p = 0.16; Table S6A).

These levels of experiment aversion near the height of the pandemic were slightly (but not significantly) higher than those we observed among similar laypeople in 2019 (41% ± 5% in 2020 vs. 37% ± 6% in 2019 for Catheterization Safety Checklist, p = 0.31; 44% ± 5% in 2020 vs. 40% ± 6% in 2019 for Best Anti-Hypertensive Drug, p = 0.32) [19].

[Figure 1]

Table 2

Sentiments about experiments by vignette and population

	Negative sentiment				Positive sentiment			
	Experiment Aversion	A/B Effect	More people averse than appreciative?	More people rank AB test worst than best?	More people rank AB test best than worst?	More people appreciative than averse?	Reverse A/B Effect	Experiment Appreciation
(A) Lay Sentiments About Healthcare Experimentation								
Catheterization Safety Checklist	✓	✓	✓	✓				
Best Anti-Hypertensive Drug	✓	✓	✓					
(B) Lay Sentiments About Covid-19 Healthcare Experimentation								
Ventilator Proning	✓	✓	✓					
School Reopening		✓	✓	✓				
Masking Rules	✓	✓	✓	✓				
Intubation Safety Checklist	✓	✓	✓	✓				
Best Corticosteroid Drug		✓			✓			
Best Vaccine		✓			✓			
(C) Clinician Sentiments About Covid-19 Healthcare Experimentation								
Masking Rules	✓	✓	✓	✓				
Intubation Safety Checklist	✓	✓	✓	✓				
Best Corticosteroid Drug	✓	✓	✓					
Best Vaccine		✓*			✓			

Notes. Experiment Aversion refers to the difference between the lowest-rated intervention and the rating of the A/B test. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. The Reverse A/B Effect refers to the difference between the rating of the A/B test and the average rating of the two interventions. Experiment Appreciation refers to the difference between the rating of the A/B test and the rating of the highest-rated intervention. See Table S6A-C of SM for detailed results (including Cohen's *d*s and 95% CIs) for all measures of sentiment about experiments. Checkmarks (✓) represent a statistically significant effect at p < .05. In one case, the checkmark is followed by an asterisk (*). This indicates that while the effect reaches statistical significance, the effect size is very small and might have only reached significance due to the large sample size (three times as large as that for other vignettes).

Variables to the right of the thick vertical line are the reverse of those on the left. If no checkmark appears in either of the corresponding columns to the left and right of the thick vertical line (e.g., "More people rank A/B test worst than best?" and "More people rank A/B test best than worst?"), that means that there is no significant difference (e.g., there is no statistically significant difference between the proportion of people ranked that A/B test worst and the proportion of people who ranked the A/B test best).

Lay Sentiments About Covid-19 pRCTs

In all six Covid-19 vignettes, we found evidence of the A/B Effect (Table 2B). In three, however, we did not find experiment aversion: Best Vaccine, Best Corticosteroid Drug, and School Reopening. In the first two of these, participants rated the two interventions very similarly and the experiment only slightly lower (Figure 2B). These vignettes also elicited the largest proportion of participants (65% in Best Vaccine and 56% in Best Corticosteroid Drug; Table S6B) in any vignette who ranked the A/B test best among the three options, compared to 31–34% of participants who ranked it worst (Table S6B). In School Reopening, experiment aversion was not observed because participants on average clearly preferred intervention B to A and rated the experiment similar to intervention A [29,30]. 53% of participants ranked intervention B as the best of the three options (compared to 17% choosing intervention A and 30% choosing the A/B test; Table S6B).

In the other three vignettes, participants rated the A/B test condition as significantly less appropriate than their lowest-rated intervention (Masking Rules: d = 0.56, 95% CI: (0.41, 0.71); Ventilator Proning: d = 0.17, 95% CI: (0.04, 0.30); Intubation Safety Checklist: d = 0.36, 95% CI: (0.21, 0.49)). These levels of aversion to Covid-19 RCTs are similar to the levels of aversion to non-Covid-19 RCTs both before [19] and during the pandemic (see above).

[Figure 2]

Clinician Sentiments About Covid-19 pRCTs

We observed an A/B effect in all four vignettes. In two, clinicians, like laypeople, were also significantly experiment averse (Masking Rules: d = 0.74, 95% CI: (0.57, 0.91; Table S6C);

Intubation Safety Checklist: d = 0.30, 95% CI: (0.15, 0.45); Table S6C). In Best Vaccine, clinicians, like laypeople, did not show any significant difference in their ratings of the A/B test and their lowest-rated intervention (d = –0.03, 95% CI: (–0.10, 0.04); Table S6C). Again, like laypeople, 58% of clinicians ranked the vaccine A/B test as the best of the three options, the highest proportion of any clinician-rated vignette.

Clinicians differed from laypeople in their response to Best Corticosteroid Drug. Laypeople did not show experiment aversion, but clinicians rated the A/B test as significantly less appropriate than their lowest-rated intervention (d = 0.49, 95% CI: (0.32, 0.66); Table S6C). This difference may be due to clinicians' greater familiarity with the treatment of Covid-19. Clinicians may also have seen an urgent need for any drugs to treat Covid-19 [22] and thus rated adopting a clear treatment intervention as more appropriate than an RCT.

[Figure 3]

Heterogeneity in Experiment Aversion

Collapsed across studies, political ideology explained 1.5% of the variance in sentiments about experiments, with conservatives slightly less averse to experiments than liberals. Less or no variation was explained by all other demographics, including educational attainment (0.2%), STEM degree (0.1%), and prescribers versus other clinicians (0.2%); see Tables S8-11 in SM for further discussion.

DISCUSSION

In three preregistered survey experiments, we observed considerable experiment aversion among laypeople during the first year of the Covid-19 pandemic, despite increased exposure to the nature and purpose of (largely explanatory) RCTs. Neither laypeople nor clinicians were overall less averse to Covid-19 pRCTs, despite the fact that confidence in anyone's knowledge of what works should have been even more circumscribed than in the everyday contexts of hypertension and catheter infections. To the contrary, most Covid-19 vignettes were met with experiment aversion. This is consistent with an emphasis during the pandemic that we must "do" instead of "learn," a false dichotomy that fails to recognize that implementing an untested intervention is itself a nonconsensual experiment from which, unlike an RCT, little or nothing can be learned [31–33]. Similarly, across all vignettes and samples, between 28% and 57% of participants demonstrated experiment aversion, while only 6%–35% demonstrated experiment appreciation (by rating the pRCT higher than their highest-rated intervention).

Although in most cases the mean rating of the A/B test was near the neutral midpoint, in none of our 12 studies were more people appreciative of than averse to the pRCT, in none was the average pRCT rating higher than the average intervention rating, and in none was the pRCT rating higher than each participant's highest-rated intervention, on average. Notably, unlike trials with placebo or no-contact controls, the A/B tests in our vignettes compared two active, plausible interventions, neither of which was obviously known ex ante to be superior. Yet substantial shares of participants still preferred that one intervention simply be implemented without bothering to determine which (if either) worked best.

The most positive sentiment towards experiments was observed in both laypeople and clinicians in the vignettes involving Covid-19 drugs and vaccines. Here we observed the highest proportions of participants who demonstrated experiment appreciation (31%–46%) and who ranked the pRCT first (49%–65%). This result could be explained by differences in the pRCT length (ranging from one to twelve months) and perceived severity of the pRCT outcome ("best outcome" and "fewest cases of Covid-19" in Best Corticosteroid and Best Vaccine, respectively vs., e.g., "highest survival rate" in Ventilator Proning). But this result is also consistent with our previous findings that the illusion of knowledge—here, the belief that either the participant herself or some expert already does or should know the right thing to do and should simply do it—biases people to prefer universal intervention implementation to pRCTs [18,19]. Rightly or wrongly, both laypeople and clinicians might (a) appropriately recognize that near the start of a pandemic, no one knows which existing drugs, if any, are safe and effective in treating a novel disease, and that new vaccines need to be tested, yet (b) fail to sufficiently appreciate the level of uncertainty around NPIs like masking, proning, and social distancing, which can also benefit from rigorous evaluation. This is consistent with the dearth of RCTs (explanatory or pragmatic) of Covid-19 NPIs [34]: of the more than 4,000 Covid-19 trials registered worldwide as of August 2021, only 41 tested NPIs.33 Explaining critical concepts like clinical equipoise or unwarranted variation in medical and NPI practice alike might diminish experiment aversion.

While our lay participant samples were large, diverse, and demographically similar to the general U.S. population (see Table S4), they may not be perfectly representative of other populations. Similarly, because the clinician sample was largely made up of individuals with only some research training and experience, these results may not generalize to clinicians who have extensive research training and experience and conduct RCTs (or pRCTs) themselves. Importantly, however, the support of non-investigator clinical and operational leaders is often needed to conduct a pRCT, and administrator-clinicians do not always have substantial research experience. Moreover, in both samples, our primary goal was not to estimate the percentage of people in the general population who hold negative views of pRCTs, but rather to ascertain experimentally whether laypeople and clinicians display the patterns of negative sentiments about pRCTs that we have found previously [18,19], when confronted with vignettes during, or about, a novel situation (the Covid-19 pandemic). Thus, though the sample may not perfectly represent all healthcare professionals or members of the general public, the results demonstrate the repeated presence of negative sentiments, and a lack of positive sentiments, towards experiments across eight distinct situations among segments of populations whose opinions matter.

Furthermore, because experiment aversion and appreciation are likely socio-cultural phenomena, we should expect that the presence or size of the effects we report may differ among societies and over time. However, contrary to recent claims [35], the similarity in aversion to experiments between laypeople and clinicians suggests that these results generalize across populations that differ in their level of knowledge of RCTs. In addition, our findings here and elsewhere [18,19] show that experiment aversion occurs in health and non-health scenarios and, within the health domain, in both clinical and public health scenarios, and regarding both pharmaceutical and non-pharmaceutical interventions.

Finally, as noted above, all vignettes discussed in this paper are silent about whether the consent of patients and/or clinicians would be obtained. Previous work that did not directly compare judgments about pRCTs versus treatment implementation suggests that when given the option, laypeople prefer to be asked for consent (e.g., for a study comparing the effectiveness of two marketed hypertension drugs, a scenario somewhat related to one of ours [36,37]). Additionally, other research has found neither experiment aversion nor appreciation (as we define it here and elsewhere [28]) after introducing a critical element of voluntariness by asking respondents how likely they would be to "choose to be treated" at a hospital that is conducting a pRCT. In separate work, we found that when vignettes explicitly specify that prior consent is obtained, negative sentiment towards pRCTs is reduced—but not eliminated [28]. However, individual consent would undermine the external validity of pRCTs, and is anyhow rarely feasible in such settings [27,38,39], e.g., tests of policy interventions such as providing safety checklists and promulgating public health rules.

Critics rightly note that RCTs have limited external validity when they employ overly selective inclusion/exclusion criteria or are executed in ways that deviate from how interventions would be operationalized in diverse, real-world settings. However, the solution is not to abandon randomized evaluation, but to incorporate it into routine clinical care and healthcare delivery via pRCTs [1,39–41]. It has been many years since the U.S. Institute of Medicine urged research of many varieties to be embedded in care [42]. More recently, the UK Royal College of Physicians and National Institute for Health and Care Research issued a joint position statement similarly advocating the integration of research into care [43]. In addition, the U.S. Food and Drug Administration now promotes pRCTs to support post-marketing monitoring and other regulatory decision-making [44,45], a priority also highlighted in the UK Medicines and Healthcare products Regulatory Agency's 2021-2023 Delivery Plan [46] and guidance on RCTs [47]. Pragmatic RCTs have been fielded successfully and informed healthcare practice and policy [38,48,49], but they remain far from ubiquitous and they require buy-in to be successful, as shown by the case of a Norwegian school reopening trial during the pandemic that was abandoned due to lack of such support [50,51]. Broadening the use of pRCTs will require not only redoubling investment in interoperable electronic health records and recalibrating regulators' views of the comparative risks of research versus idiosyncratic practice variation,1 but also anticipating and addressing experiment aversion among patients and healthcare professionals.

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DATA AVAILABILITY

Participant response data, preregistrations, materials, and analysis code have been deposited in Open Science Framework (https://osf.io/6p5c7/?view_only=eaeb95cb754247028f1d1ed94414cbd2).

Figure Captions

Figure 1

Lay Sentiments About pRCTs

[figure uploaded separately]

Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—“very inappropriate” or “somewhat inappropriate”— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

Figure 2

Lay Sentiments About Covid-19 pRCTs

[figure uploaded separately]

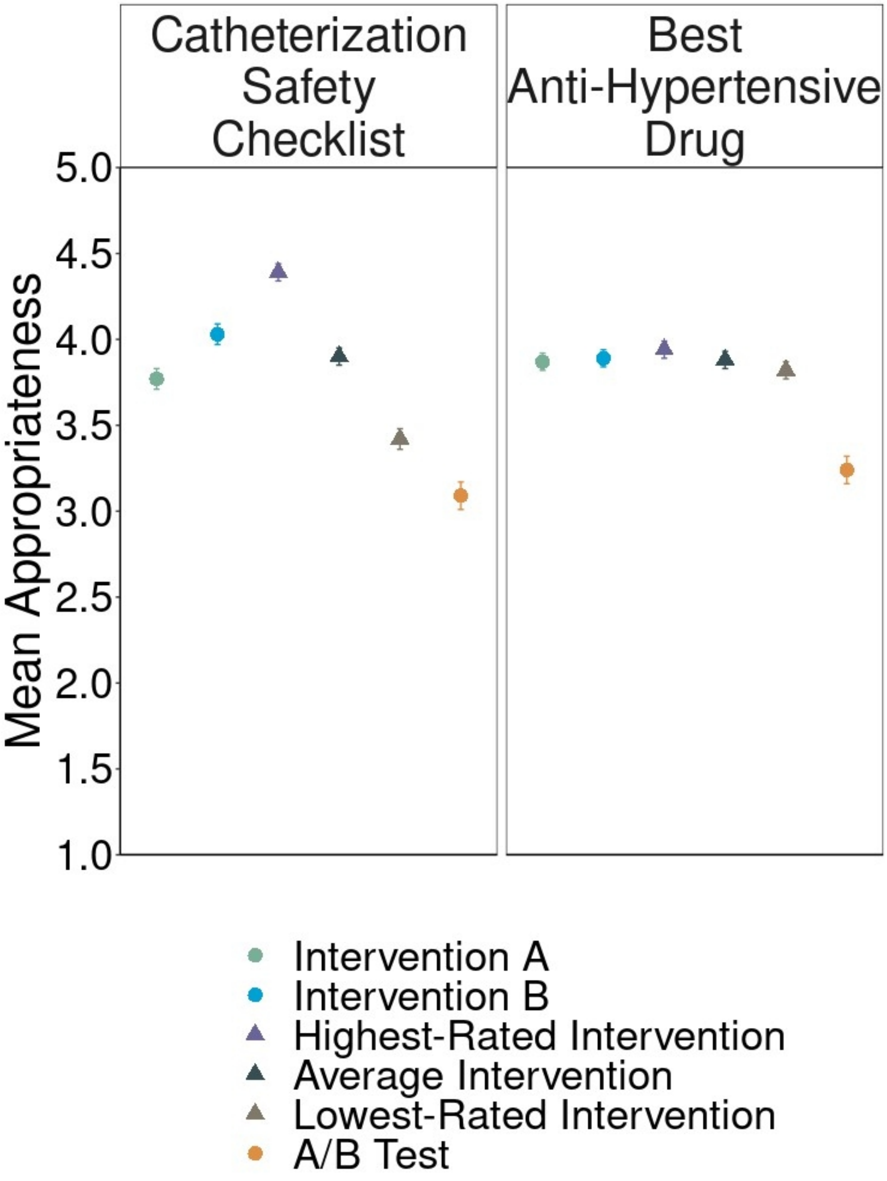
Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—"very inappropriate" or "somewhat inappropriate"— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

Figure 3

Clinician Sentiments About Covid-19 pRCTs

[figure uploaded separately]

Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—"very inappropriate" or "somewhat inappropriate"— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.



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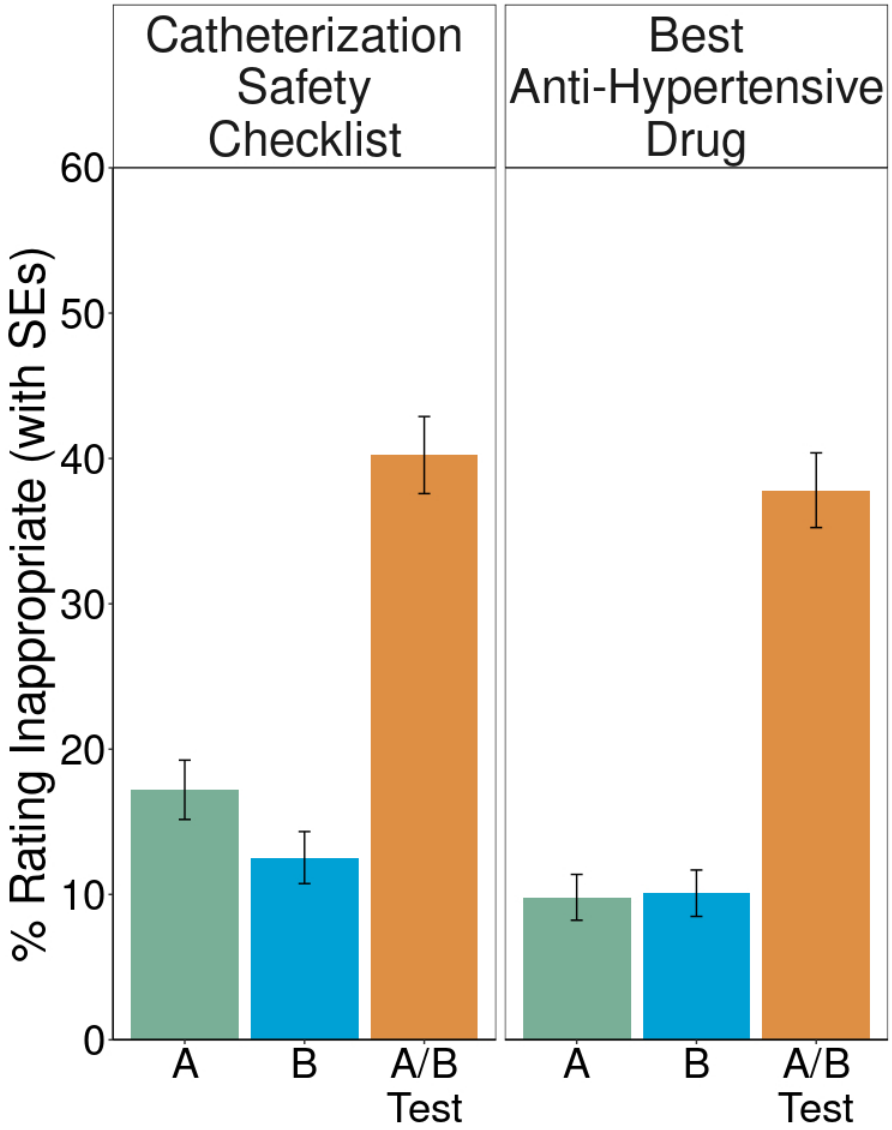

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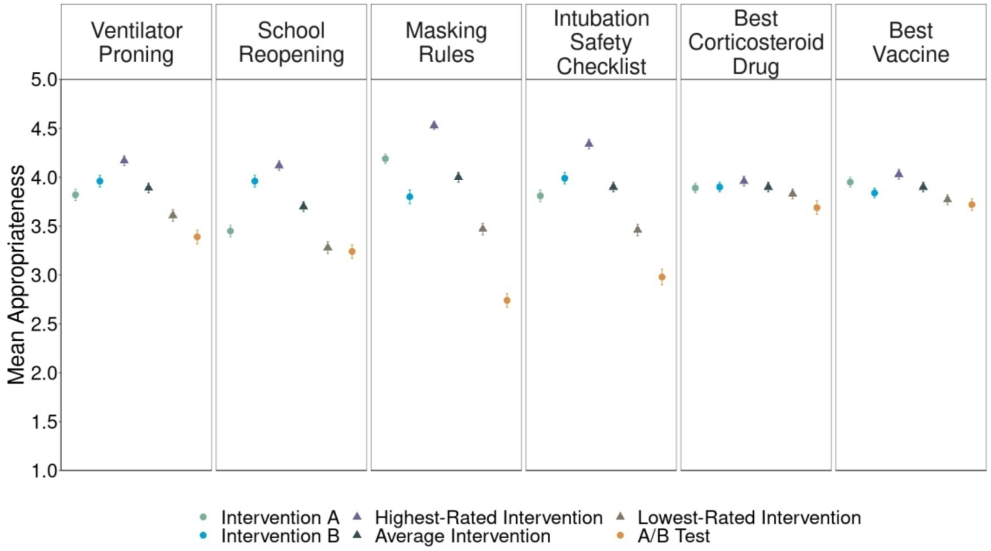

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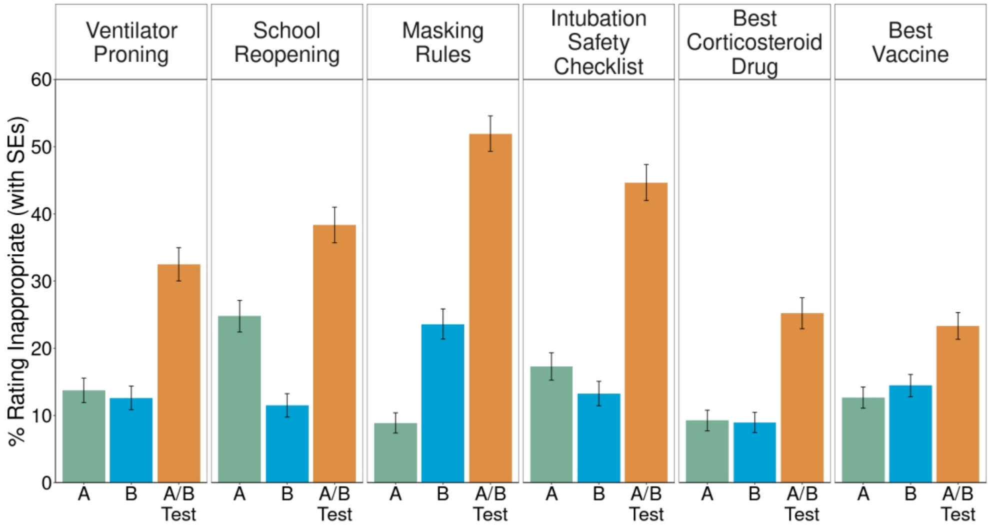

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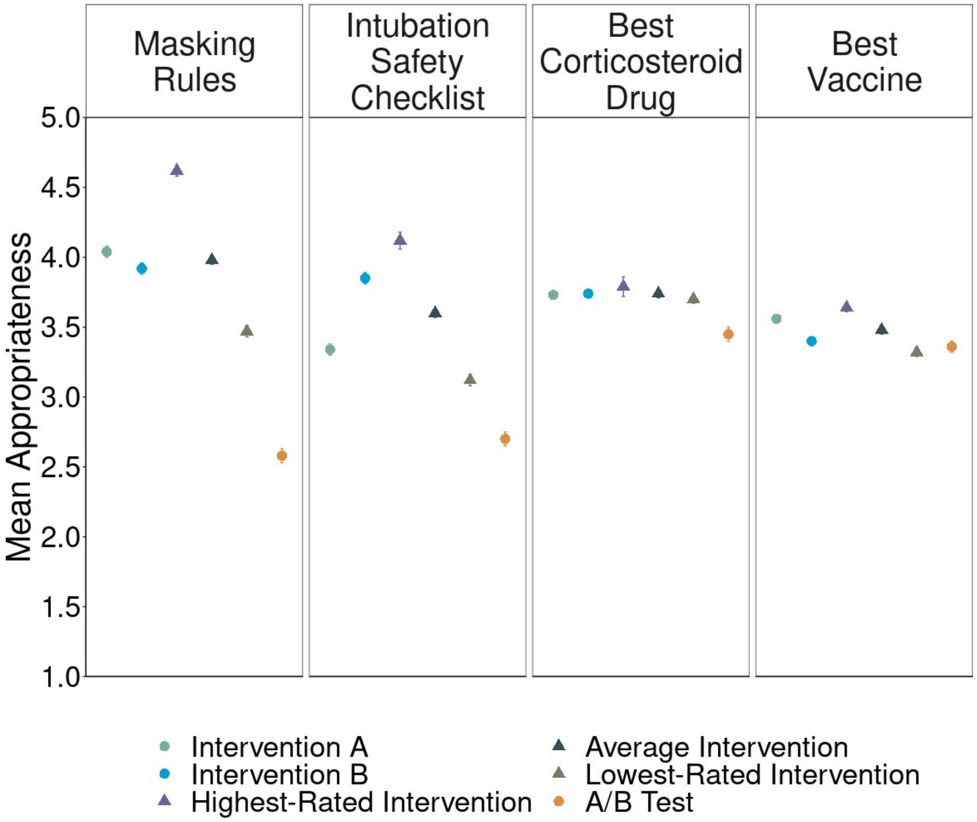

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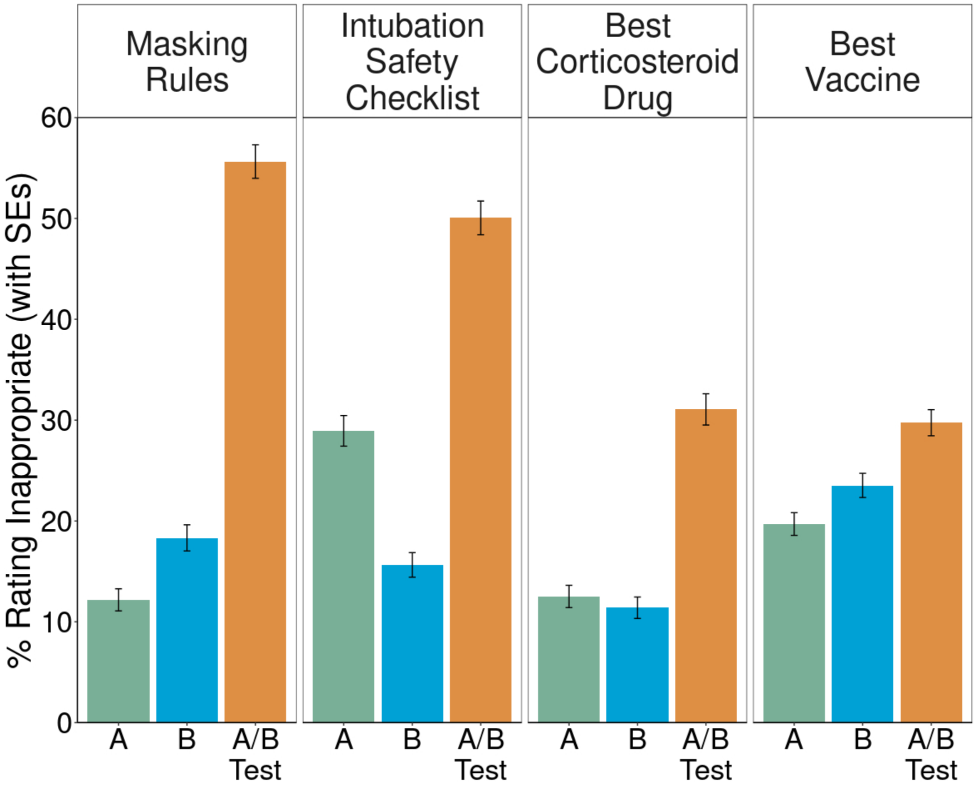

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Aversion to pragmatic randomized controlled trials among clinicians and laypeople

Supplemental Materials

Table of Contents

Methods

In the main text, we grouped the vignettes thematically into three sets: "Lay Sentiments About pRCTs," "Lay Sentiments About Covid-19 pRCTs," and "Clinician Sentiments About Covid-19 pRCTs." However, when we collected data, we grouped our vignettes differently such that we started with vignettes that we have used in previous published work and their respective Covid-19 derivatives, then we developed and tested novel Covid-19 specific vignettes separately, and then, again separately, we tested a Covid-19 vaccine vignette. We followed a similar pattern in our clinician sample: we first tested three Covid-19 specific vignettes (two which were derivatives of vignettes from our previous work, one which was new to this work) and then separately, we tested a Covid-19 vaccine vignette. These groupings are important for understanding how participants were randomly assigned to vignettes and why there are slight discrepancies (or large discrepancies in the case of the Best Vaccine vignette in the clinician sample[1]) in the number of participants in each vignette (see Table S1).

Table S1

Population, sample size, and dates of data collection for each vignette

Preregistration #	Vignette	Population	Sample size	Dates of data collection
1	Catheterization Safety Checklist	MTurk workers	343	August 13, 2020
	Intubation Safety Checklist	MTurk workers	347	August 13, 2020
	Best Anti-Hypertensive Drug	MTurk workers	357	August 13, 2020
	Best Corticosteroid Drug	MTurk workers	357	August 13, 2020
2	Masking Rules	MTurk workers	360	September 30-October 2, 2020
	School Reopening	MTurk workers	339	September 30-October 2, 2020
	Best Vaccine (ambiguous version)*	MTurk workers	350	September 30-October 2, 2020
	Ventilator Proning	MTurk workers	357	September 30-October 2, 2020
3	Intubation Safety Checklist	Clinicians	271	November 13-December 9, 2020
	Best Corticosteroid Drug	Clinicians	275	November 13-December 9, 2020
	Masking Rules	Clinicians	349	November 13-December 9, 2020
4	Best Vaccine	MTurk workers	450	January 8, 2021
5	Best Vaccine	Clinicians	1254	January 25-February 9, 2021

Note. Within each data collection batch, participants were randomly assigned to one of the vignettes. In the clinician sample (preregistration #3), clinicians saw all three vignettes in randomized order. The sample size reported here is the number of clinicians who saw that vignette first.

*Our first attempt at the Best Vaccine vignette included wording that unintentionally made the experiment condition less averse. For this reason, this vignette is not included in the main analyses.

[1] The Best Vaccine vignette was combined with another study that required a sample size much larger than the sample sizes in our previous vignette studies to have adequate statistical power.

For clarity, in the main text of this article we used different names for the vignettes than those used in the preregistrations and in previous publications (see Table S2).

Table S2

Original vignette names from preregistrations and previous work and corresponding name in main text

Original vignette name	Main text vignette name Hospital
Safety Checklist (also called Checklist)	Catheterization Safety Checklist Best
Drug: Walk-In Clinic (also called Best Drug)	Best Anti-Hypertensive Drug
Checklist (Covid-19)	Intubation Safety Checklist
Best Drug (Covid-19)	Best Corticosteroid Drug
Ventilator Proning	Ventilator Proning
School Reopening	School Reopening
Mask Requirements	Masking Rules
Modified Covid-19 Vaccines	Best Vaccine
Vaccine Distribution	(not reported in main text)

Note. Vignette names in this article were changed from those in previous work and in our preregistrations in order to clarify the content for readers.

Preregistrations, sample sizes, and power analyses

Our research questions, power analyses and sample sizes, and analysis plans were all preregistered at Open Science Framework (OSF) before data collection. These sample size precommitments are copied from each preregistration document which can be found on OSF at https://osf.io/u945y/?view_only=a901fde13ddb423899074eb79964c6cd.

Preregistration 1 (Catheterization Safety Checklist, Best Anti-Hypertensive Drug, Intubation Safety Checklist, Best Corticosteroid Drug vignettes):

"We predict that, using a two-tailed, paired t-test with α = .05 within each scenario, participants will rate the A/B test condition as significantly less appropriate than their own average rating of the two policy conditions, mean(A,B). This is the test for the "A/B Effect." Recruiting 350 participants for each scenario provides 95% power to detect an effect as small as d = 0.19, which is substantially smaller than the effect sizes we have observed using the Hospital Safety Checklist and Best Drug: Walk-In Clinic vignettes in past research."

Preregistration 2 (Ventilator Proning, School Reopening, Masking Rules, and Best Vaccine (initial ambiguous version) vignettes):

"We predict that, using a two-tailed, paired t-test with α = .05 within each scenario, participants will rate the A/B test condition as significantly less appropriate than their own average rating of the two policy conditions, mean(A,B). This is the test for the "A/B Effect." Recruiting 350 participants for each scenario provides 95% power to detect an effect as small as d = 0.19, which is substantially smaller than the effect sizes we have observed using the Hospital Safety Checklist and Best Drug: Walk-In Clinic vignettes in past research."

Preregistration 3 (Clinicians; Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes):

Note that because of time constraints around the possible starting dates of our clinician surveys, we launched this study before preregistering it, and we did not report an explicit power analysis before collecting the data. Because this study follows a similar structure to the studies above, however, it was reasonable to apply the previous sample size and power analysis considerations. We did, however, preregister our approach and research plan twice during this study: once during data collection, before any analyses had been conducted, and again after all data had been collected (but before analyzing any of them).

> Preregistration 3.1: "At the time of this preregistration, we have received 655 complete responses. No data have been explored or analyzed at this point. We will conduct an interim analysis on this dataset using the same analyses we have previously preregistered, and we may continue to collect more data from this population."
>
> Preregistration 3.2: "Data collection is now complete and we have closed the survey. On 11/24/2020, we conducted an interim analysis on 601 complete responses. Since then, we have received an additional 295 complete responses, to which we remain blind."

Preregistration 4 (Best Vaccine):

"We recruited 350 participants for the original Covid-19 vaccines study. Because we are running this study to determine whether even a small effect emerges, we will increase the sample size to 450 participants. This provides 80% power to detect an effect as small as d = 0.13 in a repeated- measures, two-tailed t-test, and 95% power to detect an effect as small as d = 0.17."

Preregistration 5 (Clinicians; Best Vaccine):

"Our previous survey of healthcare providers resulted in approximately 900 complete responses; we expect a similar response rate for this survey. This sample size provides 95% power to detect an effect as small as d = 0.12 using a two-tailed, repeated measures t-test. Even if we only receive 600 complete responses, we will have 95% power to detect an effect as small as d = 0.15."

Procedure and design

Several aspects of the procedure and experimental design were consistent across the studies reported here. Below, we describe these consistent features and note in specific studies where we deviated from them.

For the lay participant samples, we used the CloudResearch service to recruit crowd workers on Amazon Mechanical Turk (MTurk) to participate in a 3–5-minute survey experiment. These services provide samples that are broadly representative of the U.S. population and are well-accepted in social science research as providing as good or better-quality data than convenience samples such as student volunteers, with results that are similar to probability sampling methods [1,2]. Participants were excluded from recruitment in any of the studies reported here if they had participated in any of our previous studies on this topic. Across all laypeople vignettes, the completion rate of participants starting the survey was 91.5%. The [blinded for review] IRB determined that these anonymous surveys were exempt (IRB# 2017-0449).

For the clinician samples, we recruited healthcare providers (including physicians, physician assistants, nurse practitioners, and nurses) from a large health system in the Northeastern U.S via email. Each provider received either one or two emails about the study during the recruitment window. In the first clinician study (Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes), we first tested the email recruitment system by sending out the survey invitation email to just 200 clinicians. Clinicians who completed the survey based on this survey invitation were included in the final sample. Then, all clinicians were sent the recruitment email on November 19, 2020, followed by a reminder email on December 3, 2020. In the second clinician study (Best Vaccine), the initial recruitment email was sent January 25, 2021, with the follow-up email sent February 2, 2021. In the first clinician study, 5,925 clinicians were emailed and 895 completed the survey. In the second clinician study, 6,993 clinicians were emailed and 1,254 completed the survey. In these samples, because survey responses were fully anonymous, we were not able to restrict participation based on our previous studies, so some participants who completed the Best Vaccine vignette may have earlier completed the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes.

In all cases, participants completed an online survey hosted by Qualtrics. After opening the survey, participants were randomly assigned to one of the possible vignettes being studied.[2,3] In the case of data collection batches 4 and 5, there was only one vignette being tested that all participants saw. At this point, we used the exact same procedure detailed in Heck et al. (2020) [4]. First, participants were instructed to read about several possible decisions made by different decision-makers[4], and to try to treat each decision as separate from the others. All scenarios contained a brief "background" text at the top of the page that summarized a problem, followed by three "situations," each of which detailed the decision-maker's choice to adopt intervention A, intervention B, or to run an A/B test by randomly assigning people to one of two test conditions. These conditions were presented in fully counterbalanced order; each participant received one of six possible orders (i.e., Situation 1 = A, Situation 2 = B, and Situation 3 = A/B; Situation 1 = A/B, Situation 2 = B, and Situation 3 = A; etc.…). At no point did we observe a meaningful effect of presentation order, so we collapsed across this variable for all analyses.

[2] For the clinician study of the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes, clinicians were randomly assigned to one of these three scenarios and then completed the remaining two scenarios in random order. For consistency with the rest of this project and with our previous survey experiment with clinicians regarding the A/B effect (3, Study 6), and in order to make the results from clinician samples comparable to those with lay samples (in which each participant only ever saw one scenario), we analyze data from this study as a between-subjects design where we only consider the first scenario that every participant completed. See the section "Order Effect in Clinician Study" elsewhere in this appendix for further analyses.

[3] The clinician version of the Best Vaccine vignette was combined with another study being conducted by a subset of researchers on this team. The materials for Best Vaccine were presented after the survey materials from the other study. Data from the other study are unrelated to the research questions tested here and will be reported separately.

For our primary outcome measures, participants were asked to rate the appropriateness of the decisions made in Situation 1, Situation 2, and Situation 3 (“How appropriate is the director's decision in Situation 1/2/3?”), using a 1-5 scale (1 = “Very inappropriate”, 2 = “Inappropriate”, 3 = “Neither inappropriate nor appropriate”, 4 =”Appropriate”, 5 = “Very appropriate”). Participants then specified a ranked order of the three decisions (“Among these three decisions, which decision do you think the director should make? Please drag and drop the options below into your preferred order from best to worst. You must click on at least one option before you can proceed.”), with 1 being the best decision and 3 being the worst. The last item on this page asked participants to explain why they chose these ratings and rankings in a couple of sentences (“In a couple of sentences, please tell us why you chose the ratings and rankings you chose.”).

Following these primary measures, participants completed standard demographic items on the next page. For MTurk participants, these were measures of sex, race/ethnicity, age, educational attainment, household income, religious belief or affiliation, whether they have a degree in a STEM field or not, and four items identifying political orientation and affiliation. As part of an ongoing study in our laboratory (whose results will be reported elsewhere), these participants were randomized to one of six conditions for this demographic questionnaire where we varied the option to select “prefer not to answer” and whether the items were mandatory, optional, or requested (but not required). For clinician participants, demographic items were mandatory response and were limited to the following: sex, sources of training in research methods and statistics, self-reported comfort with research methods and statistics, past experience with activities related to research methods and statistics (e.g., publishing a scientific paper or analyzing data), current involvement in research, position (e.g., doctor, physician assistant, nurse, medical student, etc.), length of time working in the medical field, and field of specialty.

After completing the survey, MTurk participants were given a completion code to receive payment ($0.40). Clinician participants were invited to enter into a lottery to win a $50 Amazon gift card by following a link to an independent survey where they could enter their email address. All participants were thanked for their participation and offered the opportunity to comment on the survey.

[4] In all vignettes, the protagonist (e.g., the hospital director or Dr. Jones) was male for ease of comparison to our previous work using these vignettes. Future work should examine the impact of the characteristics of the decision-maker on evaluations of their decisions regarding policy imposition and conducting RCTs.

Measures

We computed several variables to measure participants' sentiments about pRCTs.

Following Meyer et al. (2019) [3], we define an "A/B effect" as the difference between participants' mean policy rating and their rating of the A/B test—that is, the degree to which the policies are (on average) rated higher than the A/B test. We also report the percentage of participants whose mean policy rating is higher than their rating of the A/B test.

Following Heck et al. (2020 [4]; see also Mislavsky et al., 2019 [5]), we define "experiment aversion" as the difference between participants' rating of their own lowest-rated policy and their rating of the A/B test. We also report the percentage of participants who express experiment aversion.

"Experiment rejection" (first reported in Heck et al., 2020 [4], but without this name) occurs when a participant rates the A/B test as inappropriate (1 or 2 on the 5-point scale) while also rating each policy as neutral or appropriate (3–5 on the scale).

A "reverse A/B effect" is the difference between participants' rating of the A/B test and their mean policy rating—that is, the degree to which the A/B test is rated higher than the policies (on average). We also report the percentage of participants whose rating of the A/B test is higher than their mean policy rating.

"Experiment appreciation" is the difference between participants' rating of the A/B test and their rating of their own highest-rated policy. We also report the percentage of participants who express experiment appreciation.

"Experiment endorsement" occurs when a participant rates the A/B as appropriate (4 or 5 on the 5-point scale) while also rating each intervention as neutral or inappropriate (1–3 on the scale).

In all cases where a *d*-value was calculated (i.e., A/B effect, experiment aversion, reverse A/B effect, experiment appreciation), we used Cohen's *d* recovered from the *t*-statistic, *n*, and correlation between the two measures being compared (Dunlop et al., 1996 [6], equation 3: $d = t_c[2(1-r)/n]^{½}$; see also http://jakewestfall.org/blog/index.php/category/effect-size/kewestfall.org [7]. To calculate this *d*-value, we use the following R code: effsize::cohen.d(x,y, paired = TRUE).

In Figures 1B, 2B, and 3B, we transformed participants A, B, and A/B ratings on the continuous 5-point Likert scale into a binary objected/did not object variable (where objecting was defined as assigning a rating of 1 or 2—"very inappropriate" or "somewhat inappropriate"— on the 1–5 scale). We do this only for visualization and do not perform any statistical analyses on this transformed objected/did not object variable. Instead, as is standard in social and moral psychology, we treated appropriateness ratings elicited on the 5-point Likert scale as continuous. Therefore, we use t-tests to test the differences between the ratings of the A/B test and the interventions (lowest, average, and highest). Other methodologies and statistical analyses like a discrete choice approach, in which participants would see and evaluation two of the three possible decisions (e.g., intervention A vs. A/B test) at a time, or the Stuart-Maxwell test, which requires a kxk matrix of categorical variables, would not be appropriate.

Vignettes

Our vignettes were inspired by discussions about the ethics of real-world RCTs (see Table S3).

Table S3

Literature calling for or reporting an RCT similar to what is proposed in each vignette

Vignette name	Relevant literature
Catheterization Safety Checklist	Pronovost et al. [8], Urbach et al. [9], Arriaga et al. [10]
Best Anti-Hypertensive Drug	ROMP Ethics Study [11], Sinnott et al. [12]
Intubation Safety Checklist	Turner et al. [13]
Best Corticosteroid Drug	Wagner et al. [14]
Ventilator Proning	Elharrar et al. [15], Sartini et al. [16], Caputo et al. [17]
School Reopening	Fretheim et al. [18, 19], Helsingen et al. [20], Angrist et al. [21], Kolata [22]
Masking Rules	Abaluck et al. [23], Jefferson et al. [24], Bundgaard et al. [25]
Best Vaccine	Bach [26]

The following section shows the exact vignette text that participants read in these studies (with the exception of the bolded titles, which are never shown to participants).

Catheterization Safety Checklist

(Originally from Heck et al. (2020) [4], adapted from Meyer et al. (2019) [2])

Background: Some medical treatments require a doctor to insert a plastic tube into a large vein. These treatments can save lives, but they can also lead to deadly infections.

Situation 1

A hospital director wants to reduce these infections, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All patients having this procedure will then be treated by doctors with this list attached to their clothing.

Situation 2

A hospital director wants to reduce these infections, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All patients having this procedure will then be treated in rooms with this list posted on the wall.

Situation 3

A hospital director thinks of two different ways to reduce these infections, so he decides to run an experiment by randomly assigning patients to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After a year, the director will have all patients treated in whichever way turns out to have the highest survival rate.

Best Anti-Hypertensive Drug

(Originally from Heck et al. (2020) [4], adapted from Meyer et al. (2019) [2])

Background: Several drugs have been approved by the US. Food and Drug Administration as safe and effective for treating high blood pressure. Doctor Jones works in a multi-doctor walk-in clinic where patients see whichever doctor is available. Some doctors in the clinic prescribe drug A for high blood pressure, while others prescribe drug B. Both drugs are affordable and patients can tolerate their side effects.
Situation 1

Doctor Jones wants to provide good treatment to his patients, so he decides that his patients who need high blood pressure medication will be prescribed drug A.

Situation 2

Doctor Jones wants to provide good treatment to his patients, so he decides that his patients who need high blood pressure medication will be prescribed drug B.

Situation 3

Doctor Jones thinks of two different ways to provide good treatment to his patients, so he decides to run an experiment by randomly assigning his patients who need high blood pressure medication to one of two test conditions. Half of patients will be prescribed drug A, and the other half will be prescribed drug B. After a year, he will only prescribe to new patients whichever drug has had the best outcomes for his patients.

Intubation Safety Checklist

Background: Some treatments for coronavirus (Covid-19) patients require a doctor to insert a plastic breathing tube into the throat. These treatments can save lives, but they can also lead to deadly fluid buildup in the lungs.

Situation 1

A hospital director wants to reduce these cases of fluid buildup, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All coronavirus patients having this procedure will then be treated by doctors with this list attached to their clothing.

Situation 2

A hospital director wants to reduce these cases of fluid buildup, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All coronavirus patients having this procedure will then be treated in rooms with this list posted on the wall.

Situation 3

A hospital director thinks of two different ways to reduce these cases of fluid buildup, so he decides to run an experiment by randomly assigning coronavirus patients who need a breathing tube to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After two months, the director will have all patients treated in whichever way turns out to have the highest survival rate.

Best Corticosteroid Drug

Background: Several corticosteroids (a family of anti-inflammatory drugs) have been approved by the U.S. Food and Drug Administration as safe and effective for treating a variety of diseases. There is some evidence that corticosteroids can also help certain coronavirus (Covid-19) patients, and many doctors prescribe corticosteroids for these patients. Doctor Jones works in a multi-doctor emergency department where patients see whichever doctor is available. Some doctors in the emergency department prescribe corticosteroid A for coronavirus symptoms, while others prescribe corticosteroid B. Both corticosteroids are affordable and patients can tolerate their side effects.

Situation 1

Doctor Jones wants to provide good treatment to his patients, so he decides that his coronavirus patients who need medication will be prescribed corticosteroid A.

Situation 2

Doctor Jones wants to provide good treatment to his patients, so he decides that his coronavirus patients who need medication will be prescribed corticosteroid B.

Situation 3

Doctor Jones thinks of two different ways to provide good treatment to his coronavirus patients, so he decides to run an experiment by randomly assigning his patients who need medication to one of two test conditions. Half of coronavirus patients will be prescribed corticosteroid A, and the other half will be prescribed corticosteroid B. After two months, he will only prescribe to new coronavirus patients whichever corticosteroid has had the best outcomes for his patients.

Ventilator Proning

Background: Some coronavirus (Covid-19) patients have to be sedated and placed on a ventilator to help them breathe. Even with a ventilator, these patients can have dangerously low blood oxygenation levels, which can result in death. Current standards suggest that laying ventilated patients on their stomach for 12-16 hours per day can reduce pressure on the lungs and might increase blood oxygen levels and improve survival rates.

Situation 1

A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 12-13 hours per day.

Situation 2

A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 15-16 hours per day.

Situation 3

A hospital director thinks of two different ways to save as many ventilated Covid-19 patients as possible, so he decides to run an experiment by randomly assigning ventilated Covid-19 patients to one of two test conditions. Half of these patients will be placed on their stomach for 12-13 hours per day. The other half of these patients will be placed on their stomach for 15-16 hours per day. After one month, the director will have all ventilated Covid-19 patients treated in whichever way turns out to have the highest survival rate.

Best Vaccine (ambiguous version; results not reported in main analyses)

Background: Imagine that several vaccines have been approved by the U.S. Food and Drug Administration as safe and effective for preventing Covid-19. Vaccine A uses mRNA molecules to provide the cells with a blueprint for how to destroy the virus. Vaccine B uses deactivated or weakened coronavirus to help the body create an immune resistance to the disease. Both vaccines are affordable, similarly priced, and people can tolerate their side effects. However, people can only receive one of these two vaccines.

Situation 1

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine A for free. People can get any other vaccine somewhere else, if they want.

Situation 2

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine B for free. People can get any other vaccine somewhere else, if they want.

Situation 3

The director of public health for a state thinks of two different ways to reduce Covid-19 cases, so he decides to run an experiment by randomly assigning clinics in the state to one of two test conditions. Half of the clinics will offer Vaccine A for free, and the other half will offer Vaccine B for free. People can get any other vaccine somewhere else, if they want.[5] After six months, he will direct the state to offer whichever vaccine has resulted in the fewest cases of Covid-19.

Best Vaccine

Background: Imagine that several vaccines have been approved by the U.S. Food and Drug Administration as safe and effective for preventing Covid-19. Vaccine A uses mRNA molecules to provide the cells with a blueprint for how to destroy the virus. Vaccine B uses deactivated or weakened coronavirus to help the body create an immune resistance to the disease. Both vaccines are affordable, similarly priced, and people can tolerate their side effects.

Situation 1

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine A for free.

Situation 2

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine B for free.

Situation 3

The director of public health for a state thinks of two different ways to reduce Covid-19 cases, so he decides to run an experiment by randomly assigning clinics in the state to one of two test conditions. Half of the clinics will offer Vaccine A for free, and the other half will offer Vaccine B for free. After six months, he will direct the state to offer whichever vaccine has resulted in the fewest cases of Covid-19.

[5] This wording unintentionally implied that residents could choose their vaccine (by going elsewhere) if they did not wish to be subject to the official's decision (including policy implementation or A/B test); we suspect this had the effect of making the experiment condition less aversive, since people could effectively opt-out of it, and our goal in this research is to study pragmatic, real-world situations in which avoiding randomization is not a realistic option.

School Reopening

Background: This Fall, school districts must decide whether to reopen their doors to students, teachers, and staff despite the risks of spreading coronavirus (Covid-19). Many school and public health officials have decided to use a “hybrid model” of teaching that offers some of the benefits of face-to-face learning time while attempting to minimize the risks related to Covid-19.

Situation 1

A superintendent at a large school district wants to provide good education to his students while slowing the spread of Coronavirus. So, he decides that students will attend school according to an even-odd schedule. Students in even-numbered grades (e.g., 2nd grade, 4th grade, etc.) will attend school in the morning and learn remotely in the afternoons, while students in odd- numbered grades will attend school in the afternoon and learn remotely in the mornings.

Situation 2

A superintendent at a large school district wants to provide good education to his students while slowing the spread of Coronavirus. So, he decides that students will attend school according to an A-day/B-day schedule. Students in the A group will attend school in person on Monday, Tuesday, and Wednesday morning, and students in the B group will attend school in person on Wednesday afternoon, Thursday, and Friday. Students will learn remotely on the days they do not attend school.

Situation 3

A superintendent at a large school district thinks of two different ways to provide good education to his students while slowing the spread of Coronavirus. So, he decides to conduct an experiment by randomly assigning schools in the district to one of two test conditions. For half of schools, students will attend school according to an even-odd schedule. Students in even-numbered grades (e.g., 2nd grade, 4th grade, etc.) will attend school in the morning and learn remotely in the afternoons, while students in odd-numbered grades will attend school in the afternoon and learn remotely in the mornings. For the other half of schools, students will attend school according to an A-day/B-day schedule. Students in the A group will attend school in person on Monday, Tuesday, and Wednesday morning, and students in the B group will attend school in person on Wednesday afternoon, Thursday, and Friday. Students will learn remotely on the days they do not attend school. At the end of the semester, all schools will adopt, for future semesters when the pandemic threat level remains similar, whichever policy has resulted in the best combination of test scores on state aptitude tests and number of Covid-19 cases.

Masking Rules

Background: Public health officials have considered different rules about when and where people must wear masks or other face coverings to reduce the spread of coronavirus (Covid-19).
Increasing mask use can reduce the spread of the disease, but highly restrictive mask policies can substantially reduce compliance rates.

Situation 1

A state health department director wants to reduce coronavirus spread within his state, so he decides that all counties will require masks in all businesses and public buildings.

Situation 2

A state health department director wants to reduce coronavirus spread within his state, so he decides that all counties will require masks in all businesses, public buildings, and outdoor public spaces.

Situation 3

A state health department director thinks of two different ways to reduce coronavirus spread within his state, so he decides to run an experiment by randomly assigning counties within the state to one of two test conditions. Half of counties will require masks in all businesses and public buildings. The other half of counties will require masks in all businesses, public buildings, and outdoor public spaces. After one month, the director will require all counties to adopt whichever policy has led to the fewest cases of Covid-19 for as long as the pandemic threat level remains high.

Results

Sample demographics

Lay participants

Across all vignettes reported in the main text (i.e., excluding the initial ambiguous version of the Best Vaccine vignette), there were a total of 2,909 lay participants. They ranged in age from 18 to 88 years old (mean = 38.4, SD = 12.8) and the majority were White (74.6%) and female (55.9%). 35.7% had a 4-year college degree, 29.7% had some college, and 20.5% had a graduate degree. 21.3% of participants had a degree in a STEM field. The most frequently selected income level was between $20,000 and $40,000 (20.7%). A majority of participants reported being moderate, leaning liberal, or being liberal both generally and specifically with regards to social and economic issues. Similarly, a majority of participants reported being independent, leaning Democrat, or being Democrat in their political party affiliations. 37.7% of participants reported being non-religious. Of those who reported being religious, the most reported religion was Protestant (24.2%). See Table S4 for demographic breakdowns by vignette and in the combined lay participant sample.

Table S4

Demographics of lay participants by vignette

	Catheterization Safety Checklist	Best Anti-Hypertensive Drug	Intubation Safety Checklist	Best Corticosteroid Drug	Best Vaccine (first attempt)	Best Vaccine	School Reopening	Ventilator Proning	Masking Rules	All vignettes
Total N	343	357	346	357	350	450	339	357	360	2909
Age [Mean (SD)]	37.9 (12.9)	38.6 (12.9)	37.9 (12.4)	38.0 (12.7)	36.7 (12.0)	37.7 (12.6)	38.7 (13.0)	38.4 (12.7)	39.0 (12.8)	38.4 (12.8)
Sex (%)										
Male	51.3%	41.5%	48.1%	51.5%	36.6%	38.4%	39.2%	40.9%	39.7%	43.6%
Female	47.8%	58.0%	51.9%	48.2%	63.1%	60.9%	60.5%	58.8%	60.0%	55.9%
Other	0.6%	0.6%	0.0%	0.0%	0.3%	0.4%	0.3%	0.3%	0.3%	0.2%
Prefer not to answer	0.3%	0.0%	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%
Race - select all that apply (%)										
Black/African-American	11.1%	5.0%	8.4%	10.1%	10.9%	11.3%	9.7%	6.7%	8.9%	9.0%
Hispanic or Latino	8.2%	8.4%	7.2%	8.4%	8.3%	5.6%	5.9%	9.5%	7.5%	7.5%
White	72.0%	78.7%	71.5%	72.0%	70.9%	72.7%	77.0%	77.6%	75.8%	74.6%
Asian	12.5%	8.7%	15.3%	12.6%	12.6%	13.3%	8.6%	7.0%	7.8%	10.8%
Other	1.2%	1.7%	1.2%	0.3%	3.4%	0.9%	1.8%	1.7%	2.2%	1.3%
Prefer not to answer	0.9%	0.6%	0.0%	0.6%	0.3%	0.9%	0.6%	0.3%	0.3%	0.5%
Education (%)										
Less than high school	0.6%	0.8%	0.3%	0.3%	0.6%	0.2%	0.3%	9.8%	0.8%	0.4%
High school degree	5.5%	7.8%	8.9%	9.2%	9.1%	10.2%	10.3%	29.4%	11.4%	9.2%
Some college	32.7%	32.2%	24.2%	28.0%	30.3%	32.0%	26.3%	33.6%	31.9%	29.7%
Four-year college degree	37.3%	35.6%	39.5%	35.9%	37.1%	35.8%	37.8%	3.1%	30.6%	35.7%
Some graduate school	4.4%	3.4%	4.6%	4.2%	4.6%	5.1%	4.4%	23.8%	4.7%	4.3%
Graduate degree	19.2%	19.9%	22.5%	22.1%	18.3%	16.2%	20.9%	0.3%	20.6%	20.5%
Prefer not to answer	0.3%	0.3%	0.0%	0.3%	0.0%	0.4%	0.0%	0.0%	0.0%	0.2%
Income (%)										
< $20,000	11.1%	8.4%	9.2%	7.6%	12.0%	9.3%	9.4%	11.2%	9.7%	9.5%
$20,000-$40,000	17.8%	22.1%	21.6%	25.8%	19.7%	20.2%	18.9%	19.0%	19.7%	20.7%
$40,000-$60,000	24.5%	18.8%	19.0%	20.2%	21.4%	20.4%	21.2%	19.9%	20.8%	20.6%
$60,000-$80,000	13.7%	17.4%	16.1%	17.9%	18.6%	17.8%	16.5%	19.3%	19.2%	17.3%
$80,000-$100,000	11.4%	13.7%	11.0%	9.5%	10.6%	12.2%	13.3%	8.4%	12.2%	11.5%
> $100,000	20.7%	18.5%	21.3%	17.4%	17.1%	18.7%	20.4%	19.6%	16.9%	19.1%
Prefer not to answer	0.9%	1.1%	0.9%	1.4%	0.3%	1.3%	0.3%	2.5%	1.4%	1.2%
No response	0.0%	0.0%	0.9%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%
Political Ideology (%)										
Very liberal	12.2%	12.6%	13.0%	11.2%	10.6%	13.1%	12.7%	12.0%	12.8%	12.5%
Liberal	32.1%	30.3%	32.3%	35.9%	29.4%	31.1%	30.4%	30.8%	28.6%	31.4%
Moderate	29.2%	25.5%	28.2%	26.1%	31.1%	27.3%	27.7%	24.9%	28.3%	27.1%
Conservative	19.8%	20.2%	20.7%	17.1%	21.7%	18.7%	20.9%	21.3%	23.6%	20.2%
Very conservative	5.8%	10.6%	5.2%	9.5%	6.3%	8.9%	7.4%	9.8%	5.8%	7.9%
Prefer not to answer	0.9%	0.6%	0.3%	0.3%	0.9%	0.9%	0.6%	0.8%	0.8%	0.7%
No response	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.1%

Table S4, continued

Demographics of lay participants by vignette

	Catheterization Safety Checklist	Best Anti-Hypertensive Drug	Intubation Safety Checklist	Best Corticosteroid Drug	Best Vaccine (first attempt)	Best Vaccine	School Reopening	Ventilator Proning	Masking Rules	All vignettes
Political ideology on social issues (%)										
Very liberal	18.7%	16.8%	19.6%	13.7%	17.7%	18.0%	17.7%	[illegible]	17.5%	17.5%
Liberal	34.1%	33.3%	33.4%	40.3%	31.1%	30.4%	36.6%	[illegible]	31.7%	34.1%
Moderate	21.6%	23.8%	23.9%	19.9%	26.0%	25.6%	19.8%	[illegible]	23.3%	22.6%
Conservative	16.6%	15.4%	17.3%	17.1%	18.0%	16.0%	18.3%	16.0%	19.4%	17.0%
Very conservative	8.2%	10.4%	5.2%	8.4%	6.3%	9.1%	6.8%	[illegible]	7.5%	8.2%
Prefer not to answer	0.9%	0.3%	0.6%	0.6%	0.9%	0.9%	0.6%	[illegible]	0.6%	0.6%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
Political ideology on economic issues (%)										
Very liberal	9.9%	12.0%	13.5%	11.2%	8.0%	13.8%	11.8%	[illegible]	11.9%	11.9%
Liberal	28.3%	21.6%	27.1%	28.3%	24.9%	23.3%	27.7%	[illegible]	19.7%	24.8%
Moderate	28.0%	27.5%	25.1%	25.2%	27.7%	28.4%	24.2%	[illegible]	32.2%	27.3%
Conservative	23.0%	24.9%	24.8%	22.1%	30.9%	22.0%	24.2%	[illegible]	26.4%	24.1%
Very conservative	9.3%	13.7%	8.6%	12.0%	7.4%	11.3%	11.2%	12.9%	9.2%	11.1%
Prefer not to answer	1.5%	0.3%	0.9%	1.1%	1.1%	0.9%	0.6%	[illegible]	0.6%	0.8%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.0%	0.0%	0.1%
Political party (%)										
Strong Democrat	14.9%	10.9%	12.4%	13.7%	12.0%	13.6%	13.0%	[illegible]	12.8%	13.2%
Democrat	23.3%	22.7%	27.7%	28.9%	26.3%	24.4%	22.7%	[illegible]	21.7%	24.1%
Independent (but lean Democrat)	15.7%	16.2%	14.7%	12.9%	13.4%	14.9%	17.4%	[illegible]	15.8%	15.2%
Independent	15.7%	16.8%	17.6%	14.3%	16.9%	16.9%	13.6%	[illegible]	18.1%	16.0%
Independent (but lean Republican)	7.0%	8.7%	7.8%	10.4%	9.4%	8.7%	10.6%	10.9%	10.6%	9.3%
Republican	16.3%	14.6%	14.1%	12.0%	13.1%	15.3%	15.6%	[illegible]	13.9%	14.5%
Strong Republican	4.1%	8.4%	4.3%	7.3%	6.9%	4.9%	6.5%	[illegible]	6.4%	6.3%
Prefer not to answer	2.9%	1.7%	1.4%	0.6%	2.0%	1.3%	0.3%	[illegible]	0.8%	1.3%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
Religion (%)										
Christian - Protestant	26.2%	24.6%	23.6%	21.0%	24.6%	24.2%	25.4%	24.4%	23.9%	24.2%
Christian - Catholic	17.5%	16.5%	15.9%	18.2%	17.7%	14.0%	17.1%	[illegible]	15.3%	16.6%
Christian - Other	11.1%	11.2%	8.1%	11.2%	11.7%	11.1%	11.8%	10.9%	12.2%	11.0%
Jewish	2.6%	1.7%	1.7%	1.7%	1.7%	1.3%	1.8%	[illegible]	2.5%	1.8%
Muslim	2.0%	0.8%	1.4%	0.6%	0.3%	0.9%	1.2%	1.1%	1.7%	1.2%
Buddhist	2.3%	1.4%	2.0%	1.7%	1.1%	2.0%	2.4%	0.6%	1.4%	1.7%
Hindu	1.2%	0.6%	2.6%	1.1%	1.7%	1.6%	0.3%	[illegible]	0.6%	1.1%
Non-religious	32.7%	38.1%	40.9%	40.3%	36.6%	40.0%	35.4%	[illegible]	36.4%	37.7%
Other	3.5%	3.6%	2.6%	3.4%	3.7%	3.8%	4.1%	[illegible]	4.2%	3.6%
Prefer not to answer	0.9%	1.4%	1.2%	0.6%	0.9%	1.1%	0.6%	[illegible]	1.9%	1.2%
No response	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.3%	0.0%	0.1%
STEM degree (%)										
No	77.6%	77.0%	75.2%	76.8%	77.4%	80.7%	78.5%	[illegible]	78.6%	77.9%
Yes	21.9%	22.1%	23.3%	22.4%	22.3%	18.7%	21.5%	[illegible]	21.1%	21.3%
Prefer not to answer	0.6%	0.8%	1.4%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
No response	0.0%	0.0%	0.0%	0.0%	0.3%	0.7%	0.0%	0.3%	0.3%	0.1%

Clinicians

There were 2,149 clinician responses across all vignettes. In the clinician samples, survey responses were anonymous, so we could not restrict participation based on our previous studies so some participants who completed the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes may have also completed the Best Vaccine vignette. For this reason, demographics are reported separately by vignette in Table S5. Across vignettes, a majority of clinicians were female. Over 50% of participants in the sample were registered nurses, followed by physicians and physician assistants. Over 50% of participants in the sample reported that they had been in the medical field for over 10 years. The clinicians reported that they had received training in research methods and statistics via an average of 1.5 of the sources we listed, and that they engaged in an average of 2.5 research methods and statistics activities. Most clinicians reported being somewhat to moderately comfortable with research methods and statistics.

Table S5

Demographics of clinicians by vignette

	Intubation Safety Checklist	Best Corticosteroid Drug	Masking Rules	Best Vaccine
Total N	271	275	349	1254
Sex (%)				
Male	18.1%	22.5%	18.1%	18.7%
Female	81.9%	77.1%	81.4%	81.2%
Other	0.0%	0.4%	0.6%	0.2%
Source of research methods/statistics training - select all that apply (%)				
Undergraduate coursework	48.7%	49.5%	48.7%	47.4%
Professional school instruction	40.2%	31.3%	34.4%	34.4%
Postgraduate coursework	26.2%	20.7%	22.1%	21.1%
CME/CEU courses	27.7%	25.1%	24.1%	25.8%
Self-instruction via peer-reviewed literature	19.2%	15.6%	17.2%	21.3%
Other	7.0%	4.0%	3.2%	3.9%
Total number of research methods/statistics training [mean (SD)]	1.69 (1.22)	1.46 (1.02)	1.50 (1.13)	1.54 (1.16)
Comfort with research methods/statistics (%)				
Not at all	8.9%	12.7%	10.9%	11.1%
Somewhat	37.6%	44.4%	45.8%	46.6%
Moderately	39.5%	32.0%	32.7%	30.8%
Very	11.8%	9.1%	8.9%	9.9%
Extremely	2.2%	1.8%	1.7%	1.7%
Research methods/statistics activities - select all that apply (%)				
Read results of RCT in peer-reviewed journal article	81.2%	75.3%	71.9%	71.2%
Changed typical prescription/recommendation after personally reading results of RCT in peer-reviewed journal article	41.0%	33.1%	33.0%	39.8%
Published scientific paper in peer-reviewed journal	13.3%	12.4%	9.7%	12.0%
Conducted or worked on a team conducting an RCT	18.5%	20.0%	19.2%	17.1%
Took a course/class in statistics, biostatistics, research methods	73.1%	69.8%	69.1%	68.5%
Analyzed data for statistical significance outside of course require	23.6%	21.8%	19.2%	21.1%
Used statistical software	12.2%	11.6%	11.5%	9.3%
Total number of research methods/statistics activities [mean (SD)]	2.63 (1.69)	2.44 (1.71)	2.34 (1.66)	2.39 (1.72)
Currently involved in research (%)	10.7%	9.1%	9.7%	9.6%
Position (%)				
Doctor	14.8%	14.5%	12.6%	15.7%
Physician Assistant	12.5%	6.9%	9.5%	7.7%
Nurse Practitioner	6.3%	2.5%	4.3%	4.7%
Nurse (RN)	51.3%	57.1%	55.6%	52.8%
Nurse (LPN)	6.3%	9.5%	8.0%	15.6%
Nurse (Other)	1.8%	1.1%	1.4%	0.6%
Genetic Counselor	0.0%	0.0%	0.0%	0.0%
Non-prescribing clinician or staff without clinical credential	0.0%	0.0%	0.0%	0.0%
Medical student	5.2%	5.5%	4.6%	0.1%
Faculty or Professor	0.4%	0.7%	0.3%	0.3%
Other	1.5%	2.2%	3.7%	2.6%
Years in medical field (%)				
< 1 year	2.6%	2.9%	3.2%	2.8%
1-2 years	6.3%	5.5%	6.0%	5.8%
3-5 years	15.1%	11.3%	12.6%	13.6%
6-10 years	16.6%	14.2%	15.8%	15.8%
> 10 years	59.4%	66.2%	62.5%	62.0%

Note. Reported here are the demographics of the clinicians who saw the Intubation Safety Checklist, Best Corticosteroid Drug, or Masking Rules vignette first (responses to the Best Vaccine vignette were collected at a different time). All clinicians who participated in this study completed all vignettes but in randomized order. In the main text, we only analyze responses to the first vignette, so we report demographics similarly here.

Results presented in main text

In Figures S1-3, we show all individual appropriateness ratings (1 = very inappropriate, 5 = very appropriate) for intervention A, intervention B, and the A/B test across all vignettes.

Figure S1

Lay Sentiments About pRCTs

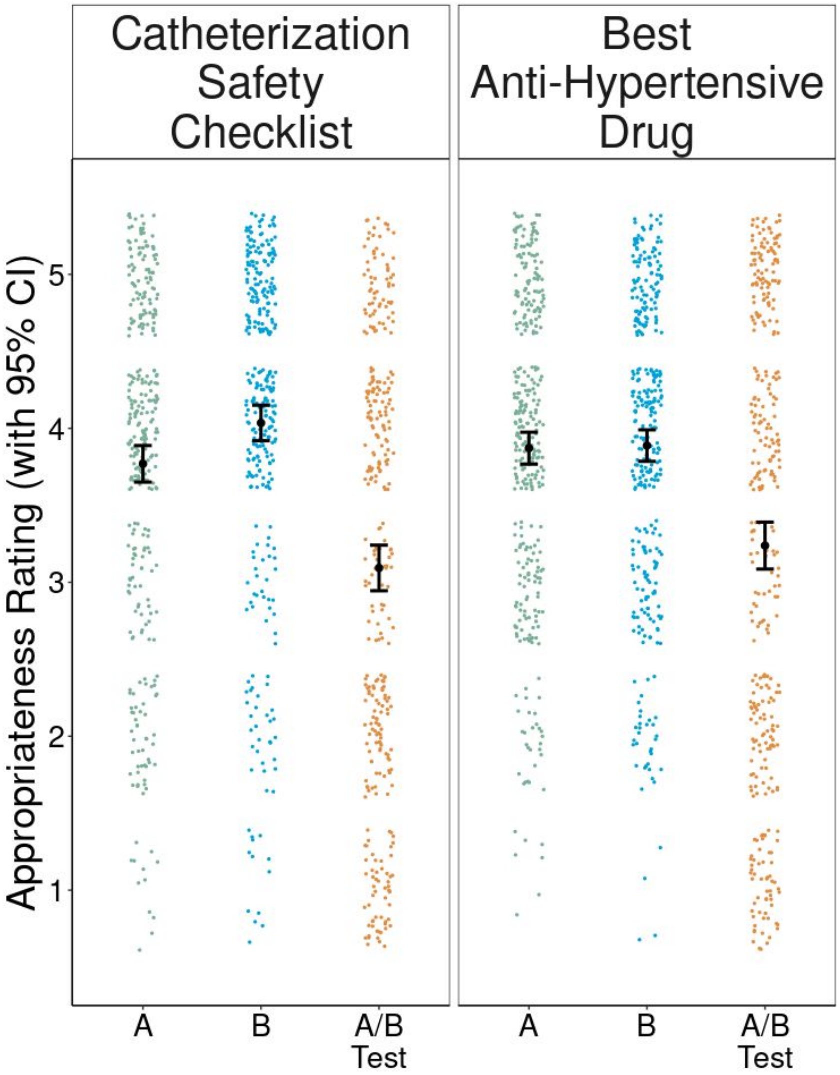


Figure S2

Lay Sentiments About Covid-19 pRCTs

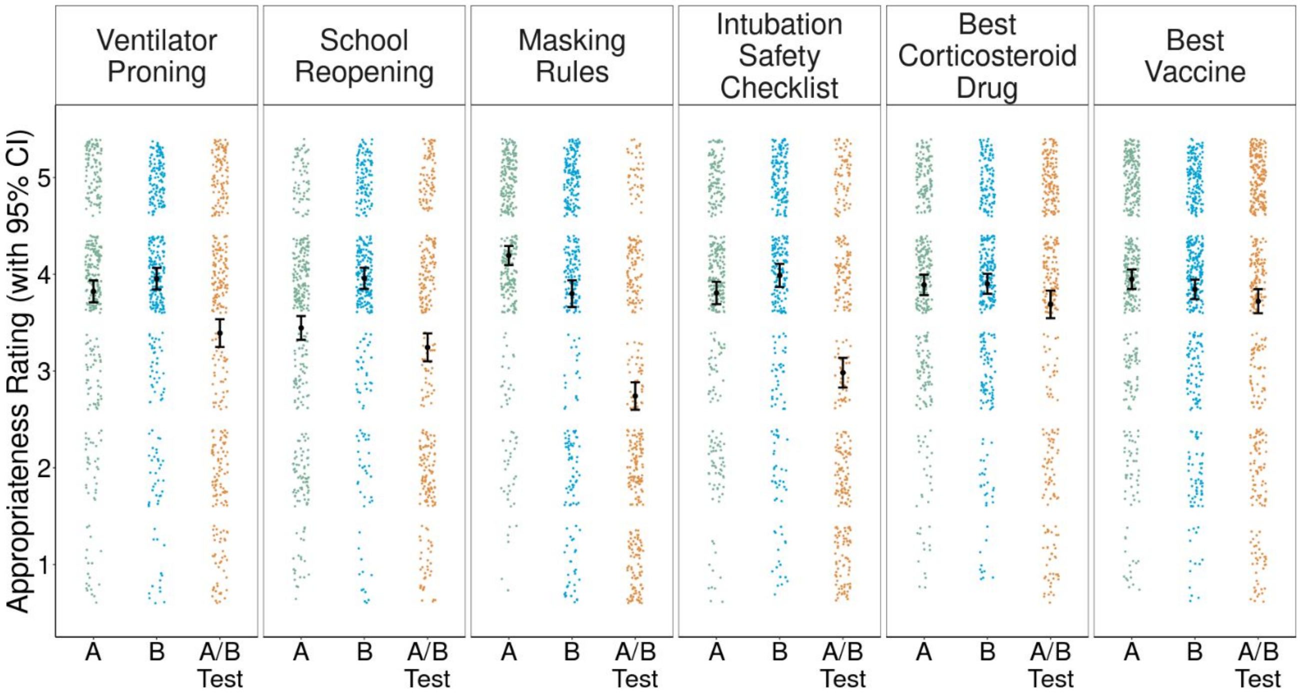
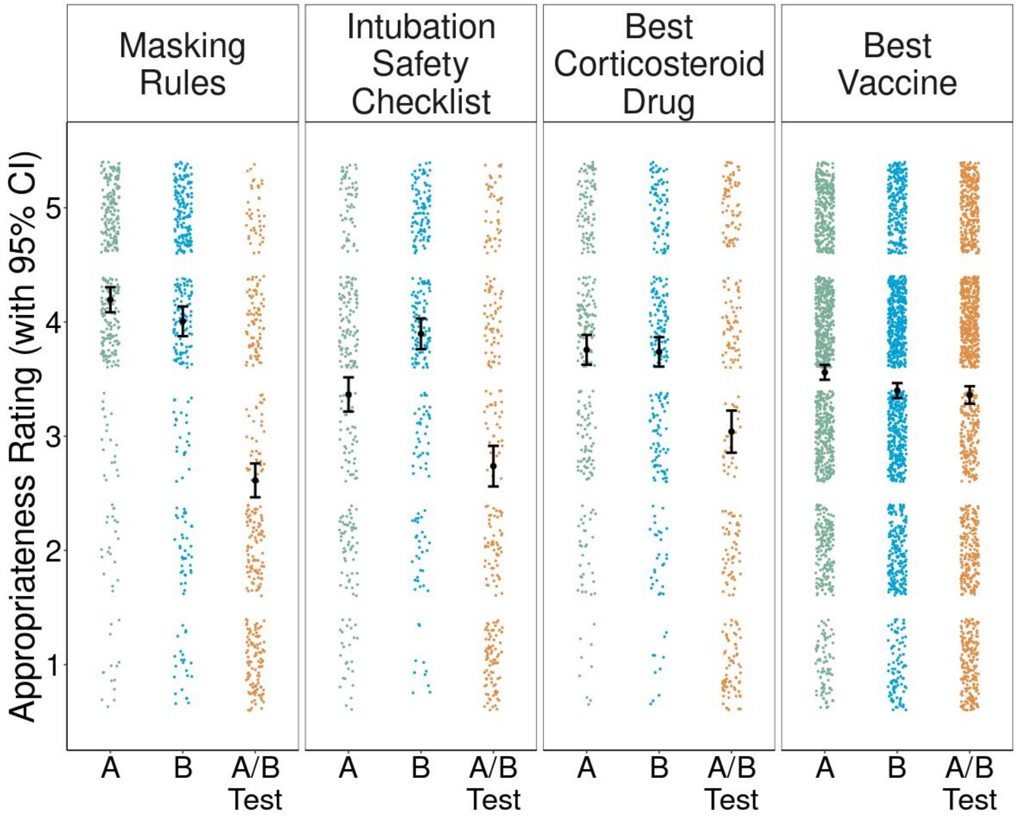


Figure S3

Clinician Sentiments About Covid-19 pRCTs



In Table S6A-C, we present the descriptive and inferential results for all vignettes discussed in the main text.

Table S6A

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

	Descriptive Results				***Inferential Results***	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Lay Sentiments About pRCTs						
Catheterization Safety Checklist (n = 343 laypeople)					A/B Effect	t (342) = 9.74***, d = 0.69 ± .16
					Mean(A,B) > AB	58% ± 5%
	A	3.77 (1.12)	27%	32%	Reverse A/B effect	t (342) = -9.74***, d = -0.69 ± .16
	B	4.03 (1.09)	42%	21%	AB > Mean(A,B)	27% ± 4%
	AB	3.09 (1.40)	32%	48%	Experiment Aversion	t (342) = 3.70***, d = 0.25 ± .14
	Mean(A,B)	3.90 (0.84)	-	-	Min(A,B) > AB	41% ± 5%
	Min(A,B)	3.42 (1.16)	-	-	Experiment Appreciation	t (342) = -14.61***, d = -1.13 ± .20
	Max(A,B)	4.39 (0.81)	-	-	AB > Max(A,B)	15% ± 3%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	28% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	3% ± 1%
Best Anti-Hypertensive Drug (n = 357 laypeople)					A/B Effect	t (356) = 6.68***, d = 0.52 ± .16
					Mean(A,B) > AB	47% ± 5%
	A	3.87 (1.00)	25%	27%	Reverse A/B effect	t (356) = -6.68***, d = -0.52 ± .16
	B	3.89 (0.99)	25%	28%	AB > Mean(A,B)	31% ± 5%
	AB	3.24 (1.47)	50%	45%	Experiment Aversion	t (356) = 5.96***, d = 0.46 ± .16
	Mean(A,B)	3.88 (0.95)	-	-	Min(A,B) > AB	44% ± 5%
	Min(A,B)	3.82 (1.03)	-	-	Experiment Appreciation	t (356) = -7.26***, d = -0.57 ± .17
	Max(A,B)	3.94 (0.95)	-	-	AB > Max(A,B)	29% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	34% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	18% ± 4%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

*p < .05

**p < .01

***p < .001

Table S6B

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Lay Sentiments About Covid-19 pRCTs						
Intubation Safety Checklist (n = 346 laypeople)	A	3.81 (1.10)	29%	29%	A/B Effect Mean(A,B) > AB	$t(345) = 10.69^{***}$, $d = 0.75 \pm .16$ 58% ± 5%
	B	3.99 (1.13)	43%	19%	Reverse A/B effect AB > Mean(A,B)	$t(345) = -10.69^{***}$, $d = -0.75 \pm .16$ 25% ± 4%
	AB	2.98 (1.46)	29%	52%	Experiment Aversion Min(A,B) > AB	$t(345) = 5.28^{***}$, $d = 0.35 \pm .14$ 45% ± 5%
	Mean(A,B)	3.90 (0.88)	-	-	Experiment Appreciation AB > Max(A,B)	$t(345) = -14.94^{***}$, $d = -1.14 \pm .19$ 14% ± 3%
	Min(A,B)	3.46 (1.19)	-	-	Experiment Rejection (A,B = 3,4,5; AB = 1,2)	31% ± 5%
	Max(A,B)	4.34 (0.84)	-	-	Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	4% ± 2%
Best Corticosteroid Drug (n = 357 laypeople)	A	3.89 (1.03)	17%	32%	A/B Effect Mean(A,B) > AB	$t(356) = 2.28^{*}$, $d = 0.17 \pm .15$ 34% ± 5%
	B	3.90 (1.00)	18%	37%	Reverse A/B effect AB > Mean(A,B)	$t(356) = -2.28^{*}$, $d = -0.17 \pm .15$ 38% ± 5%
	AB	3.69 (1.37)	65%	31%	Experiment Aversion Min(A,B) > AB	$t(356) = 1.55$, $p = .123$, $d = 0.12 \pm .15$ 31% ± 5%
	Mean(A,B)	3.90 (0.99)	-	-	Experiment Appreciation AB > Max(A,B)	$t(356) = -2.99^{**}$, $d = -0.23 \pm .15$ 35% ± 5%
	Min(A,B)	3.83 (1.04)	-	-	Experiment Rejection (A,B = 3,4,5; AB = 1,2)	22% ± 4%
	Max(A,B)	3.96 (0.98)	-	-	Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	17% ± 4%
Best Vaccine (n = 450 laypeople)	A	3.95 (1.09)	26%	27%	A/B Effect Mean(A,B) > AB	$t(449) = 2.41^{*}$, $d = 0.15 \pm .12$ 34% ± 4%
	B	3.84 (1.09)	19%	39%	Reverse A/B effect AB > Mean(A,B)	$t(449) = -2.41^{*}$, $d = -0.15 \pm .12$ 36% ± 4%
	AB	3.72 (1.34)	55%	34%	Experiment Aversion Min(A,B) > AB	$t(449) = 0.61$, $p = .546$, $d = 0.04 \pm .12$ 29% ± 4%
	Mean(A,B)	3.90 (1.03)	-	-	Experiment Appreciation AB > Max(A,B)	$t(449) = -4.06^{***}$, $d = -0.25 \pm .12$ 32% ± 4%
	Min(A.B)	3.77 (1.13)	-	-	Experiment Rejection (A,B = 3,4,5; AB = 1,2)	17% ± 3%
	Max(A,B)	4.03 (1.04)	-	-	Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	13% ± 3%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

$^{*}p < .05$

$^{**}p < .01$

Table S6B, continued

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Lay Sentiments About Covid-19 pRCTs						
					A/B Effect	*t* (338) = 6.42***, *d* = 0.39 ± .12
					Mean(A,B) > AB	46% ± 5%
	A	3.45 (1.15)	17%	46%	Reverse A/B effect	*t* (338) = -6.42***, *d* = -0.39 ± .12
	B	3.96 (1.03)	53%	14%	AB > Mean(A,B)	28% ± 5%
School	AB	3.24 (1.36)	30%	40%	Experiment Aversion	*t* (338) = 0.47, *p* = .638, *d* = 0.03 ± .12
Reopening	Mean(A,B)	3.70 (0.90)	-	-	Min(A,B) > AB	28% ± 5%
(*n* = 339	Min(A,B)	3.28 (1.15)	-	-	Experiment Appreciation	*t* (338) = -11.25***, *d* = -0.75 ± .15
laypeople)	Max(A,B)	4.12 (0.91)	-	-	AB > Max(A,B)	15% ± 3%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	19% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	4% ± 2%
					A/B Effect	*t* (356) = 6.07***, *d* = 0.42 ± .14
					Mean(A,B) > AB	45% ± 5%
	A	3.82 (1.09)	21%	33%	Reverse A/B effect	*t* (356) = -6.07***, *d* = -0.42 ± .14
	B	3.96 (1.07)	36%	25%	AB > Mean(A,B)	31% ± 5%
Ventilator	AB	3.39 (1.38)	43%	42%	Experiment Aversion	*t* (356) = 2.63**, *d* = 0.17 ± .13
Proning	Mean(A,B)	3.89 (0.96)	-	-	Min(A,B) > AB	36% ± 5%
(*n* = 357	Min(A,B)	3.61 (1.11)	-	-	Experiment Appreciation	*t* (356) = -8.927***, *d* = -0.64 ± .16
laypeople)	Max(A,B)	4.17 (0.99)	-	-	AB > Max(A,B)	22% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	23% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	6% ± 2%
					A/B Effect	*t* (359) = 14.55***, *d* = 1.07 ± .18
					Mean(A,B) > AB	68% ± 5%
	A	4.19 (0.95)	44%	14%	Reverse A/B effect	*t* (359) = -14.55***, *d* = -1.07 ± .18
	B	3.80 (1.34)	38%	27%	AB > Mean(A,B)	21% ± 4%
Masking	AB	2.74 (1.38)	18%	59%	Experiment Aversion	*t* (359) = 7.63***, *d* = 0.56 ± .15
Rules	Mean(A,B)	4.00 (0.91)	-	-	Min(A,B) > AB	50% ± 5%
(*n* = 360	Min(A,B)	3.47 (1.22)	-	-	Experiment Appreciation	*t* (359) = -20.85***, *d* = -1.57 ± .22
laypeople)	Max(A,B)	4.53 (0.84)	-	-	AB > Max(A,B)	8% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	38% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	3% ± 1%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

**p* < .05

***p* < .01

****p* < .001

Table S6C

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					***Inferential Results***	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Clinician Sentiments About Covid-19 pRCTs						
					A/B Effect	*t* (270) = 9.00***, *d* = 0.71 ± .17
					Mean(A,B) > AB	57% ± 6%
Intubation Safety Checklist (*n* = 271 clinicians)	A	3.37 (1.26)	19%	32%	Reverse A/B effect	*t* (270) = -9.00***, *d* = -0.71 ± .17
	B	3.90 (1.12)	53%	14%	AB > Mean(A,B)	23% ± 5%
	AB	2.74 (1.49)	28%	54%	Experiment Aversion	*t* (270) = 3.98***, *d* = 0.30 ± .15
	Mean(A,B)	3.63 (0.96)	-	-	Min(A,B) > AB	43% ± 6%
	Min(A.B)	3.14 (1.23)	-	-	Experiment Appreciation	*t* (270) =-12.70***, *d* = -1.08 ± .21
	Max(A,B)	4.12 (1.01)	-	-	AB > Max(A,B)	16% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	28% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	6% ± 2%
					A/B Effect	*t* (274) = 6.59***, *d* = 0.52 ± .17
					Mean(A,B) > AB	48% ± 6%
Best Corticosteroid Drug (*n* = 275 clinicians)	A	3.76 (1.10)	28%	28%	Reverse A/B effect	*t* (274) = -6.59***, *d* = -0.52 ± .17
	B	3.74 (1.09)	23%	26%	AB > Mean(A,B)	27% ± 5%
	AB	3.04 (1.56)	49%	46%	Experiment Aversion	*t* (274) = 6.18***, *d* = 0.49 ± .17
	Mean(A,B)	3.75 (1.08)	-	-	Min(A,B) > AB	46% ± 6%
	Min(A,B)	3.71 (1.11)	-	-	Experiment Appreciation	*t* (274) = -6.93***, *d* = -0.55 ± .17
	Max(A,B)	3.79 (1.08)	-	-	AB > Max(A,B)	26% ± 5%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	34% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	15% ± 4%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

**p* < .05

***p* < .01

****p* < .001

Table S6C, continued

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	Variable	Mean (SD)	% Ranking Best	% Ranking Worst	Test Description	Test Outcome
Clinician Sentiments About Covid-19 pRCTs						
					A/B Effect	*t* (348) = 16.50***, *d* = 1.27 ± .20
					Mean(A,B) > AB	72% ± 5%
	A	4.19 (1.05)	39%	15%	Reverse A/B effect	*t* (348) = -16.50***, *d* = -1.27 ± .20
	B	4.01 (1.24)	44%	22%	AB > Mean(A,B)	16% ± 3%
Masking Rules (*n* = 349 clinicians)	AB	2.61 (1.41)	17%	62%	Experiment Aversion	*t* (348) = 9.72***, *d* = 0.74 ± .17
	Mean(A,B)	4.10 (0.88)	-	-	Min(A,B) > AB	57% ± 5%
	Min(A,B)	3.58 (1.20)	-	-	Experiment Appreciation	*t* (348) = -22.58***, *d* = -1.74 ± .24
	Max(A,B)	4.62 (0.82)	-	-	AB > Max(A,B)	6% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	43% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	2% ± 1%
					A/B Effect	*t* (1253) = 2.50*, *d* = 0.10 ± .07
					Mean(A,B) > AB	35% ± 3%
	A	3.56 (1.17)	27%	28%	Reverse A/B effect	*t* (1253) = -2.50*, *d* = -0.10 ± .07
	B	3.40 (1.18)	17%	39%	AB > Mean(A,B)	34% ± 3%
Best Vaccine (*n* = 1254 clinicians)	AB	3.36 (1.38)	56%	33%	Experiment Aversion	*t* (1253) = -0.89, *p* = .375, *d* = -0.03 ± .07
	Mean(A,B)	3.48 (1.09)	-	-	Min(A,B) > AB	29% ± 2%
	Min(A,B)	3.32 (1.18)	-	-	Experiment Appreciation	*t* (1253) = -5.49***, *d* = -0.22 ± .08
	Max(A,B)	3.64 (1.16)	-	-	AB > Max(A,B)	30% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	20% ± 2%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	20% ± 2%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

**p* < .05

***p* < .01

****p* < .001

Comparisons to previously published work

To compare these results to our previous findings reporting sentiments about experiments, as we do in the main text, please refer to Heck et al. (2020) [4]. For example, in the Results section "Lay Sentiments About pRCTs," we say, "these levels of experiment aversion near the height of the pandemic were slightly (but not significantly) higher than those we observed among similar laypeople in 2019 (41% ± 5% in 2020 vs. 37% ± 6% in 2019 for Catheterization Safety Checklist, p = .31 ; 44% ± 5% in 2020 vs. 40% ± 6% in 2019 for Best Anti-Hypertensive Drug, p = .32)." We extracted the percentage of participants who were experiment averse in 2019 from Heck et al. (2020) [4]. We then performed a two-sample z-test for proportions to compare the 2019 and 2020 proportions. As noted in the main text, we did not find a significant difference between the percentage of people who were experiment averse in 2019 and the percentage of people who were experiment averse in the current studies which took place in 2020 and 2021 (Catheterization Safety Checklist: $\chi^2(1) = 1.034$, p = .309, Anti- Hypertensive Drug: $\chi^2(1) = 0.998$, p = .318).

Results not presented in the main text

Results of Best Vaccine vignette (initial ambiguous version)

The only vignette which showed no A/B Effect was the initial ambiguous version of Best Vaccine (see Table S6D). The two versions of Best Vaccine both presented a public health official's decision to either distribute an mRNA-based vaccine to every county in their state, distribute an inactivated-virus vaccine to every county, or run an experiment in which counties are randomized to receive one of the two vaccine types. However, in version 1, the wording unintentionally implied that residents could choose their vaccine (by going elsewhere) if they did not wish to be subject to the official's decision (including intervention implementation or A/B test), while in version 2 we eliminated this possible interpretation; we suspect this had the effect of making the experiment condition in version 1 less aversive, since people could effectively opt- out of it, and our goal in this research is to study pragmatic, real-world situations in which avoiding randomization is typically not a realistic option.

Table S6D

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Best Vaccine (initial ambiguous version; *n* = 350 laypeople)					A/B Effect	*t* (349) = -0.72, *p* = .473, *d* = -0.05 ± .15
					Mean(A,B) > AB	33% ± 5%
	A	3.58 (1.08)	21%	29%	Reverse A/B effect	*t* (349) = 0.72, *p* = .473, *d* = 0.05 ± .15
	B	3.47 (1.10)	21%	40%	AB > Mean(A,B)	45% ± 5%
	AB	3.59 (1.37)	58%	31%	Experiment Aversion	*t* (349) = -2.28*, *d* = -0.17 ± .15
	Mean(A,B)	3.53 (1.02)	-	-	Min(A,B) > AB	29% ± 5%
	Min(A,B)	3.38 (1.11)	-	-	Experiment Appreciation	*t* (349) = -0.84, *p* = .399, *d* = -0.07 ± .15
	Max(A,B)	3.67 (1.05)	-	-	AB > Max(A,B)	40% ± 5%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	21% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	24% ± 4%

Order effect in clinician study

For the clinician study of the Catheterization Safety Checklist, Best Anti-Hypertensive Drug, and Masking Rules vignettes, participants were randomly assigned to one of these three vignettes and then completed the remaining two vignettes in random order. For consistency with the rest of this project and with our previous approach (Meyer et al., 2019) [3], we analyze data from this study as a between-subjects design where we only consider the first vignette that every participant completed.

While conducting an interim analysis on the data for this study, we observed an intriguing and unexpected order effect of presentation.

For the first 601 complete responses we received, we observed an effect of presentation order on participants' appropriateness ratings of the A/B test condition within the Best Anti-Hypertensive Drug vignette. Participants who received the Best Anti-Hypertensive Drug vignette first rated the A/B test an average of 2.95 (SD = 1.57), participants who received this vignette second rated the A/B test an average of 3.48 (SD = 1.39), and participants who received this vignette last rated the A/B test an average of 3.78 (SD = 1.41). This suggests that participants who read about other policies and A/B tests before considering the Best Anti-Hypertensive Drug vignette found the A/B test in the Best Anti-Hypertensive Drug vignette to be less objectionable than participants who received this vignette earlier in the survey. The relationship between presentation order (1, 2, or 3) and appropriateness rating of the A/B test was $r = .23$. This order effect did not emerge for the other two vignettes or for ratings of either intervention (A or B).

After observing this order effect but before examining any additional data, we preregistered this order effect with the goal of replicating it in an independent sample. 294 new participants completed the study after this interim analysis, and we analyzed the data from this sample independently from the sample that generated the order effect. Table S7 displays ratings of the A/B condition within each scenario grouped by the order in which participants received them.

The order effect observed with the Best Anti-Hypertensive Drug A/B test condition replicated (r = .15), as did the absence of any similar order effect for the other conditions.

Table S7

Ratings of A/B test in Clinician Sample

Exploratory Sample (N = 601)	**Best Corticosteroid Drug A/B Rating (SD)**	**Intubation Safety Checklist A/B Rating (SD)**	**Masking Rules A/B Rating (SD)**
Target Scenario First	2.95 (1.57)	2.79 (1.49)	2.63 (1.43)
Target Scenario Second	3.48 (1.39)	2.53 (1.35)	2.66 (1.44)
Target Scenario Last	3.78 (1.41)	2.78 (1.38)	2.57 (1.29)

Confirmatory Sample (N=294)	**Best Corticosteroid Drug A/B Rating (SD)**	**Intubation Safety Checklist A/B Rating (SD)**	**Masking Rules A/B Rating (SD)**
Target Scenario First	3.22 (1.54)	2.63 (1.50)	2.58 (1.38)
Target Scenario Second	3.49 (1.51)	2.76 (1.39)	2.38 (1.42)
Target Scenario Last	3.77 (1.33)	2.69 (1.15)	2.51 (1.38)

Heterogeneity in experiment aversion

In both the lay participant sample and the clinician sample, associations between demographic variables, including educational attainment, having a degree in a STEM field, years of experience in the medical field, and role in the healthcare system, and sentiment about pRCTs (e.g., A/B effect, experiment aversion, experiment appreciation) are consistently small ($r < |.13|$, therefore explaining less than 2% of the variance; Tables S8–11).

In the lay sample, women show larger AB and experiment aversion effects (e.g., larger difference between mean intervention rating/lowest-rated intervention rating and AB test rating; r = .067–.068, $p < .001$) and a smaller experiment appreciation effect (e.g., smaller difference between AB test and highest-rated intervention rating; $r = –.064$, $p < .001$). Lay participants who are more conservative (in general and with respect to social and economic issues) or more likely to be strong Republicans show lower levels of an AB effect and experiment aversion (i.e., smaller difference between mean intervention rating/lowest-rated intervention rating and AB test rating; all rs < –.094, ps < .0001). These participants also show significantly more experiment appreciation, though the strength of the association is weaker (rs = .037–.046, $p < .0001$).
Finally, we find that people who are non-religious show a larger degree of experiment aversion ($r = .061$, $p < .001$; they also show a larger AB effect, $r = .051$, but $p = .007$ which is greater than $p < .005$, the standard proposed in Benjamin et al. (2018)[17] for exploratory analyses without a priori hypotheses). For all other variables, we find no significant associations between the individual difference measures and experiment sentiments (all rs < |.051|, all ps > .005).

In the clinician sample, the strongest association was between self-reported comfort with research methods and statistics and experiment aversion—clinicians who report being more comfortable with research methods and statistics are more likely to appreciate the A/B test (r =
.070, p = .001).

Table S8

Correlations between lay participant characteristics and sentiments about experiments

	Size of A/B effect		A/B effect		Size of experiment aversion		Experiment aversion		Experiment rejection		Size of experiment appreciation		Experiment appreciation		Experiment endorsement	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Age	-0.008	0.662	-0.020	0.286	-0.020	0.270	-0.038	0.043	-0.046	0.012	-0.004	0.809	-0.016	0.389	-0.033	0.073
Sex (1 = male, 2 = female)	0.068	<.001	0.048	0.010	0.067	<.001	0.039	0.035	0.059	0.002	-0.064	<.001	-0.071	<.001	-0.036	0.053
Race (0 = all other, 1 = Nonhispanic White)	-0.004	0.814	-0.017	0.360	-0.001	0.945	-0.016	0.388	0.003	0.867	0.007	0.706	0.001	0.937	-0.012	0.533
Education	0.047	0.011	0.033	0.075	0.049	0.008	0.051	0.006	0.029	0.114	-0.042	0.024	-0.023	0.216	-0.019	0.298
Income	0.020	0.293	0.005	0.787	0.020	0.273	0.011	0.571	0.005	0.777	-0.017	0.353	-0.025	0.184	-0.026	0.158
Political Ideology (1 = Very Liberal, 5 = Very Conservative)	-0.114	< .0001	-0.087	< .0001	-0.118	< .0001	-0.101	< .0001	-0.091	< .0001	0.101	< .0001	0.043	0.022	0.045	0.015
Political Ideology (Social) (1 = Very Liberal, 5 = Very Conservative)	-0.123	< .0001	-0.099	< .0001	-0.128	< .0001	-0.118	< .0001	-0.106	< .0001	0.109	< .0001	0.039	0.036	0.052	0.005
Political Ideology (Economic) (1 = Very Liberal, 5 = Very Conservative)	-0.094	< .0001	-0.065	<.001	-0.095	< .0001	-0.082	< .0001	-0.073	< .0001	0.085	< .0001	0.046	0.013	0.040	0.031
Political Party (1 = Strong Democrat, 7 = Strong Republican)	-0.096	< .0001	-0.073	< .0001	-0.098	< .0001	-0.075	< .0001	-0.075	< .0001	0.087	< .0001	0.037	0.050	0.035	0.063
Conservatism (mean of z-scored Political Ideology, Political Ideology (Social), Political Ideology (Economic), and Political Party)	-0.117	<.0001	-0.089	< .0001	-0.121	< .0001	-0.103	< .0001	-0.095	< .0001	0.105	< .0001	0.045	0.015	0.047	0.012
Non-religious (0 = Religious (any religion), 1 = non-religious)	0.051	0.007	0.027	0.150	0.061	<.001	0.049	0.009	0.046	0.015	-0.036	0.053	-0.013	0.496	-0.021	0.266
STEM degree (0 = no, 1 = yes)	0.023	0.208	0.016	0.399	0.027	0.154	0.026	0.157	0.027	0.142	-0.019	0.318	0.016	0.403	0.024	0.205

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S9

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Sex											
Male	0.479	1.620	45.6	0.183	1.650	35.7	23.2	-0.775	1.730	22.0	9.8
Female	0.703	1.630	50.4	0.408	1.680	39.5	28.4	-0.998	1.710	19.1	7.8
Other	0.571	1.880	28.6	0.429	1.810	28.6	28.6	-0.714	1.980	28.6	0.0
Prefer not to answer	0.900	1.880	60.0	0.800	1.920	40.0	20.0	-1.000	1.870	20.0	0.0
Race											
Black/African-American	0.504	1.597	49.8	0.149	1.647	37.2	21.8	-0.858	1.681	21.5	9.6
Hispanic or Latino	0.692	1.646	50.2	0.429	1.675	38.8	28.8	-0.954	1.726	20.1	7.8
White	0.601	1.631	47.7	0.309	1.671	37.2	26.2	-0.893	1.724	21.7	8.4
Asian	0.594	1.634	47.1	0.296	1.645	39.2	26.1	-0.892	1.757	23.2	10.5
Other	0.679	1.730	48.7	0.256	1.831	38.5	23.1	-1.103	1.818	25.6	5.1
Prefer not to answer	1.200	1.623	60.0	0.933	1.624	40.0	33.3	-1.467	1.767	13.3	6.7
Education											
Less than high school	1.580	1.440	75.0	1.330	1.610	58.3	41.7	-1.830	1.400	0.0	0.0
High school degree	0.403	1.550	42.2	0.093	1.650	30.6	22.0	-0.713	1.610	20.9	9.0
Some college	0.524	1.690	47.5	0.216	1.720	36.3	25.2	-0.831	1.790	24.2	10.2
Four-year college degree	0.643	1.620	48.7	0.361	1.650	38.4	26.7	-0.925	1.710	21.4	8.0
Some graduate school	0.673	1.600	50.0	0.379	1.640	37.9	28.2	-0.968	1.700	20.2	6.5
Graduate degree	0.713	1.590	50.6	0.419	1.620	41.7	27.8	-1.010	1.690	19.8	8.2
Prefer not to answer	0.750	1.720	50.0	0.667	1.750	33.3	16.7	-0.833	1.720	16.7	0.0
Income											
< $20,000	0.672	1.570	47.8	0.380	1.650	37.7	26.8	-0.964	1.640	17.4	6.9
$20,000-$40,000	0.480	1.700	46.6	0.215	1.730	37.1	25.0	-0.745	1.790	27.8	10.8
$40,000-$60,000	0.592	1.630	49.4	0.220	1.670	36.9	25.4	-0.930	1.750	20.5	8.9
$60,000-$80,000	0.629	1.620	49.5	0.376	1.640	38.0	27.4	-0.883	1.710	20.9	10.5
$80,000-$100,000	0.741	1.520	50.0	0.488	1.530	41.3	27.2	-0.994	1.640	18.9	6.0
> $100,000	0.608	1.620	47.2	0.302	1.680	37.5	25.7	-0.914	1.700	21.0	7.4
Prefer not to answer	0.861	1.940	47.2	0.556	2.080	38.9	36.1	-1.170	1.930	19.4	2.8
No response	-0.250	0.866	25.0	-0.500	1.000	0.0	0.0	0.000	0.816	25.0	0.0

Table S9, continued

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Political Ideology											
Very liberal	0.888	1.740	54.3	0.590	1.780	44.1	31.1	-1.190	1.830	19.8	6.1
Liberal	0.753	1.650	51.6	0.491	1.680	42.3	29.8	-1.010	1.740	20.2	8.2
Moderate	0.557	1.570	47.5	0.247	1.600	36.2	25.4	-0.867	1.670	21.1	8.1
Conservative	0.380	1.600	43.8	0.058	1.650	33.1	21.4	-0.703	1.700	25.0	11.2
Very conservative	0.307	1.520	39.0	0.026	1.570	27.7	18.6	-0.589	1.500	24.2	9.5
Prefer not to answer	0.684	1.680	57.9	0.263	1.560	31.6	21.1	-1.110	1.940	21.1	15.8
No response	0.625	0.750	50.0	0.250	0.957	50.0	50.0	-1.000	0.816	0.0	0.0
Political Ideology (Social)											
Very liberal	0.927	1.720	55.7	0.628	1.760	46.3	33.3	-1.230	1.810	19.1	5.5
Liberal	0.714	1.610	51.2	0.445	1.640	41.1	28.5	-0.983	1.710	20.9	8.2
Moderate	0.498	1.600	45.2	0.205	1.660	35.2	25.0	-0.791	1.680	22.1	9.4
Conservative	0.321	1.590	42.5	-0.016	1.630	30.6	19.8	-0.658	1.710	25.1	12.1
Very conservative	0.362	1.500	40.6	0.059	1.550	28.9	18.8	-0.665	1.590	22.6	8.0
Prefer not to answer	0.528	1.540	55.6	0.222	1.560	33.3	11.1	-0.833	1.650	16.7	11.1
No response	-1.000	NA	0.0	-2.000	NA	0.0	0.0	0.000	NA	0.0	0.0
Political Ideology (Economic)											
Very liberal	0.795	1.760	49.4	0.514	1.770	40.5	28.6	-1.080	1.870	19.9	6.7
Liberal	0.800	1.630	53.8	0.512	1.670	43.7	31.5	-1.090	1.730	18.9	7.8
Moderate	0.594	1.600	48.2	0.307	1.650	38.0	25.5	-0.882	1.670	21.4	8.4
Conservative	0.401	1.580	44.2	0.076	1.620	33.5	22.4	-0.726	1.710	25.5	10.4
Very conservative	0.435	1.600	42.9	0.165	1.650	30.7	21.7	-0.705	1.660	22.7	9.6
Prefer not to answer	0.783	1.540	65.2	0.435	1.530	39.1	21.7	-1.130	1.660	13.0	8.7
No response	-1.000	0.000	0.0	-1.500	0.707	0.0	0.0	0.500	0.707	50.0	0.0
Political Party											
Strong Democrat	0.869	1.710	54.6	0.582	1.720	43.9	28.7	-1.160	1.820	19.6	7.6
Democrat	0.701	1.630	50.7	0.411	1.690	39.7	29.9	-0.990	1.700	19.9	6.7
Independent (but lean Democrat)	0.755	1.620	51.9	0.470	1.640	42.0	29.6	-1.040	1.730	21.0	8.6
Independent	0.468	1.590	43.7	0.173	1.630	34.0	23.3	-0.762	1.670	22.1	9.2
Independent (but lean Republican)	0.437	1.720	42.4	0.144	1.730	33.9	24.7	-0.731	1.830	28.8	14.8
Republican	0.387	1.550	44.8	0.076	1.610	33.4	20.9	-0.699	1.640	22.5	8.8
Strong Republican	0.432	1.500	44.0	0.130	1.570	32.6	20.7	-0.734	1.580	21.7	7.6
Prefer not to answer	0.615	1.580	56.4	0.282	1.490	41.0	23.1	-0.949	1.790	20.5	10.3
No response	-1.000	NA	0.0	-2.000	NA	0.0	0.0	0.000	NA	0.0	0.0

Table S9, continued

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Religion											
Christian - Protestant	0.515	1.620	45.9	0.212	1.680	34.9	24.3	-0.818	1.700	22.5	10.0
Christian - Catholic	0.483	1.510	46.7	0.176	1.550	34.4	21.6	-0.790	1.610	20.7	6.4
Christian - Other	0.589	1.650	48.3	0.298	1.690	37.3	25.4	-0.881	1.740	22.9	9.7
Jewish	0.868	1.720	54.7	0.453	1.840	43.4	32.1	-1.280	1.770	13.2	7.6
Muslim	0.357	1.700	45.7	-0.057	1.800	28.6	20.0	-0.771	1.780	31.4	17.1
Buddhist	0.840	1.690	54.0	0.520	1.570	48.0	32.0	-1.160	1.940	24.0	14.0
Hindu	-0.129	1.550	38.7	-0.452	1.570	29.0	16.1	-0.194	1.620	35.5	19.4
Non-religious	0.704	1.650	49.9	0.435	1.680	40.7	28.5	-0.973	1.750	21.1	8.0
Other	0.673	1.780	49.0	0.337	1.810	40.4	31.7	-1.010	1.880	22.1	8.7
Prefer not to answer	1.090	1.570	58.8	0.794	1.650	41.2	38.2	-1.380	1.600	11.8	0.0
No response	1.250	1.770	50.0	1.000	1.410	50.0	50.0	-1.500	2.120	0.0	0.0
STEM degree											
No	0.587	1.620	47.9	0.289	1.650	37.2	25.6	-0.885	1.720	21.3	8.4
Yes	0.680	1.680	49.8	0.397	1.740	40.3	28.5	-0.963	1.750	22.9	10.0
Prefer not to answer	0.400	1.510	40.0	0.200	1.510	30.0	15.0	-0.600	1.570	25.0	0.0
No response	0.250	1.060	50.0	-0.500	0.707	0.0	0.0	-1.000	1.410	0.0	0.0

Note. If there is an NA in the SD column, that indicates that there was only 1 respondent in that group so there is no variability in responses to report.
Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S10

Correlations between clinician characteristics and sentiments about experiments

	Size of A/B effect		A/B effect		Size of experiment aversion		Experiment aversion		Experiment rejection		Size of experiment appreciation		Experiment appreciation		Experiment endorsement	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Sex (1 = male, 2 = female)	0.016	0.453	0.016	0.457	0.000	0.991	-0.011	0.619	-0.021	0.326	-0.030	0.165	-0.026	0.226	-0.032	0.134
Number of research methods/statistics training units	-0.005	0.812	0.000	0.992	0.000	0.999	0.016	0.471	0.017	0.428	0.010	0.659	0.019	0.382	0.010	0.643
Comfort with research methods/statistics	-0.036	0.100	-0.018	0.410	-0.039	0.071	-0.021	0.335	-0.016	0.446	0.030	0.165	0.070	0.001	0.045	0.035
Number of research methods/statistics activities	-0.019	0.375	-0.022	0.301	-0.006	0.796	0.006	0.778	0.020	0.360	0.031	0.157	0.041	0.056	0.023	0.279
Currently involved in research	-0.002	0.912	-0.012	0.570	-0.009	0.691	-0.016	0.470	-0.022	0.309	-0.004	0.870	-0.024	0.267	0.009	0.693
Position (0 = non-prescriber, 1 = prescriber)	0.033	0.121	0.029	0.176	0.040	0.061	0.042	0.050	0.052	0.016	-0.025	0.250	-0.020	0.347	-0.021	0.338
Years in medicine	0.016	0.452	-0.004	0.865	0.011	0.599	-0.007	0.734	0.006	0.792	-0.020	0.362	0.029	0.185	-0.003	0.879

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S11

Means and percentages of sentiments about experiments by demographic variable in clinician sample

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Sex											
Male	0.456	1.800	43.9	0.270	1.800	38.5	28.2	-0.642	1.890	26.5	17.2
Female	0.529	1.750	45.9	0.271	1.750	37.2	25.8	-0.786	1.890	23.6	14.2
Other	0.000	1.870	40.0	0.000	1.870	40.0	20.0	0.000	1.870	20.0	20.0
Source of research methods/statistics training											
Undergraduate coursework	0.483	1.755	44.2	0.258	1.753	37.7	26.5	-0.777	1.870	25.0	14.1
Professional school instruction	0.571	1.767	46.0	0.314	1.756	38.2	27.1	-0.828	1.916	22.8	14.7
Postgraduate coursework	0.624	1.818	49.4	0.402	1.809	41.5	29.4	-0.847	1.936	24.5	14.5
CME/CEU courses	0.463	1.788	47.1	0.217	1.767	38.6	26.6	-0.798	1.925	25.7	16.7
Self-instruction via peer-reviewed literature	0.333	1.820	41.2	0.097	1.798	32.9	23.2	-0.559	1.949	27.3	16.6
Other	0.722	1.902	46.7	0.478	1.915	41.1	32.2	-0.967	1.986	22.2	14.4
Comfort with research methods/statistics											
Not at all	0.682	1.760	45.8	0.432	1.780	37.7	26.3	-0.922	1.870	18.2	12.7
Somewhat	0.516	1.710	45.7	0.282	1.690	37.8	26.8	-0.760	1.840	22.5	14.0
Moderately	0.482	1.770	46.5	0.237	1.770	38.3	26.6	-0.727	1.880	26.8	15.1
Very	0.491	1.910	43.9	0.203	1.900	34.0	23.1	-0.778	2.070	29.2	17.9
Extremely	0.105	2.020	31.6	-0.079	2.050	28.9	23.7	-0.289	2.100	26.3	23.7
Research methods/statistics activities											
Read results of RCT in peer-reviewed journal article	0.521	1.772	45.5	0.284	1.762	38.0	27.2	-0.778	1.898	24.7	15.0
Changed typical prescription/recommendation after personally reading results of RCT in peer-reviewed journal article	0.430	1.813	43.3	0.217	1.814	36.8	26.3	-0.643	1.921	26.6	16.7
Published scientific paper in peer-reviewed journal	0.530	1.692	43.3	0.339	1.681	38.2	29.9	-0.720	1.802	22.8	13.4
Conducted or worked on a team conducting an RCT	0.371	1.745	42.9	0.114	1.725	35.1	20.9	-0.628	1.902	25.8	16.3
Took a course/class in statistics, biostatistics, research methods	0.505	1.775	45.0	0.277	1.770	37.8	27.3	-0.732	1.892	25.4	15.2
Analyzed data for statistical significance outside of course requirement	0.470	1.781	43.7	0.251	1.766	36.7	26.2	-0.690	1.912	26.2	15.4
Used statistical software	0.588	1.803	49.3	0.389	1.795	42.5	31.7	-0.787	1.915	26.7	14.9

Table S11, continued

Means and percentages of sentiments about experiments by demographic variable in clinician sample

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Currently involved in research											
Yes	0.526	1.740	47.4	0.316	1.720	39.7	29.2	-0.767	1.860	27.3	13.9
No	0.512	1.760	45.3	0.265	1.760	37.2	25.9	-0.769	1.890	23.8	14.9
Position											
Doctor	0.556	1.730	45.5	0.374	1.720	39.9	28.7	-0.778	1.840	23.1	13.7
Physician Assistant	0.757	1.780	53.0	0.508	1.780	44.3	34.4	-1.010	1.890	21.9	13.1
Nurse Practitioner	0.500	1.910	45.9	0.184	1.970	36.7	25.5	-0.816	2.030	23.5	14.3
Nurse (RN)	0.436	1.720	43.8	0.181	1.720	35.2	23.9	-0.600	1.850	25.3	15.1
Nurse (LPN)	0.410	1.790	42.1	0.150	1.760	33.5	22.6	-0.639	1.960	24.8	17.3
Nurse (Other)	1.180	1.910	65.0	0.800	1.910	55.0	35.0	-1.550	2.060	10.0	10.0
Genetic Counselor	---	---	---	---	---	---	---	---	---	---	---
Non-prescribing clinician or staff without clinical credential	---	---	---	---	---	---	---	---	---	---	---
Medical student	1.170	1.770	65.2	0.935	1.790	56.5	45.7	-1.430	1.830	15.2	8.7
Faculty or Professor	1.120	2.050	62.5	0.875	2.030	50.0	37.5	-1.310	2.200	25.0	12.5
Other	0.727	2.000	45.5	0.618	1.980	41.8	32.7	-0.856	2.060	25.5	16.4
Years in medical field											
< 1 year	0.582	1.540	47.5	0.377	1.540	39.3	32.8	-0.787	1.660	24.6	8.2
1-2 years	0.560	1.720	48.4	0.333	1.710	41.3	29.4	-0.786	1.840	23.8	14.3
3-5 years	0.392	1.570	44.8	0.140	1.570	36.0	21.3	-0.643	1.690	23.4	13.6
6-10 years	0.423	1.730	43.3	0.205	1.760	36.5	24.6	-0.641	1.830	26.4	15.1
> 10 years	0.555	1.820	45.9	0.303	1.810	37.5	27.1	-0.807	1.950	23.7	15.3

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

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Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	6-8
Objectives	3	State specific objectives, including any prespecified hypotheses	9
Methods			
Study design	4	Present key elements of study design early in the paper	9-14
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	9, 13-14
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	9, 13-14
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	13
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9-14
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	SM 3-4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	13
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	SM 7
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	N/A

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9, 13-14
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	SM 14-18, SM 28-35
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	14-18 SM 21-25
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	SM 26-35
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20-22
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20-22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	27

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at

http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople in the United States

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Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople in the United States

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Abstract

Objectives: Pragmatic randomized controlled trials (pRCTs) are essential for determining the real-world safety and effectiveness of healthcare interventions. However, both laypeople and clinicians often demonstrate experiment aversion: preferring to implement either of two interventions for everyone rather than comparing them to determine which is best. We studied whether clinician and layperson views of pRCTs for Covid-19 or other interventions became more positive early in the pandemic, which increased both the urgency and public discussion of pRCTs.

Design: Randomized survey experiments

Setting: Geisinger, a network of hospitals and clinics in central and northeastern Pennsylvania, U.S.; Amazon Mechanical Turk, a research participant platform used to recruit online participants residing across the U.S.

Participants: 2,149 clinicians (the types of people who conduct or make decisions about conducting pRCTs) and 2,909 laypeople (the types of people who are included in pRCTs as patients) in 2020 and 2021. The layperson sample ranges in age from 18 to 88 years old (mean = 38.4, SD = 12.8) and the majority were White (74.6%) and female (55.9%). The clinician sample was primarily female (80.8%), comprised doctors (14.9%), physician assistants (8.5%), registered nurses (53.6%), and other medical professionals, including other nurses, genetic counselors, and medical students (23%), and the majority of clinicians had more than 10 years of experience (62.3%).

Main outcome measures: Participants read vignettes in which a hypothetical decision-maker who sought to improve health could choose to implement intervention A for all, implement intervention B for all, or experimentally compare A and B and implement the superior intervention. Participants rated and ranked the appropriateness of each decision. Experiment aversion was defined as the degree to which a participant rated the experiment below their lowest-rated intervention.

Results: In a mid-pandemic survey of laypeople, we found significant aversion to experiments involving catheterization checklists and hypertension drugs unrelated to the treatment of Covid-19 (Cohen's d = 0.25-0.46, p < .001). Similarly, among both laypeople and clinicians, we found significant aversion to most (comparing different checklist, proning, and mask protocols; Cohen's d = 0.17-0.56, p < .001) but not all non-pharmaceutical Covid-19 experiments (comparing school reopening protocols; Cohen's d = 0.03, p = .64). Interestingly, we found the lowest experiment aversion to pharmaceutical Covid-19 experiments (comparing new drugs and new vaccine protocols for treating the novel coronavirus; Cohen's d = 0.04-0.12, p = .12-.55). Across all vignettes and samples, 28% to 57% of participants expressed experiment aversion, whereas only 6% to 35% expressed experiment appreciation by rating the trial higher than the participant's highest-rated intervention.

Conclusions: Advancing evidence-based medicine through pRCTs will require anticipating and addressing experiment aversion among patients and healthcare professionals.

Registration: https://osf.io/u945y/?view_only=a901fde13ddb423899074eb79964c6cd

Summary box

Strengths and limitations of this study

- The decision-science approach used in this paper enables measurement of aversion towards pragmatic randomized controlled trials (pRCTs) in large and diverse samples of laypeople and clinicians.
- The size of the experiment aversion effect is measured in eight pRCT vignettes (in the layperson sample) and four pRCT vignettes (in the clinician sample) that describe a range of pRCTs from pharmaceutical medical interventions to non-pharmaceutical medical interventions to public health interventions, and specific to the Covid-19 pandemic as well as more general medical situations.
- The large sample sizes ensured sufficient statistical power to detect experiment aversion in each vignette and sample.
- The samples may not perfectly represent all healthcare professionals or members of the general public as they are convenience samples of clinicians at a specific teaching hospital system in the United States and laypeople on a specific online crowdworking platform.
- Participants expressed attitudes and judgments about the appropriateness of carrying out pRCTs or implementing policies, but were not in a position to make a real decision to execute the pRCTs or policies.

INTRODUCTION

Pragmatic randomized controlled trials (pRCTs) are crucial for understanding how to safely, effectively, and equitably prevent and treat disease and deliver healthcare. Randomized evaluation is the gold standard in medicine, largely because it permits one to infer that an intervention *caused* an outcome, such as reduction of symptoms or improvement in a biomarker. Randomized experiments have repeatedly upended conventional clinical wisdom and the results of observational studies [1,2] and are urgently needed to evaluate new technologies [3,4]. Compared to more explanatory trials, trials that are further towards the pragmatic end of the spectrum [5] evaluate effectiveness of the intervention in more real-world contexts. Such pragmatism is critical for ensuring that causal evidence from randomized evaluation speaks to the effects of interventions in the circumstances in which they would be implemented (or maintained).

Yet despite their importance to healthcare quality and safety, pRCTs often prove controversial—even when they compare interventions that are within the standard of care or are otherwise unobjectionable, and about which the relevant expert community is in equipoise. Several recently published pRCTs—including Surfactant, Positive Pressure, and Oxygenation Randomized Trial (SUPPORT) [6], Flexibility in Duty Hour Requirements for Surgical Trainees (FIRST) [7], and Individualized Comparative Effectiveness of Models Optimizing Patient Safety and Resident Education (iCOMPARE) [8]—have received considerable criticism from physician-scientists, ethicists, and regulators [9,10] and in the public square [11–14]. Although criticisms of pRCTs can be complex, nuanced, and sometimes valid, many appear to reflect a rejection of the very idea that a randomized experiment was conducted, as opposed to simply giving everyone one of the interventions that was trialed. Our research applies concepts and methods from the behavioral and decision sciences to systematically explore whether, when, and why people might genuinely object to running pRCTs in healthcare, public health, and other domains.

In prior studies—inspired by several “notorious pRCTs,” including technology industry “A/B tests” [15–17]—we confirmed that substantial shares of both laypeople and clinicians can be averse to randomized evaluation of efforts to improve health [18,19]. People rated a pRCT designed to compare the effectiveness of two interventions as less appropriate than the average appropriateness of implementing either one, untested, for everyone. We called this phenomenon the “A/B effect” [18]. In some cases, the lower average rating of an experiment could be driven not by dislike of experiments, per se, but by many raters’ belief that one of the experiment’s arms is inferior to the other [18–21]. Importantly, such beliefs are often based on intuition rather than evidence and have the potential to undermine evidence-based medicine. Yet this form of experiment rejection is not illogical, given the individual’s own beliefs. We also, however, documented a more peculiar (if no less dangerous) phenomenon of “experiment aversion,” which occurred when people rated the pRCT as significantly less appropriate than implementing *their own* least-preferred intervention contained within the trial. In this pattern of decision-making, in other words, people who perceive that one intervention is good and the other is less good prefer that everyone receive the less good (or even bad) intervention rather than half the people receiving the better one, and without comparing the two to determine whether one is really better than the other [19]. Such judgments could reflect a more general skepticism about or opposition to pRCTs, at least within specific domains of inquiry. For instance, people may be averse to the inequality or disparate treatment that is necessarily (temporarily) imposed by any RCT (pRCT or otherwise), the uncertainty signaled by agents (often trusted experts) who decide they do not already know what works and need to conduct a pRCT, the process of assigning people to treatments "randomly" as opposed to using expert judgment, or something else viewed as undesirable. Both patterns of negative sentiments about experiments can impede efforts to assure and improve health outcomes.

The Covid-19 pandemic presented the potential for an inflection point in attitudes towards pRCTs. In April 2020, 72 Covid-19 drug trials were already underway [22] and more traditional, explanatory RCTs became daily, front-page news. Because explanatory and pragmatic RCTs share many key features that participants in our prior research often cited as partial explanations for their lower ratings of experiments—including random assignment to different conditions [18]—that sustained exposure to explanatory RCTs might have educated people about the value of healthcare pRCTs, too, and/or made them seem less exceptional and more normative. Our previous research also suggests that another cause of experiment aversion is an illusion of knowledge—a (mis)perception that experts already must know what works best and should simply implement those interventions without further study. But Covid-19 was a novel disease, and—at least in the case of pharmaceutical interventions—no sensible person thought the correct treatments were already obvious. People therefore may have been less averse to Covid-19 pRCTs (e.g., trials comparing Covid-19 proning protocols or masking rules) than to pRCTs that test interventions for familiar conditions or problems, such as hypertension or hospital-acquired infections. On the other hand, because of the urgency attached to Covid-19, people may have been *more* averse to Covid-19 RCTs, being even less inclined to risk giving someone a treatment that might turn out to "lose" in a comparison study [23,24]. Finally, even if the pandemic did not affect public attitudes towards explanatory or pragmatic RCTs, it could have affected the attitudes of clinicians, many of whom were involved in Covid-19 research.

Because clinicians strongly influence whether particular RCTs are conducted (both explanatory and pragmatic), their attitudes matter. Here, we investigated attitudes towards pRCTs in the first year of the pandemic by conducting a series of preregistered studies conducted between August 2020 and February 2021.

METHODS

Study setting

The study was conducted online using the Qualtrics platform [25]. For the layperson sample, we used the CloudResearch service [26,27] to recruit adult crowd workers on Amazon Mechanical Turk [28] living in the U.S. to participate in a brief online survey. These services provide samples that are broadly representative of the U.S. population and are well-accepted in social science research as providing as good or better-quality, diverse samples of research participants than common convenience samples such as student volunteers, with results that are similar to probability sampling methods [29–31]. Clinicians of various levels in healthcare were recruited by email (following a procedure successfully used in several previous studies including [18]) from Geisinger, a network of hospitals and clinics in central and northeastern Pennsylvania, U.S. with a medical school and a research institute. Geisinger's IRB determined that these surveys were exempt (IRB# 2017-0449).

Study design

Data was collected between August 2020 and January 2021 (Table S1). First, we used decision-making vignettes from our previous work to ask whether the extraordinary publicity around (primarily explanatory) Covid-19 RCTs reduced general healthcare experiment aversion by the public. Next, we adapted these vignettes to determine whether the public was averse to pRCTs on pharmaceutical and/or non-pharmaceutical interventions (NPIs) for Covid-19. Finally, we recruited a large clinician sample to investigate how their attitudes compared to those of laypeople.

Participants were evenly randomly assigned (using the Qualtrics survey software, such that aside from participants who dropped prior to completing the survey, the same number of participants are allocated to each vignette) to read one of the vignettes that described a problem that the decision-maker could address in one of three ways: by implementing intervention A for all patients or relevant members of the public (A); by implementing intervention B for all patients or relevant members of the public (B); or by conducting an experiment in which patients or relevant members of the public are randomly assigned to A or B and the superior intervention is then implemented for all (A/B). For example, in Best Anti-Hypertensive Drug, some doctors in a walk-in clinic prescribe “Drug A” while others prescribe “Drug B” (both of which are affordable, tolerable, and FDA approved), and “Dr. Jones” prescribes either A for all his hypertensive patients, B for all those patients, or runs a randomized experiment to compare the effectiveness of A and B. (See Table 1 for two additional examples, Table S2 for all vignette names, and pp. 8-13 in the Supplemental Materials [SM] for all vignette text.) To develop the vignettes, we consulted the literature and our knowledge, as experts in bioethics and psychological science, of pRCTs that have historically proved controversial (see Table S3 in the SM for motivations for all vignettes). All vignettes describe an RCT that is highly pragmatic in nature (i.e., high on PRECIS-2 eligibility, recruitment, setting, organization, follow-up, and primary outcome domains [5]). For instance, all patients with the relevant condition who attend the clinic/hospital for care become members of the trial and the trial is situated within the clinic/hospital where their care would typically take place. (Similarly, in the public health scenarios, all students in the school district and all residents of the state where these trials occur are included in the trial.) In addition, our vignettes are silent about whether consent will be obtained. Trials that include only those who opt into them are less pragmatic if they are testing the effectiveness of an intervention that would be imposed on people as a matter of policy or practice. IRBs customarily waive consent when it would make low-risk pRCTs impracticable, including by rendering the results uninformative about how an intervention would fare in practice [32]. In separate work, we found that substantial shares of people object to such experiments even when we specify that consent will be obtained [33].

Next, following a standard decision-science approach commonly used in social and moral psychology for evaluating decisions [34], participants rated each option on a scale of appropriateness from 1 ("very inappropriate") to 5 ("very appropriate"), with 3 as a neutral midpoint. Participants then rank-ordered the options from best to worst and provided demographic information.

Table 1

Vignette text for Catheterization Safety Checklist and Ventilator Proning

	Catheterization Safety Checklist	Ventilator Proning
Background	Some medical treatments require a doctor to insert a plastic tube into a large vein. These treatments can save lives, but they can also lead to deadly infections.	Some coronavirus (Covid-19) patients have to be sedated and placed on a ventilator to help them breathe. Even with a ventilator, these patients can have dangerously low blood oxygenation levels, which can result in death. Current standards suggest that laying ventilated patients on their stomach for 12-16 hours per day can reduce pressure on the lungs and might increase blood oxygen levels and improve survival rates.
Intervention A	A hospital director wants to reduce these infections, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All patients having this procedure will then be treated by doctors with this list attached to their clothing.	A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 12-13 hours per day.
Intervention B	A hospital director wants to reduce these infections, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All patients having this procedure will then be treated in rooms with this list posted on the wall.	A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 15-16 hours per day.
A/B test	A hospital director thinks of two different ways to reduce these infections, so he decides to run an experiment by randomly assigning patients to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After a year, the director will have all patients treated in whichever way turns out to have the highest survival rate.	A hospital director thinks of two different ways to save as many ventilated Covid-19 patients as possible, so he decides to run an experiment by randomly assigning ventilated Covid-19 patients to one of two test conditions. Half of these patients will be placed on their stomach for 12-13 hours per day. The other half of these patients will be placed on their stomach for 15-16 hours per day. After one month, the director will have all ventilated Covid-19 patients treated in whichever way turns out to have the highest survival rate.

Participants

Based on a power analysis, we determined that recruiting ~350 participants (laypeople and clinicians) per vignette (Catheterization Safety Checklist, Best Anti-Hypertensive Drug, Intubation Safety Checklist, Best Corticosteroid Drug, Masking Rules, School Reopening, and Ventilator Proning) would yield 95% power to detect an effect as small as Cohen's $d = 0.19$ at $\alpha = .05$. These sample sizes are consistent with our previous work using the same methods (but different vignettes, [19]).

For Best Vaccine, based on a prior study (see SM for full details), we hypothesized a smaller effect size, which resulted in a power analysis that determined that recruiting ~450 lay participants would yield 80% power to detect an effect as small as Cohen's $d = 0.13$ and 95% power to detect as small as Cohen's $d = 0.17$ (sample size consistent with [19]). For the clinician sample, we based our power analysis for Best Vaccine on the number of responses we collected in the first clinician survey testing the Masking Rules, Intubation Safety Checklist, and Best Corticosteroid vignettes. We assumed ~900 responses which we determined would yield 95% power to detect an effect as small as $d = 0.12$.

Across all vignettes, there were a total of 2,909 lay participants. They ranged in age from 18 to 88 with a mean age of 38 years old (SD = 12.8). The majority of participants were White (75%), female (56%), and college educated (30% having completed some college, 36% having earned a four-year degree, and 21% having earned a graduate degree; 21% of participants had a STEM degree) with a median household income of $40,000 to $60,000. The sample is more liberal (44%) and Democrat (38%) than conservative (28%) and Republican (21%) and a plurality of participants identified as non-religious (38%).

The clinician sample (N = 2,149) was comprised of doctors (15%), physician assistants (9%), nurse practitioners (5%), nurses (67%; RN: 54%; LPN: 12%, other: 1%), and other medical professionals (including genetic counselors and medical students; 4%). We determined the ratio of different types of clinicians from their self-reported position in the survey. We did not estimate in advance the proportion of certain types of clinicians who would respond. The majority of the clinicians were female (81%) and had been working in health care for more than 10 years (62%). A majority of clinicians reported being somewhat or moderately comfortable with research methods and statistics (77%) and had two sources of formal or informal training or education in research methods and statistics (e.g., undergraduate, professional school, or postgraduate coursework; 58%). (In these clinician samples, because survey responses were made fully anonymous to encourage greater participation and honest responding, we were unable to restrict participation in later waves to clinicians who had not participated in earlier waves. Therefore, some clinicians who completed the Best Vaccine vignette may have earlier completed the Masking Rules, Intubation Safety Checklist, and Best Corticosteroid Drug vignettes.) See Table S4-5 for detailed demographics of lay participants and clinicians by vignette.

Data analysis

We define the "A/B Effect" as the degree to which participants' ratings of the A/B test were lower than the average of their ratings of implementing A and B [18]. "Experiment aversion" is the degree to which participants rated the A/B test lower than their own lowest-rated intervention (either A or B for each person) [19]. "Experiment appreciation" is the opposite: the degree to which the experiment is rated higher than each participant's highest-rated intervention. For all measures, we performed paired t-tests at α = .05 and calculated Cohen's *d* recovered from the *t*-statistic, *n*, and correlation between the two measures being compared [35,36]. We also calculated the percentage of participants who ranked the A/B test as the worst (or best) option the decision-maker could implement as well as the percentage of participants who showed an A/B Effect, were experiment averse, or were experiment appreciative. We analyzed data using R version 4.3.0. Participant response data, preregistrations, materials, and analysis code have been deposited in Open Science Framework [60].

Patient and public involvement

We included laypeople as participants in our studies because they are typically included in pRCTs as patients or (in the case of some public health pRCTs and pRCTs in other domains) as members of the public and are therefore important stakeholders. Decisions about whether to participate in or conduct pRCTs are made against the backdrop of individuals' personal views and/or anticipation of potential backlash or other public reactions; therefore, how patients and clinicians feel about experiments is relevant to if and how advancements in healthcare are made. All participant responses were anonymous and, thus, results cannot be disseminated back to our participants.

RESULTS

In the following results, we group the vignettes by theme: those eliciting lay participants sentiments about pRCTs unrelated to the treatment of Covid-19, those eliciting lay participants sentiments about pRCTs related to the treatment, prevention of, or public health response to Covid-19, and those eliciting clinician sentiments about pRCTs related to the treatment, prevention of, or public health response to Covid-19.

Lay Sentiments About pRCTs

To elicit lay sentiments about pRCTs, participants responded to one of two vignettes: Catheterization Safety Checklist (which described two locations where a hospital director could display a safety checklist for clinicians; see Table 1; *n* = 343) or Best Anti-Hypertensive Drug (which described two drugs a doctor could prescribe for his hypertensive patients; *n* = 357).

We found substantial negative reactions to A/B testing in both vignettes (Table 2A), replicating our pre-pandemic findings [18,19]. Although in most cases the mean rating of the A/B test was near the neutral midpoint, implementing policies was substantially preferred to A/B testing (Figure 1A) and large proportions of participants objected to the A/B test (Figure 1B). In Catheterization Safety Checklist (Figure 1A), we found evidence of the A/B Effect: participants rated the A/B test significantly below the average ratings they gave to implementing interventions A and B (*d* = 0.69, 95% CI: (0.53, 0.85); Table S6A). Here, 41% ± 5% (95% CI) of participants expressed experiment aversion (rating the A/B test lower than their own lowest-rated intervention; *d* = 0.25, 95% CI: (0.11, 0.39); Table S6A). When ranking the three options from best to worst, only 32% placed the A/B test first, while 48% placed it last (Table S6A).

We also observed an A/B Effect in Best Anti-Hypertensive Drug (Figure 1B); *d* = 0.52, 95% CI: (0.36, 0.68); Table S6A), where 44% ± 5% also expressed experiment aversion (*d* = 0.46, 95% CI: (0.30, 0.52); Table S6A). Notably, participants were averse to this experiment even though there is no reason to prefer “Drug A” to “Drug B,” and patients are effectively already randomized to A or B based on which clinician happens to see them—which occurs wherever unwarranted variation in practice determines treatments, such as walk-in clinics and emergency departments. Here, however, similar proportions of people ranked the A/B test best and worst (50% vs. 45%; $p = 0.16$; Table S6A).

These levels of experiment aversion near the height of the pandemic were slightly (but not significantly) higher than those we observed among similar laypeople in 2019 (41% ± 5% in 2020 vs. 37% ± 6% in 2019 for Catheterization Safety Checklist, $p = 0.31$; 44% ± 5% in 2020 vs. 40% ± 6% in 2019 for Best Anti-Hypertensive Drug, $p = 0.32$) [19].

[Figure 1]

Table 2

Sentiments about experiments by vignette and population

	Negative sentiment				Positive sentiment			
	Experiment Aversion	A/B Effect	More people averse than appreciative?	More people rank AB test worst than best?	More people rank AB test best than worst?	More people appreciative than averse?	Reverse A/B Effect	Experiment Appreciation
(A) Lay Sentiments About pRCTs								
Catheterization Safety Checklist	✓	✓	✓	✓				
Best Anti-Hypertensive Drug	✓	✓	✓					
(B) Lay Sentiments About Covid-19 pRCTs								
Ventilator Proning	✓	✓	✓					
School Reopening		✓	✓	✓				
Masking Rules	✓	✓	✓	✓				
Intubation Safety Checklist	✓	✓	✓	✓				
Best Corticosteroid Drug		✓			✓			
Best Vaccine		✓			✓			
(C) Clinician Sentiments About Covid-19 pRCTs								
Masking Rules	✓	✓	✓	✓				
Intubation Safety Checklist	✓	✓	✓	✓				
Best Corticosteroid Drug	✓	✓	✓					
Best Vaccine		✓*			✓			

Notes. Experiment Aversion refers to the difference between the lowest-rated intervention and the rating of the A/B test. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. The Reverse A/B Effect refers to the difference between the rating of the A/B test and the average rating of the two interventions. Experiment Appreciation refers to the difference between the rating of the A/B test and the rating of the highest-rated intervention. See Table S6A-C of SM for detailed results (including Cohen's *ds* and 95% CIs) for all measures of sentiment about experiments.

Checkmarks (✓) represent a statistically significant effect at p < .05. In one case, the checkmark is followed by an asterisk (*). This indicates that while the effect reaches statistical significance, the effect size is very small and might have only reached significance due to the large sample size (three times as large as that for other vignettes).

Variables to the right of the thick vertical line are the reverse of those on the left. If no checkmark appears in either of the corresponding columns to the left and right of the thick vertical line (e.g., "More people rank A/B test worst than best?" and "More people rank A/B test best than worst?"), that means that there is no significant difference (e.g., there is no statistically significant difference between the proportion of people ranked that A/B test worst and the proportion of people who ranked the A/B test best).

Lay Sentiments About Covid-19 pRCTs

To elicit lay sentiments about Covid-19 pRCTs, we asked lay participants to read one of the following vignettes: Masking Rules (which described two masking policies, of varying scope; *n* = 360); School Reopening (two school schedules designed to increase social distancing; *n* = 339); Best Vaccine (two types of vaccine—mRNA versus inactivated virus; *n* = 450); Ventilator Proning (two protocols for positioning ventilated Covid-19 patients; see Table 1; *n* = 357); Intubation Safety Checklist (adapted from above to apply to Covid-19; *n* = 347); and Best Corticosteroid Drug (adapted from above to apply to Covid-19; *n* = 357).

In all six Covid-19 vignettes, we found evidence of the A/B Effect (Table 2B, Figure 2A). In three, however, we did not find experiment aversion: Best Vaccine[1], Best Corticosteroid Drug, and School Reopening. In the first two of these, participants rated the two interventions very similarly and the experiment only slightly lower (Figure 2B). These vignettes also elicited the largest proportion of participants (65% in Best Vaccine and 56% in Best Corticosteroid Drug; Table S6B) in any vignette who ranked the A/B test best among the three options, compared to 31–34% of participants who ranked it worst (Table S6B). In School Reopening, experiment aversion was not observed because participants on average clearly preferred intervention B to A and rated the experiment similar to intervention A [20,21]. 53% of participants ranked intervention B as the best of the three options (compared to 17% choosing intervention A and 30% choosing the A/B test; Table S6B).

[1] See Table S6D for results from a previous version of Best Vaccine which unintentionally implied that vignette participants could choose their vaccine.

In the other three vignettes, participants rated the A/B test condition as significantly less appropriate than their lowest-rated intervention (Masking Rules: d = 0.56, 95% CI: (0.41, 0.71); Ventilator Proning: d = 0.17, 95% CI: (0.04, 0.30); Intubation Safety Checklist: d = 0.36, 95% CI: (0.21, 0.49)). These levels of aversion to Covid-19 RCTs are similar to the levels of aversion to non-Covid-19 RCTs both before [19] and during the pandemic (see above).

[Figure 2]

Clinician Sentiments About Covid-19 pRCTs

Clinicians responded to one[2] of four Covid-19-related vignettes: Masking Rules (n = 349), Intubation Safety Checklist (n = 271), Best Corticosteroid Drug (n = 275), or Best Vaccine (n = 1254). We observed an A/B effect in all four vignettes (Figures 3A-B). In two, clinicians, like laypeople, were also significantly experiment averse (Masking Rules: d = 0.74, 95% CI: (0.57, 0.91; Table S6C); Intubation Safety Checklist: d = 0.30, 95% CI: (0.15, 0.45); Table S6C). In Best Vaccine, clinicians, like laypeople, did not show any significant difference in their ratings of the A/B test and their lowest-rated intervention (d = –0.03, 95% CI: (–0.10, 0.04); Table S6C). Again, like laypeople, 58% of clinicians ranked the vaccine A/B test as the best of the three options, the highest proportion of any clinician-rated vignette.

Clinicians differed from laypeople in their response to Best Corticosteroid Drug. Laypeople did not show experiment aversion, but clinicians rated the A/B test as significantly less appropriate than their lowest-rated intervention (d = 0.49, 95% CI: (0.32, 0.66); Table S6C).

[2] Clinicians in the first survey were randomly assigned to one of the three vignettes (Masking Rules, Intubation Safety Checklist, and Best Corticosteroid Drug) and then completed the remaining vignettes in random order. For consistency with the rest of this project and with our previous approach [18], we analyzed data from this survey as a between-subjects design where we only consider the first vignette that every participant completed. See Table S7 and pp. 27-28 in SM for further discussion.

This difference may be due to clinicians' greater familiarity with the treatment of Covid-19. Clinicians may also have seen an urgent need for any drugs to treat Covid-19 [24] and thus rated adopting a clear treatment intervention as more appropriate than an RCT.

[Figure 3]

Heterogeneity in Experiment Aversion

Collapsed across studies, political ideology explained 1.5% of the variance ($p < .001$) in sentiments about experiments, with conservatives slightly less averse to experiments than liberals. Less or no variation was explained by all other demographics, including educational attainment (0.2%, $p = .008$), STEM degree (0.1%, $p = .15$), and prescribers versus other clinicians (0.2%, $p = .061$); see Tables S8-11 in SM for further discussion.

DISCUSSION

In three preregistered survey experiments, we observed considerable experiment aversion among laypeople during the first year of the Covid-19 pandemic, despite increased exposure to the nature and purpose of (largely explanatory) RCTs. Neither laypeople nor clinicians were overall less averse to Covid-19 pRCTs, despite the fact that confidence in anyone's knowledge of what works should have been even more circumscribed than in the everyday contexts of hypertension and catheter infections. To the contrary, most Covid-19 vignettes were met with experiment aversion. This is consistent with an emphasis during the pandemic that we must "do" instead of "learn," a false dichotomy that fails to recognize that implementing an untested intervention is itself a nonconsensual experiment from which, unlike an RCT, little or nothing can be learned [37–39]. Participants may have been averse to the uncertainty that the decision to conduct an experiment conveys. They may have perceived the experiment as more risky than implementing either of the policies it contains. Or they may have experienced hindsight bias, believing that the experiment was unfair to whomever received the least effective policy, neglecting the fact that the results were not known in advance. For whatever reason, across all vignettes and samples, between 28% and 57% of participants demonstrated experiment aversion, while only 6%–35% demonstrated experiment appreciation (by rating the pRCT higher than their highest-rated intervention).

Although in most cases the mean rating of the A/B test was near the neutral midpoint, in none of our 12 studies were more people appreciative of than averse to the pRCT, in none was the average pRCT rating higher than the average intervention rating, and in none was the pRCT rating higher than each participant's highest-rated intervention, on average. Notably, unlike trials with placebo or no-contact controls, the A/B tests in our vignettes compared two active, plausible interventions, neither of which was obviously known ex ante to be superior. Yet substantial shares of participants still preferred that one intervention simply be implemented without bothering to determine which (if either) worked best.

The most positive sentiment towards experiments was observed in both laypeople and clinicians in the vignettes involving Covid-19 drugs and vaccines. Here we observed the highest proportions of participants who demonstrated experiment appreciation (31%–46%) and who ranked the pRCT first (49%–65%). This result could be explained by differences in the pRCT length (ranging from one to twelve months) and perceived severity of the pRCT outcome ("best outcome" and "fewest cases of Covid-19" in Best Corticosteroid and Best Vaccine, respectively vs., e.g., "highest survival rate" in Ventilator Proning). But this result is also consistent with our previous findings that the illusion of knowledge—here, the belief that either the participant herself or some expert already does or should know the right thing to do and should simply do it—biases people to prefer universal intervention implementation to pRCTs [18,19]. One possible solution is to teach patients that clinicians typically have many options for treating a condition, that often no one knows which option is best, and that a pRCT is the optimal way to figure that out. Similarly, highlighting unwarranted variation in practice during medical training may help reduce clinicians' negative sentiments towards experiments. Rightly or wrongly, both laypeople and clinicians might (a) appropriately recognize that near the start of a pandemic, no one knows which existing drugs, if any, are safe and effective in treating a novel disease, and that new vaccines need to be tested, yet (b) fail to sufficiently appreciate the level of uncertainty around NPIs like masking, proning, and social distancing, which can also benefit from rigorous evaluation. This is consistent with the dearth of RCTs (explanatory or pragmatic) of Covid-19 NPIs [40]: of the more than 4,000 Covid-19 trials registered worldwide as of August 2021, only 41 tested NPIs [41]. Explaining critical concepts like clinical equipoise or unwarranted variation in medical and NPI practice might diminish experiment aversion.

Limitations

While our lay participant samples were large, diverse, and demographically similar to the general U.S. population (see Table S4), they may not be perfectly representative of other populations. Similarly, Geisinger, the network of hospitals with which the clinicians were affiliated, may not be representative of all hospitals, specifically in their exposure to research and A/B tests such as those described in our vignettes. Geisinger is primarily comprised of teaching hospitals, and has a medical school, but is not associated with a university and, therefore, our results may not generalize either to clinicians who practice at large academic medical centers (e.g., Massachusetts General Hospital or Johns Hopkins Hospital) where RCTs are often conducted or, on the other hand, to clinicians who practice at small community hospitals that have little exposure to research. In addition, because the clinician sample was largely made up of individuals with only some research training and experience, these results may not generalize to clinicians who have extensive research training and experience and conduct RCTs (or pRCTs) themselves. Importantly, however, the support of non-investigator clinical and operational leaders is often needed to conduct a pRCT, and administrator-clinicians do not always have substantial research experience. Moreover, in both samples, our primary goal was not to estimate the percentage of people in the general population who hold negative views of pRCTs, but rather to ascertain experimentally whether laypeople and clinicians display the patterns of negative sentiments about pRCTs that we have found previously [18,19], when confronted with vignettes during, or about, a novel situation (the Covid-19 pandemic). Thus, though the sample may not perfectly represent all healthcare professionals or members of the general public, the results demonstrate the repeated presence of negative sentiments, and a lack of positive sentiments, towards experiments across eight distinct situations among segments of populations whose opinions matter.

Furthermore, because experiment aversion and appreciation are likely socio-cultural phenomena, we should expect that the presence or size of the effects we report may differ among societies and over time [42]. However, contrary to recent claims [43], the similarity in aversion to experiments between laypeople and clinicians suggests that these results generalize across populations that differ in their level of knowledge of RCTs. In addition, our findings here and elsewhere [18,19] show that experiment aversion occurs in health and non-health scenarios and, within the health domain, in both clinical and public health scenarios, and regarding both pharmaceutical and non-pharmaceutical interventions.

Finally, as noted above, all vignettes discussed in this paper are silent about whether the consent of patients and/or clinicians would be obtained. Previous work that did not directly compare judgments about pRCTs versus treatment implementation suggests that when given the option, laypeople prefer to be asked for consent (e.g., for a study comparing the effectiveness of two marketed hypertension drugs, a scenario somewhat related to one of ours [44,45]). Additionally, other research has found neither experiment aversion nor appreciation (as we define it here and elsewhere [33]) after introducing a critical element of voluntariness by asking respondents how likely they would be to "choose to be treated" at a hospital that is conducting a pRCT [43]. In separate work, we found that when vignettes explicitly specify that prior consent is obtained, negative sentiment towards pRCTs is reduced—but not eliminated [33]. However, individual consent would undermine the external validity of pRCTs, and is anyhow rarely feasible in such settings [32,46,47], e.g., tests of policy interventions such as providing safety checklists and promulgating public health rules.

Conclusion

Critics rightly note that RCTs have limited external validity when they employ overly selective inclusion/exclusion criteria or are executed in ways that deviate from how interventions would be operationalized in diverse, real-world settings. However, the solution is not to abandon randomized evaluation, but to incorporate it into routine clinical care and healthcare delivery via pRCTs [1,47–49]. It has been many years since the U.S. Institute of Medicine urged research of many varieties to be embedded in care [50]. More recently, the UK Royal College of Physicians and National Institute for Health and Care Research issued a joint position statement similarly advocating the integration of research into care [51]. In addition, the U.S. Food and Drug Administration now promotes pRCTs to support post-marketing monitoring and other regulatory decision-making [52,53], a priority also highlighted in the UK Medicines and Healthcare products Regulatory Agency's 2021-2023 Delivery Plan [54] and guidance on RCTs [55]. Pragmatic RCTs have been fielded successfully and informed healthcare practice and policy [46,56,57], but they remain far from ubiquitous and they require buy-in to be successful, as shown by the case of a Norwegian school reopening trial during the pandemic that was abandoned due to lack of such support [58,59]. Broadening the use of pRCTs will require not only redoubling investment in interoperable electronic health records and recalibrating regulators' views of the comparative risks of research versus idiosyncratic practice variation [1], but also anticipating and addressing experiment aversion among patients and healthcare professionals. Better understanding experiment aversion and then discovering strategies to mitigate it will help grow the evidence base necessary for evidence-based decision-making and, ultimately, improved patient outcomes.

ETHICS APPROVAL

Geisinger's IRB determined that the study surveys were exempt from ethical approval, including any requirement of informed consent, under 45 C.F.R. § 46.104(2)(i) (IRB# 2017-0449). Nevertheless, prospective participants were invited to take a survey and told the broad topic, the estimated time it would take, and the compensation offered. Those who proceeded were deemed to have tacitly consented. Participants could quit the survey at any time.

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DATA AVAILABILITY STATEMENT

Participant response data, preregistrations, materials, and analysis code have been deposited in Open Science Framework (https://osf.io/6p5c7/?view_only=eaeb95cb754247028f1d1ed94414cbd2).

CONTRIBUTORS

P.R.H., P.H., C.F.C, and M.N.M. designed the studies and collected the data. P.R.H. and R.L.V. analyzed the data. R.L.V., R.M.M., C.F.C., and M.N.M. wrote the first draft of the manuscript. P.R.H. and P.H. provided critical revisions. R.L.V. and P.R.H. contributed equally to this work. M.N.M. and C.F.C. contributed equally to this work.

COMPETING INTERESTS

None of the authors have competing interests to report.

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Figure Captions

Figure 1

Lay Sentiments About pRCTs

[figure uploaded separately]

Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—“very inappropriate” or “somewhat inappropriate”— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

Figure 2

Lay Sentiments About Covid-19 pRCTs

[figure uploaded separately]

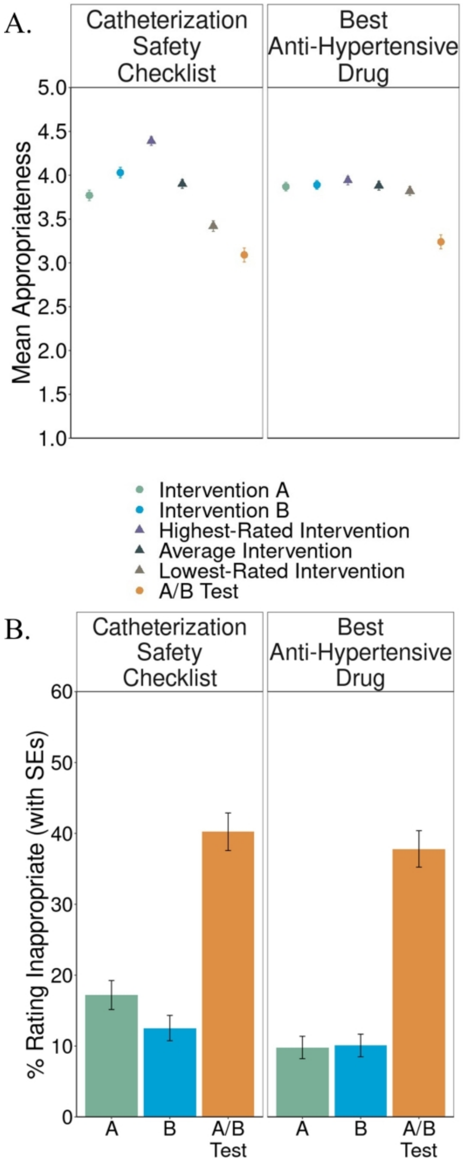
Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—“very inappropriate” or “somewhat inappropriate”— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

Figure 3

Clinician Sentiments About Covid-19 pRCTs

[figure uploaded separately]

Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—"very inappropriate" or "somewhat inappropriate"— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.



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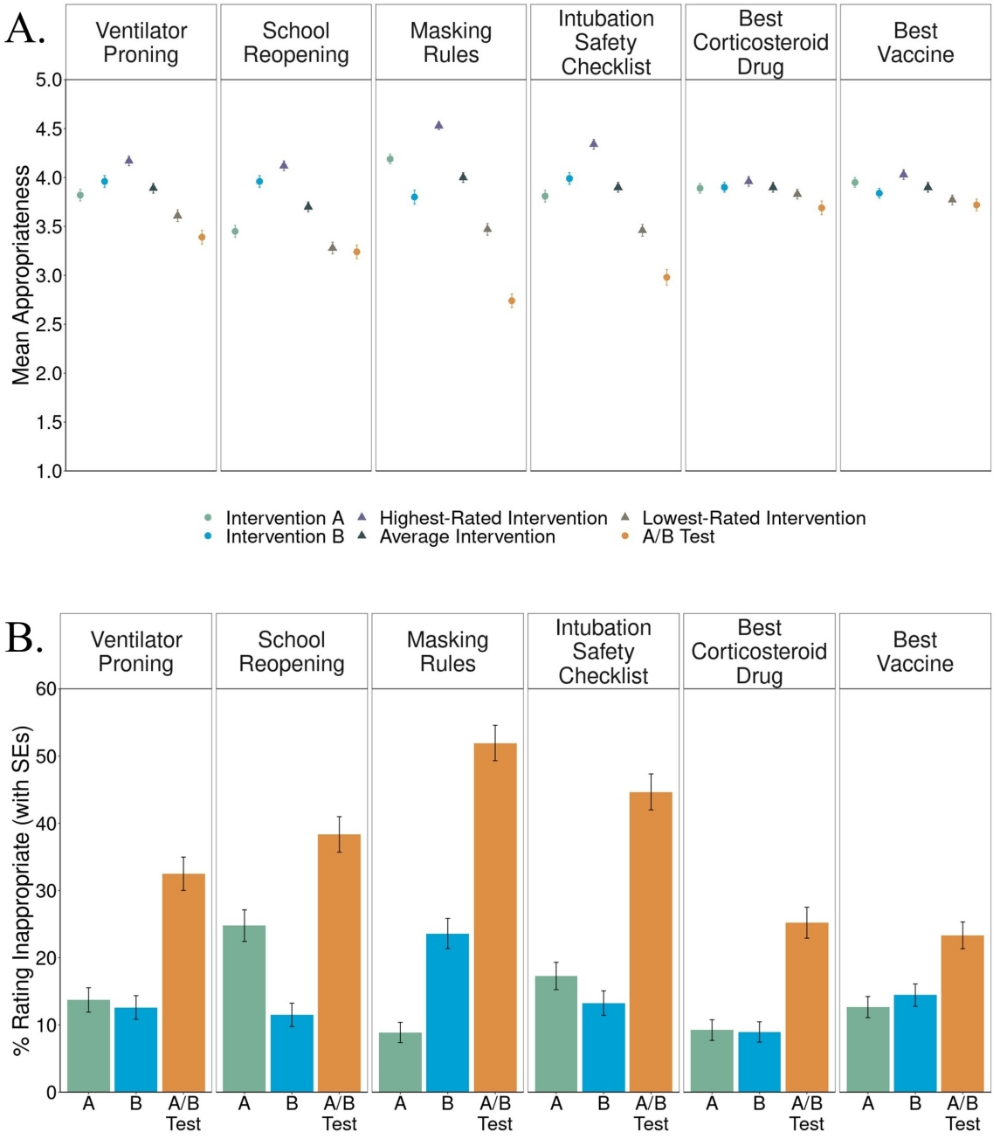
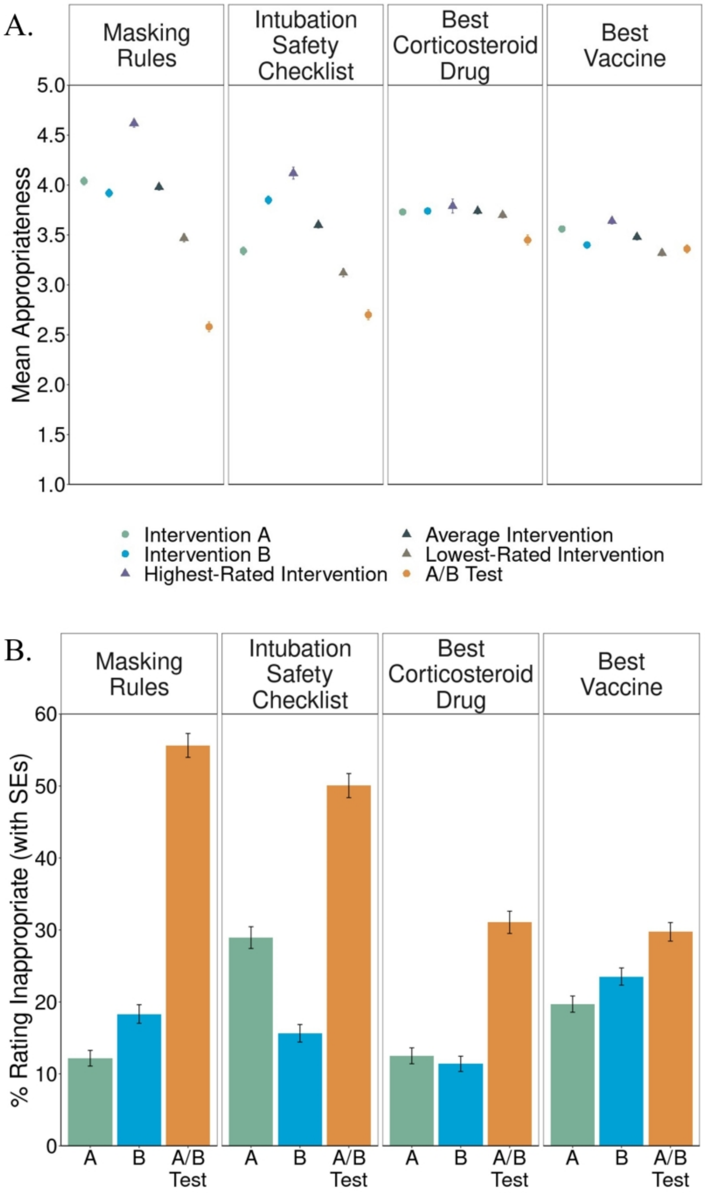


Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2— "very inappropriate" or "somewhat inappropriate"— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

190x218mm (300 x 300 DPI)



Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2— "very inappropriate" or "somewhat inappropriate"— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

190x320mm (300 x 300 DPI)

Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople in the United States

Supplemental Materials

Table of Contents

Methods

In the main text, we grouped the vignettes thematically into three sets: “Lay Sentiments About pRCTs,” “Lay Sentiments About Covid-19 pRCTs,” and “Clinician Sentiments About Covid-19 pRCTs.” However, when we collected data, we grouped our vignettes differently such that we started with vignettes that we have used in previous published work and their respective Covid-19 derivatives, then we developed and tested novel Covid-19 specific vignettes separately, and then, again separately, we tested a Covid-19 vaccine vignette. We followed a similar pattern in our clinician sample: we first tested three Covid-19 specific vignettes (two which were derivatives of vignettes from our previous work, one which was new to this work) and then separately, we tested a Covid-19 vaccine vignette. These groupings are important for understanding how participants were randomly assigned to vignettes and why there are slight discrepancies (or large discrepancies in the case of the Best Vaccine vignette in the clinician sample[1]) in the number of participants in each vignette (see Table S1).

Table S1

Population, sample size, and dates of data collection for each vignette

Preregistration #	Vignette	Population	Sample size	Dates of data collection
1	Catheterization Safety Checklist	MTurk workers	343	August 13, 2020
	Intubation Safety Checklist	MTurk workers	347	August 13, 2020
	Best Anti-Hypertensive Drug	MTurk workers	357	August 13, 2020
	Best Corticosteroid Drug	MTurk workers	357	August 13, 2020
2	Masking Rules	MTurk workers	360	September 30-October 2, 2020
	School Reopening	MTurk workers	339	September 30-October 2, 2020
	Best Vaccine (ambiguous version)*	MTurk workers	350	September 30-October 2, 2020
	Ventilator Proning	MTurk workers	357	September 30-October 2, 2020
3	Intubation Safety Checklist	Clinicians	271	November 13-December 9, 2020
	Best Corticosteroid Drug	Clinicians	275	November 13-December 9, 2020
	Masking Rules	Clinicians	349	November 13-December 9, 2020
4	Best Vaccine	MTurk workers	450	January 8, 2021
5	Best Vaccine	Clinicians	1254	January 25-February 9, 2021

Note. Within each data collection batch, participants were randomly assigned to one of the vignettes. In the clinician sample (preregistration #3), clinicians saw all three vignettes in randomized order. The sample size reported here is the number of clinicians who saw that vignette first.
*Our first attempt at the Best Vaccine vignette included wording that unintentionally made the experiment condition less aversive. For this reason, this vignette is not included in the main analyses.

[1] The Best Vaccine vignette was combined with another study that required a sample size much larger than the sample sizes in our previous vignette studies to have adequate statistical power.

For clarity, in the main text of this article we used different names for the vignettes than those used in the preregistrations and in previous publications (see Table S2).

Table S2

Original vignette names from preregistrations and previous work and corresponding name in main text

Original vignette name	Main text vignette name Hospital
Safety Checklist (also called Checklist)	Catheterization Safety Checklist Best
Drug: Walk-In Clinic (also called Best Drug)	Best Anti-Hypertensive Drug
Checklist (Covid-19)	Intubation Safety Checklist
Best Drug (Covid-19)	Best Corticosteroid Drug
Ventilator Proning	Ventilator Proning
School Reopening	School Reopening
Mask Requirements	Masking Rules
Modified Covid-19 Vaccines	Best Vaccine
Vaccine Distribution	(not reported in main text)

Note. Vignette names in this article were changed from those in previous work and in our preregistrations in order to clarify the content for readers.

Preregistrations, sample sizes, and power analyses

Our research questions, power analyses and sample sizes, and analysis plans were all preregistered at Open Science Framework (OSF) before data collection. These sample size precommitments are copied from each preregistration document which can be found on OSF at https://osf.io/u945y/?view_only=a901fde13ddb423899074eb79964c6cd.

Preregistration 1 (Catheterization Safety Checklist, Best Anti-Hypertensive Drug, Intubation Safety Checklist, Best Corticosteroid Drug vignettes):

"We predict that, using a two-tailed, paired t-test with α = .05 within each scenario, participants will rate the A/B test condition as significantly less appropriate than their own average rating of the two policy conditions, mean(A,B). This is the test for the "A/B Effect." Recruiting 350 participants for each scenario provides 95% power to detect an effect as small as d = 0.19, which is substantially smaller than the effect sizes we have observed using the Hospital Safety Checklist and Best Drug: Walk-In Clinic vignettes in past research."

Preregistration 2 (Ventilator Proning, School Reopening, Masking Rules, and Best Vaccine (initial ambiguous version) vignettes):

"We predict that, using a two-tailed, paired t-test with α = .05 within each scenario, participants will rate the A/B test condition as significantly less appropriate than their own average rating of the two policy conditions, mean(A,B). This is the test for the "A/B Effect." Recruiting 350 participants for each scenario provides 95% power to detect an effect as small as d = 0.19, which is substantially smaller than the effect sizes we have observed using the Hospital Safety Checklist and Best Drug: Walk-In Clinic vignettes in past research."

Preregistration 3 (Clinicians; Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes):

Note that because of time constraints around the possible starting dates of our clinician surveys, we launched this study before preregistering it, and we did not report an explicit power analysis before collecting the data. Because this study follows a similar structure to the studies above, however, it was reasonable to apply the previous sample size and power analysis considerations. We did, however, preregister our approach and research plan twice during this study: once during data collection, before any analyses had been conducted, and again after all data had been collected (but before analyzing any of them).

> Preregistration 3.1: "At the time of this preregistration, we have received 655 complete responses. No data have been explored or analyzed at this point. We will conduct an interim analysis on this dataset using the same analyses we have previously preregistered, and we may continue to collect more data from this population."
>
> Preregistration 3.2: "Data collection is now complete and we have closed the survey. On 11/24/2020, we conducted an interim analysis on 601 complete responses. Since then, we have received an additional 295 complete responses, to which we remain blind."

Preregistration 4 (Best Vaccine):

"We recruited 350 participants for the original Covid-19 vaccines study. Because we are running this study to determine whether even a small effect emerges, we will increase the sample size to 450 participants. This provides 80% power to detect an effect as small as d = 0.13 in a repeated- measures, two-tailed t-test, and 95% power to detect an effect as small as d = 0.17."

Preregistration 5 (Clinicians; Best Vaccine):

"Our previous survey of healthcare providers resulted in approximately 900 complete responses; we expect a similar response rate for this survey. This sample size provides 95% power to detect an effect as small as d = 0.12 using a two-tailed, repeated measures t-test. Even if we only receive 600 complete responses, we will have 95% power to detect an effect as small as d = 0.15."

Procedure and design

Several aspects of the procedure and experimental design were consistent across the studies reported here. Below, we describe these consistent features and note in specific studies where we deviated from them.

For the lay participant samples, we used the CloudResearch service to recruit crowd workers on Amazon Mechanical Turk (MTurk) to participate in a 3–5-minute survey experiment. These services provide samples that are broadly representative of the U.S. population and are well-accepted in social science research as providing as good or better-quality data than convenience samples such as student volunteers, with results that are similar to probability sampling methods [1,2]. Participants were excluded from recruitment in any of the studies reported here if they had participated in any of our previous studies on this topic. Across all laypeople vignettes, the completion rate of participants starting the survey was 91.5%. The Geisinger IRB determined that these anonymous surveys were exempt (IRB# 2017-0449).

For the clinician samples, we recruited healthcare providers (including physicians, physician assistants, nurse practitioners, and nurses) from a large health system in the Northeastern U.S via email. Each provider received either one or two emails about the study during the recruitment window. In the first clinician study (Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes), we first tested the email recruitment system by sending out the survey invitation email to just 200 clinicians. Clinicians who completed the survey based on this survey invitation were included in the final sample. Then, all clinicians were sent the recruitment email on November 19, 2020, followed by a reminder email on December 3, 2020. In the second clinician study (Best Vaccine), the initial recruitment email was sent January 25, 2021, with the follow-up email sent February 2, 2021. In the first clinician study, 5,925 clinicians were emailed and 895 completed the survey. In the second clinician study, 6,993 clinicians were emailed and 1,254 completed the survey. In these samples, because survey responses were fully anonymous, we were not able to restrict participation based on our previous studies, so some participants who completed the Best Vaccine vignette may have earlier completed the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes.

In all cases, participants completed an online survey hosted by Qualtrics. After opening the survey, participants were randomly assigned to one of the possible vignettes being studied.[2,3] In the case of data collection batches 4 and 5, there was only one vignette being tested that all participants saw. At this point, we used the exact same procedure detailed in Heck et al. (2020) [4]. First, participants were instructed to read about several possible decisions made by different decision-makers[4], and to try to treat each decision as separate from the others. All scenarios contained a brief "background" text at the top of the page that summarized a problem, followed by three "situations," each of which detailed the decision-maker's choice to adopt intervention A, intervention B, or to run an A/B test by randomly assigning people to one of two test conditions. These conditions were presented in fully counterbalanced order; each participant received one of six possible orders (i.e., Situation 1 = A, Situation 2 = B, and Situation 3 = A/B; Situation 1 = A/B, Situation 2 = B, and Situation 3 = A; etc.…). At no point did we observe a meaningful effect of presentation order, so we collapsed across this variable for all analyses.

[2] For the clinician study of the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes, clinicians were randomly assigned to one of these three scenarios and then completed the remaining two scenarios in random order. For consistency with the rest of this project and with our previous survey experiment with clinicians regarding the A/B effect (3, Study 6), and in order to make the results from clinician samples comparable to those with lay samples (in which each participant only ever saw one scenario), we analyze data from this study as a between-subjects design where we only consider the first scenario that every participant completed. See the section "Order Effect in Clinician Study" elsewhere in this appendix for further analyses.

[3] The clinician version of the Best Vaccine vignette was combined with another study being conducted by a subset of researchers on this team. The materials for Best Vaccine were presented after the survey materials from the other study. Data from the other study are unrelated to the research questions tested here and will be reported separately.

For our primary outcome measures, participants were asked to rate the appropriateness of the decisions made in Situation 1, Situation 2, and Situation 3 ("How appropriate is the director's decision in Situation 1/2/3?"), using a 1-5 scale (1 = "Very inappropriate", 2 = "Inappropriate", 3 = "Neither inappropriate nor appropriate", 4 ="Appropriate", 5 = "Very appropriate"). Participants then specified a ranked order of the three decisions ("Among these three decisions, which decision do you think the director should make? Please drag and drop the options below into your preferred order from best to worst. You must click on at least one option before you can proceed."), with 1 being the best decision and 3 being the worst. The last item on this page asked participants to explain why they chose these ratings and rankings in a couple of sentences ("In a couple of sentences, please tell us why you chose the ratings and rankings you chose.").

Following these primary measures, participants completed standard demographic items on the next page. For MTurk participants, these were measures of sex, race/ethnicity, age, educational attainment, household income, religious belief or affiliation, whether they have a degree in a STEM field or not, and four items identifying political orientation and affiliation. As part of an ongoing study in our laboratory (whose results will be reported elsewhere), these participants were randomized to one of six conditions for this demographic questionnaire where we varied the option to select "prefer not to answer" and whether the items were mandatory, optional, or requested (but not required). For clinician participants, demographic items were mandatory response and were limited to the following: sex, sources of training in research methods and statistics, self-reported comfort with research methods and statistics, past experience with activities related to research methods and statistics (e.g., publishing a scientific paper or analyzing data), current involvement in research, position (e.g., doctor, physician assistant, nurse, medical student, etc.), length of time working in the medical field, and field of specialty.

After completing the survey, MTurk participants were given a completion code to receive payment ($0.40). Clinician participants were invited to enter into a lottery to win a $50 Amazon gift card by following a link to an independent survey where they could enter their email address. All participants were thanked for their participation and offered the opportunity to comment on the survey.

[4] In all vignettes, the protagonist (e.g., the hospital director or Dr. Jones) was male for ease of comparison to our previous work using these vignettes. Future work should examine the impact of the characteristics of the decision-maker on evaluations of their decisions regarding policy imposition and conducting RCTs.

Measures

We computed several variables to measure participants' sentiments about pRCTs.

Following Meyer et al. (2019) [3], we define an "A/B effect" as the difference between participants' mean policy rating and their rating of the A/B test—that is, the degree to which the policies are (on average) rated higher than the A/B test. We also report the percentage of participants whose mean policy rating is higher than their rating of the A/B test.

Following Heck et al. (2020 [4]; see also Mislavsky et al., 2019 [5]), we define "experiment aversion" as the difference between participants' rating of their own lowest-rated policy and their rating of the A/B test. We also report the percentage of participants who express experiment aversion.

"Experiment rejection" (first reported in Heck et al., 2020 [4], but without this name) occurs when a participant rates the A/B test as inappropriate (1 or 2 on the 5-point scale) while also rating each policy as neutral or appropriate (3–5 on the scale).

A "reverse A/B effect" is the difference between participants' rating of the A/B test and their mean policy rating—that is, the degree to which the A/B test is rated higher than the policies (on average). We also report the percentage of participants whose rating of the A/B test is higher than their mean policy rating.

"Experiment appreciation" is the difference between participants' rating of the A/B test and their rating of their own highest-rated policy. We also report the percentage of participants who express experiment appreciation.

"Experiment endorsement" occurs when a participant rates the A/B as appropriate (4 or 5 on the 5-point scale) while also rating each intervention as neutral or inappropriate (1–3 on the scale).

In all cases where a *d*-value was calculated (i.e., A/B effect, experiment aversion, reverse A/B effect, experiment appreciation), we used Cohen's *d* recovered from the *t*-statistic, *n*, and correlation between the two measures being compared (Dunlap et al., 1996 [6], equation 3: $d = tc[2(1-r)/n]^{1/2}$; see also http://jakewestfall.org/blog/index.php/category/effect-size/kewestfall.org [7]. To calculate this *d*-value, we use the following R code: effsize::cohen.d(x,y, paired = TRUE).

In Figures 1B, 2B, and 3B, we transformed participants A, B, and A/B ratings on the continuous 5-point Likert scale into a binary objected/did not object variable (where objecting was defined as assigning a rating of 1 or 2—"very inappropriate" or "somewhat inappropriate"— on the 1–5 scale). We do this only for visualization and do not perform any statistical analyses on this transformed objected/did not object variable. Instead, as is standard in social and moral psychology, we treated appropriateness ratings elicited on the 5-point Likert scale as continuous. Therefore, we use t-tests to test the differences between the ratings of the A/B test and the interventions (lowest, average, and highest). Other methodologies and statistical analyses like a discrete choice approach, in which participants would see and evaluation two of the three possible decisions (e.g., intervention A vs. A/B test) at a time, or the Stuart-Maxwell test, which requires a kxk matrix of categorical variables, would not be appropriate.

Vignettes

Our vignettes were inspired by discussions about the ethics of real-world RCTs (see Table S3).

Table S3

Literature calling for or reporting an RCT similar to what is proposed in each vignette

Vignette name	Relevant literature
Catheterization Safety Checklist	Pronovost et al. [8], Urbach et al. [9], Arriaga et al. [10]
Best Anti-Hypertensive Drug	ROMP Ethics Study [11], Sinnott et al. [12]
Intubation Safety Checklist	Turner et al. [13]
Best Corticosteroid Drug	Wagner et al. [14]
Ventilator Proning	Elharrar et al. [15], Sartini et al. [16], Caputo et al. [17]
School Reopening	Fretheim et al. [18, 19], Helsingen et al. [20], Angrist et al. [21], Kolata [22]
Masking Rules	Abaluck et al. [23], Jefferson et al. [24], Bundgaard et al. [25]
Best Vaccine	Bach [26]

The following section shows the exact vignette text that participants read in these studies (with the exception of the bolded titles, which are never shown to participants).

Catheterization Safety Checklist

(Originally from Heck et al. (2020) [4], adapted from Meyer et al. (2019) [2])

Background: Some medical treatments require a doctor to insert a plastic tube into a large vein. These treatments can save lives, but they can also lead to deadly infections.

Situation 1

A hospital director wants to reduce these infections, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All patients having this procedure will then be treated by doctors with this list attached to their clothing.

Situation 2

A hospital director wants to reduce these infections, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All patients having this procedure will then be treated in rooms with this list posted on the wall.

Situation 3

A hospital director thinks of two different ways to reduce these infections, so he decides to run an experiment by randomly assigning patients to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After a year, the director will have all patients treated in whichever way turns out to have the highest survival rate.

Best Anti-Hypertensive Drug

(Originally from Heck et al. (2020) [4], adapted from Meyer et al. (2019) [2])

Background: Several drugs have been approved by the US. Food and Drug Administration as safe and effective for treating high blood pressure. Doctor Jones works in a multi-doctor walk-in clinic where patients see whichever doctor is available. Some doctors in the clinic prescribe drug A for high blood pressure, while others prescribe drug B. Both drugs are affordable and patients can tolerate their side effects.
Situation 1

Doctor Jones wants to provide good treatment to his patients, so he decides that his patients who need high blood pressure medication will be prescribed drug A.

Situation 2

Doctor Jones wants to provide good treatment to his patients, so he decides that his patients who need high blood pressure medication will be prescribed drug B.

Situation 3

Doctor Jones thinks of two different ways to provide good treatment to his patients, so he decides to run an experiment by randomly assigning his patients who need high blood pressure medication to one of two test conditions. Half of patients will be prescribed drug A, and the other half will be prescribed drug B. After a year, he will only prescribe to new patients whichever drug has had the best outcomes for his patients.

Intubation Safety Checklist

Background: Some treatments for coronavirus (Covid-19) patients require a doctor to insert a plastic breathing tube into the throat. These treatments can save lives, but they can also lead to deadly fluid buildup in the lungs.

Situation 1

A hospital director wants to reduce these cases of fluid buildup, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All coronavirus patients having this procedure will then be treated by doctors with this list attached to their clothing.

Situation 2

A hospital director wants to reduce these cases of fluid buildup, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All coronavirus patients having this procedure will then be treated in rooms with this list posted on the wall.

Situation 3

A hospital director thinks of two different ways to reduce these cases of fluid buildup, so he decides to run an experiment by randomly assigning coronavirus patients who need a breathing tube to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After two months, the director will have all patients treated in whichever way turns out to have the highest survival rate.

Best Corticosteroid Drug

Background: Several corticosteroids (a family of anti-inflammatory drugs) have been approved by the U.S. Food and Drug Administration as safe and effective for treating a variety of diseases. There is some evidence that corticosteroids can also help certain coronavirus (Covid-19) patients, and many doctors prescribe corticosteroids for these patients. Doctor Jones works in a multi-doctor emergency department where patients see whichever doctor is available. Some doctors in the emergency department prescribe corticosteroid A for coronavirus symptoms, while others prescribe corticosteroid B. Both corticosteroids are affordable and patients can tolerate their side effects.

Situation 1

Doctor Jones wants to provide good treatment to his patients, so he decides that his coronavirus patients who need medication will be prescribed corticosteroid A.

Situation 2

Doctor Jones wants to provide good treatment to his patients, so he decides that his coronavirus patients who need medication will be prescribed corticosteroid B.

Situation 3

Doctor Jones thinks of two different ways to provide good treatment to his coronavirus patients, so he decides to run an experiment by randomly assigning his patients who need medication to one of two test conditions. Half of coronavirus patients will be prescribed corticosteroid A, and the other half will be prescribed corticosteroid B. After two months, he will only prescribe to new coronavirus patients whichever corticosteroid has had the best outcomes for his patients.

Ventilator Proning

Background: Some coronavirus (Covid-19) patients have to be sedated and placed on a ventilator to help them breathe. Even with a ventilator, these patients can have dangerously low blood oxygenation levels, which can result in death. Current standards suggest that laying ventilated patients on their stomach for 12-16 hours per day can reduce pressure on the lungs and might increase blood oxygen levels and improve survival rates.

Situation 1

A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 12-13 hours per day.

Situation 2

A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 15-16 hours per day.

Situation 3

A hospital director thinks of two different ways to save as many ventilated Covid-19 patients as possible, so he decides to run an experiment by randomly assigning ventilated Covid-19 patients to one of two test conditions. Half of these patients will be placed on their stomach for 12-13 hours per day. The other half of these patients will be placed on their stomach for 15-16 hours per day. After one month, the director will have all ventilated Covid-19 patients treated in whichever way turns out to have the highest survival rate.

Best Vaccine (ambiguous version; results not reported in main analyses)

Background: Imagine that several vaccines have been approved by the U.S. Food and Drug Administration as safe and effective for preventing Covid-19. Vaccine A uses mRNA molecules to provide the cells with a blueprint for how to destroy the virus. Vaccine B uses deactivated or weakened coronavirus to help the body create an immune resistance to the disease. Both vaccines are affordable, similarly priced, and people can tolerate their side effects. However, people can only receive one of these two vaccines.

Situation 1

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine A for free. People can get any other vaccine somewhere else, if they want.

Situation 2

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine B for free. People can get any other vaccine somewhere else, if they want.

Situation 3

The director of public health for a state thinks of two different ways to reduce Covid-19 cases, so he decides to run an experiment by randomly assigning clinics in the state to one of two test conditions. Half of the clinics will offer Vaccine A for free, and the other half will offer Vaccine B for free. People can get any other vaccine somewhere else, if they want.[5] After six months, he will direct the state to offer whichever vaccine has resulted in the fewest cases of Covid-19.

Best Vaccine

Background: Imagine that several vaccines have been approved by the U.S. Food and Drug Administration as safe and effective for preventing Covid-19. Vaccine A uses mRNA molecules to provide the cells with a blueprint for how to destroy the virus. Vaccine B uses deactivated or weakened coronavirus to help the body create an immune resistance to the disease. Both vaccines are affordable, similarly priced, and people can tolerate their side effects.

Situation 1

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine A for free.

Situation 2

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine B for free.

Situation 3

The director of public health for a state thinks of two different ways to reduce Covid-19 cases, so he decides to run an experiment by randomly assigning clinics in the state to one of two test conditions. Half of the clinics will offer Vaccine A for free, and the other half will offer Vaccine B for free. After six months, he will direct the state to offer whichever vaccine has resulted in the fewest cases of Covid-19.

[5] This wording unintentionally implied that residents could choose their vaccine (by going elsewhere) if they did not wish to be subject to the official's decision (including policy implementation or A/B test); we suspect this had the effect of making the experiment condition less aversive, since people could effectively opt-out of it, and our goal in this research is to study pragmatic, real-world situations in which avoiding randomization is not a realistic option.

School Reopening

Background: This Fall, school districts must decide whether to reopen their doors to students, teachers, and staff despite the risks of spreading coronavirus (Covid-19). Many school and public health officials have decided to use a “hybrid model” of teaching that offers some of the benefits of face-to-face learning time while attempting to minimize the risks related to Covid-19.

Situation 1

A superintendent at a large school district wants to provide good education to his students while slowing the spread of Coronavirus. So, he decides that students will attend school according to an even-odd schedule. Students in even-numbered grades (e.g., 2nd grade, 4th grade, etc.) will attend school in the morning and learn remotely in the afternoons, while students in odd- numbered grades will attend school in the afternoon and learn remotely in the mornings.

Situation 2

A superintendent at a large school district wants to provide good education to his students while slowing the spread of Coronavirus. So, he decides that students will attend school according to an A-day/B-day schedule. Students in the A group will attend school in person on Monday, Tuesday, and Wednesday morning, and students in the B group will attend school in person on Wednesday afternoon, Thursday, and Friday. Students will learn remotely on the days they do not attend school.

Situation 3

A superintendent at a large school district thinks of two different ways to provide good education to his students while slowing the spread of Coronavirus. So, he decides to conduct an experiment by randomly assigning schools in the district to one of two test conditions. For half of schools, students will attend school according to an even-odd schedule. Students in even-numbered grades (e.g., 2nd grade, 4th grade, etc.) will attend school in the morning and learn remotely in the afternoons, while students in odd-numbered grades will attend school in the afternoon and learn remotely in the mornings. For the other half of schools, students will attend school according to an A-day/B-day schedule. Students in the A group will attend school in person on Monday, Tuesday, and Wednesday morning, and students in the B group will attend school in person on Wednesday afternoon, Thursday, and Friday. Students will learn remotely on the days they do not attend school. At the end of the semester, all schools will adopt, for future semesters when the pandemic threat level remains similar, whichever policy has resulted in the best combination of test scores on state aptitude tests and number of Covid-19 cases.

Masking Rules

Background: Public health officials have considered different rules about when and where people must wear masks or other face coverings to reduce the spread of coronavirus (Covid-19).
Increasing mask use can reduce the spread of the disease, but highly restrictive mask policies can substantially reduce compliance rates.

Situation 1

A state health department director wants to reduce coronavirus spread within his state, so he decides that all counties will require masks in all businesses and public buildings.

Situation 2

A state health department director wants to reduce coronavirus spread within his state, so he decides that all counties will require masks in all businesses, public buildings, and outdoor public spaces.

Situation 3

A state health department director thinks of two different ways to reduce coronavirus spread within his state, so he decides to run an experiment by randomly assigning counties within the state to one of two test conditions. Half of counties will require masks in all businesses and public buildings. The other half of counties will require masks in all businesses, public buildings, and outdoor public spaces. After one month, the director will require all counties to adopt whichever policy has led to the fewest cases of Covid-19 for as long as the pandemic threat level remains high.

Results

Sample demographics

Lay participants

Across all vignettes reported in the main text (i.e., excluding the initial ambiguous version of the Best Vaccine vignette), there were a total of 2,909 lay participants. They ranged in age from 18 to 88 years old (mean = 38.4, SD = 12.8) and the majority were White (74.6%) and female (55.9%). 35.7% had a 4-year college degree, 29.7% had some college, and 20.5% had a graduate degree. 21.3% of participants had a degree in a STEM field. The most frequently selected income level was between $20,000 and $40,000 (20.7%). A majority of participants reported being moderate, leaning liberal, or being liberal both generally and specifically with regards to social and economic issues. Similarly, a majority of participants reported being independent, leaning Democrat, or being Democrat in their political party affiliations. 37.7% of participants reported being non-religious. Of those who reported being religious, the most reported religion was Protestant (24.2%). See Table S4 for demographic breakdowns by vignette and in the combined lay participant sample.

Table S4

Demographics of lay participants by vignette

	Catheterization Safety Checklist	Best Anti-Hypertensive Drug	Intubation Safety Checklist	Best Corticosteroid Drug	Best Vaccine (first attempt)	Best Vaccine	School Reopening	Ventilator Proning	Masking Rules	All vignettes
Total N	343	357	346	357	350	450	339	357	360	2909
Age [Mean (SD)]	37.9 (12.9)	38.6 (12.9)	37.9 (12.4)	38.0 (12.7)	36.7 (12.0)	37.7 (12.6)	38.7 (13.0)	38.4 (12.7)	39.0 (12.8)	38.4 (12.8)
Sex (%)										
Male	51.3%	41.5%	48.1%	51.5%	36.6%	38.4%	39.2%	40.9%	39.7%	43.6%
Female	47.8%	58.0%	51.9%	48.2%	63.1%	60.9%	60.5%	58.8%	60.0%	55.9%
Other	0.6%	0.6%	0.0%	0.0%	0.3%	0.4%	0.3%	0.3%	0.3%	0.2%
Prefer not to answer	0.3%	0.0%	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%
Race - select all that apply (%)										
Black/African-American	11.1%	5.0%	8.4%	10.1%	10.9%	11.3%	9.7%	6.7%	8.9%	9.0%
Hispanic or Latino	8.2%	8.4%	7.2%	8.4%	8.3%	5.6%	5.9%	9.5%	7.5%	7.5%
White	72.0%	78.7%	71.5%	72.0%	70.9%	72.7%	77.0%	77.6%	75.8%	74.6%
Asian	12.5%	8.7%	15.3%	12.6%	12.6%	13.3%	8.6%	7.0%	7.8%	10.8%
Other	1.2%	1.7%	1.2%	0.3%	3.4%	0.9%	1.8%	1.7%	2.2%	1.3%
Prefer not to answer	0.9%	0.6%	0.0%	0.6%	0.3%	0.9%	0.6%	0.3%	0.3%	0.5%
Education (%)										
Less than high school	0.6%	0.8%	0.3%	0.3%	0.6%	0.2%	0.3%	9.8%	0.8%	0.4%
High school degree	5.5%	7.8%	8.9%	9.2%	9.1%	10.2%	10.3%	29.4%	11.4%	9.2%
Some college	32.7%	32.2%	24.2%	28.0%	30.3%	32.0%	26.3%	33.6%	31.9%	29.7%
Four-year college degree	37.3%	35.6%	39.5%	35.9%	37.1%	35.8%	37.8%	3.1%	30.6%	35.7%
Some graduate school	4.4%	3.4%	4.6%	4.2%	4.6%	5.1%	4.4%	23.8%	4.7%	4.3%
Graduate degree	19.2%	19.9%	22.5%	22.1%	18.3%	16.2%	20.9%	0.3%	20.6%	20.5%
Prefer not to answer	0.3%	0.3%	0.0%	0.3%	0.0%	0.4%	0.0%	0.0%	0.0%	0.2%
Income (%)										
< $20,000	11.1%	8.4%	9.2%	7.6%	12.0%	9.3%	9.4%	11.2%	9.7%	9.5%
$20,000-$40,000	17.8%	22.1%	21.6%	25.8%	19.7%	20.2%	18.9%	19.0%	19.7%	20.7%
$40,000-$60,000	24.5%	18.8%	19.0%	20.2%	21.4%	20.4%	21.2%	19.9%	20.8%	20.6%
$60,000-$80,000	13.7%	17.4%	16.1%	17.9%	18.6%	17.8%	16.5%	19.3%	19.2%	17.3%
$80,000-$100,000	11.4%	13.7%	11.0%	9.5%	10.6%	12.2%	13.3%	8.4%	12.2%	11.5%
> $100,000	20.7%	18.5%	21.3%	17.4%	17.1%	18.7%	20.4%	19.6%	16.9%	19.1%
Prefer not to answer	0.9%	1.1%	0.9%	1.4%	0.3%	1.3%	0.3%	2.5%	1.4%	1.2%
No response	0.0%	0.0%	0.9%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%
Political Ideology (%)										
Very liberal	12.2%	12.6%	13.0%	11.2%	10.6%	13.1%	12.7%	12.0%	12.8%	12.5%
Liberal	32.1%	30.3%	32.3%	35.9%	29.4%	31.1%	30.4%	30.8%	28.6%	31.4%
Moderate	29.2%	25.5%	28.2%	26.1%	31.1%	27.3%	27.7%	24.9%	28.3%	27.1%
Conservative	19.8%	20.2%	20.7%	17.1%	21.7%	18.7%	20.9%	21.3%	23.6%	20.2%
Very conservative	5.8%	10.6%	5.2%	9.5%	6.3%	8.9%	7.4%	9.8%	5.8%	7.9%
Prefer not to answer	0.9%	0.6%	0.3%	0.3%	0.9%	0.9%	0.6%	0.8%	0.8%	0.7%
No response	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.1%

Table S4, continued

Demographics of lay participants by vignette

	Catheterization Safety Checklist	Best Anti-Hypertensive Drug	Intubation Safety Checklist	Best Corticosteroid Drug	Best Vaccine (first attempt)	Best Vaccine	School Reopening	Ventilator Proning	Masking Rules	All vignettes
Political ideology on social issues (%)										
Very liberal	18.7%	16.8%	19.6%	13.7%	17.7%	18.0%	17.7%	17.6%	17.5%	17.5%
Liberal	34.1%	33.3%	33.4%	40.3%	31.1%	30.4%	36.6%	34.2%	31.7%	34.1%
Moderate	21.6%	23.8%	23.9%	19.9%	26.0%	25.6%	19.8%	21.8%	23.3%	22.6%
Conservative	16.6%	15.4%	17.3%	17.1%	18.0%	16.0%	18.3%	16.0%	19.4%	17.0%
Very conservative	8.2%	10.4%	5.2%	8.4%	6.3%	9.1%	6.8%	9.8%	7.5%	8.2%
Prefer not to answer	0.9%	0.3%	0.6%	0.6%	0.9%	0.9%	0.6%	0.6%	0.6%	0.6%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
Political ideology on economic issues (%)										
Very liberal	9.9%	12.0%	13.5%	11.2%	8.0%	13.8%	11.8%	10.4%	11.9%	11.9%
Liberal	28.3%	21.6%	27.1%	28.3%	24.9%	23.3%	27.7%	23.0%	19.7%	24.8%
Moderate	28.0%	27.5%	25.1%	25.2%	27.7%	28.4%	24.2%	27.5%	32.2%	27.3%
Conservative	23.0%	24.9%	24.8%	22.1%	30.9%	22.0%	24.2%	25.8%	26.4%	24.1%
Very conservative	9.3%	13.7%	8.6%	12.0%	7.4%	11.3%	11.2%	12.9%	9.2%	11.1%
Prefer not to answer	1.5%	0.3%	0.9%	1.1%	1.1%	0.9%	0.6%	0.6%	0.6%	0.8%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.0%	0.0%	0.1%
Political party (%)										
Strong Democrat	14.9%	10.9%	12.4%	13.7%	12.0%	13.6%	13.0%	14.0%	12.8%	13.2%
Democrat	23.3%	22.7%	27.7%	28.9%	26.3%	24.4%	22.7%	21.0%	21.7%	24.1%
Independent (but lean Democrat)	15.7%	16.2%	14.7%	12.9%	13.4%	14.9%	17.4%	14.3%	15.8%	15.2%
Independent	15.7%	16.8%	17.6%	14.3%	16.9%	16.9%	13.6%	15.1%	18.1%	16.0%
Independent (but lean Republican)	7.0%	8.7%	7.8%	10.4%	9.4%	8.7%	10.6%	10.9%	10.6%	9.3%
Republican	16.3%	14.6%	14.1%	12.0%	13.1%	15.3%	15.6%	14.0%	13.9%	14.5%
Strong Republican	4.1%	8.4%	4.3%	7.3%	6.9%	4.9%	6.5%	9.0%	6.4%	6.3%
Prefer not to answer	2.9%	1.7%	1.4%	0.6%	2.0%	1.3%	0.3%	1.7%	0.8%	1.3%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
Religion (%)										
Christian - Protestant	26.2%	24.6%	23.6%	21.0%	24.6%	24.2%	25.4%	24.4%	23.9%	24.2%
Christian - Catholic	17.5%	16.5%	15.9%	18.2%	17.7%	14.0%	17.1%	18.8%	15.3%	16.6%
Christian - Other	11.1%	11.2%	8.1%	11.2%	11.7%	11.1%	11.8%	10.9%	12.2%	11.0%
Jewish	2.6%	1.7%	1.7%	1.7%	1.7%	1.3%	1.8%	1.4%	2.5%	1.8%
Muslim	2.0%	0.8%	1.4%	0.6%	0.3%	0.9%	1.2%	1.1%	1.7%	1.2%
Buddhist	2.3%	1.4%	2.0%	1.7%	1.1%	2.0%	2.4%	0.6%	1.4%	1.7%
Hindu	1.2%	0.6%	2.6%	1.1%	1.7%	1.6%	0.3%	2.6%	0.6%	1.1%
Non-religious	32.7%	38.1%	40.9%	40.3%	36.6%	40.0%	35.4%	35.0%	36.4%	37.7%
Other	3.5%	3.6%	2.6%	3.4%	3.7%	3.8%	4.1%	3.4%	4.2%	3.6%
Prefer not to answer	0.9%	1.4%	1.2%	0.6%	0.9%	1.1%	0.6%	1.7%	1.9%	1.2%
No response	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.3%	0.0%	0.1%
STEM degree (%)										
No	77.6%	77.0%	75.2%	76.8%	77.4%	80.7%	78.5%	78.4%	78.6%	77.9%
Yes	21.9%	22.1%	23.3%	22.4%	22.3%	18.7%	21.5%	20.2%	21.1%	21.3%
Prefer not to answer	0.6%	0.8%	1.4%	0.8%	0.0%	0.0%	0.0%	1.0%	0.0%	0.7%
No response	0.0%	0.0%	0.0%	0.0%	0.3%	0.7%	0.0%	0.3%	0.3%	0.1%

Clinicians

There were 2,149 clinician responses across all vignettes. In the clinician samples, survey responses were anonymous, so we could not restrict participation based on our previous studies so some participants who completed the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes may have also completed the Best Vaccine vignette. For this reason, demographics are reported separately by vignette in Table S5. Across vignettes, a majority of clinicians were female. Over 50% of participants in the sample were registered nurses, followed by physicians and physician assistants. Over 50% of participants in the sample reported that they had been in the medical field for over 10 years. The clinicians reported that they had received training in research methods and statistics via an average of 1.5 of the sources we listed, and that they engaged in an average of 2.5 research methods and statistics activities. Most clinicians reported being somewhat to moderately comfortable with research methods and statistics.

Table S5

Demographics of clinicians by vignette

	Intubation Safety Checklist	Best Corticosteroid Drug	Masking Rules	Best Vaccine
Total N	271	275	349	1254
Sex (%)				
Male	18.1%	22.5%	18.1%	18.7%
Female	81.9%	77.1%	81.4%	81.2%
Other	0.0%	0.4%	0.6%	0.2%
Source of research methods/statistics training - select all that apply (%)				
Undergraduate coursework	48.7%	49.5%	48.7%	47.4%
Professional school instruction	40.2%	31.3%	34.4%	34.4%
Postgraduate coursework	26.2%	20.7%	22.1%	21.1%
CME/CEU courses	27.7%	25.1%	24.1%	25.8%
Self-instruction via peer-reviewed literature	19.2%	15.6%	17.2%	21.3%
Other	7.0%	4.0%	3.2%	3.9%
Total number of research methods/statistics training [mean (SD)]	1.69 (1.22)	1.46 (1.02)	1.50 (1.13)	1.54 (1.16)
Comfort with research methods/statistics (%)				
Not at all	8.9%	12.7%	10.9%	11.1%
Somewhat	37.6%	44.4%	45.8%	46.6%
Moderately	39.5%	32.0%	32.7%	30.8%
Very	11.8%	9.1%	8.9%	9.9%
Extremely	2.2%	1.8%	1.7%	1.7%
Research methods/statistics activities - select all that apply (%)				
Read results of RCT in peer-reviewed journal article	81.2%	75.3%	71.9%	71.2%
Changed typical prescription/recommendation after personally reading results of RCT in peer-reviewed journal article	41.0%	33.1%	33.0%	39.8%
Published scientific paper in peer-reviewed journal	13.3%	12.4%	9.7%	12.0%
Conducted or worked on a team conducting an RCT	18.5%	20.0%	19.2%	17.1%
Took a course/class in statistics, biostatistics, research methods	73.1%	69.8%	69.1%	68.5%
Analyzed data for statistical significance outside of course require	23.6%	21.8%	19.2%	21.1%
Used statistical software	12.2%	11.6%	11.5%	9.3%
Total number of research methods/statistics activities [mean (SD)]	2.63 (1.69)	2.44 (1.71)	2.34 (1.66)	2.39 (1.72)
Currently involved in research (%)	10.7%	9.1%	9.7%	9.6%
Position (%)				
Doctor	14.8%	14.5%	12.6%	15.7%
Physician Assistant	12.5%	6.9%	9.5%	7.7%
Nurse Practitioner	6.3%	2.5%	4.3%	4.7%
Nurse (RN)	51.3%	57.1%	55.6%	52.8%
Nurse (LPN)	6.3%	9.5%	8.0%	15.6%
Nurse (Other)	1.8%	1.1%	1.4%	0.6%
Genetic Counselor	0.0%	0.0%	0.0%	0.0%
Non-prescribing clinician or staff without clinical credential	0.0%	0.0%	0.0%	0.0%
Medical student	5.2%	5.5%	4.6%	0.1%
Faculty or Professor	0.4%	0.7%	0.3%	0.3%
Other	1.5%	2.2%	3.7%	2.6%
Years in medical field (%)				
< 1 year	2.6%	2.9%	3.2%	2.8%
1-2 years	6.3%	5.5%	6.0%	5.8%
3-5 years	15.1%	11.3%	12.6%	13.6%
6-10 years	16.6%	14.2%	15.8%	15.8%
> 10 years	59.4%	66.2%	62.5%	62.0%

Note. Reported here are the demographics of the clinicians who saw the Intubation Safety Checklist, Best Corticosteroid Drug, or Masking Rules vignette first (responses to the Best Vaccine vignette were collected at a different time). All clinicians who participated in this study completed all vignettes but in randomized order. In the main text, we only analyze responses to the first vignette, so we report demographics similarly here.

Results presented in main text

In Figures S1-3, we show all individual appropriateness ratings (1 = very inappropriate, 5 = very appropriate) for intervention A, intervention B, and the A/B test across all vignettes.

Figure S1

Lay Sentiments About pRCTs

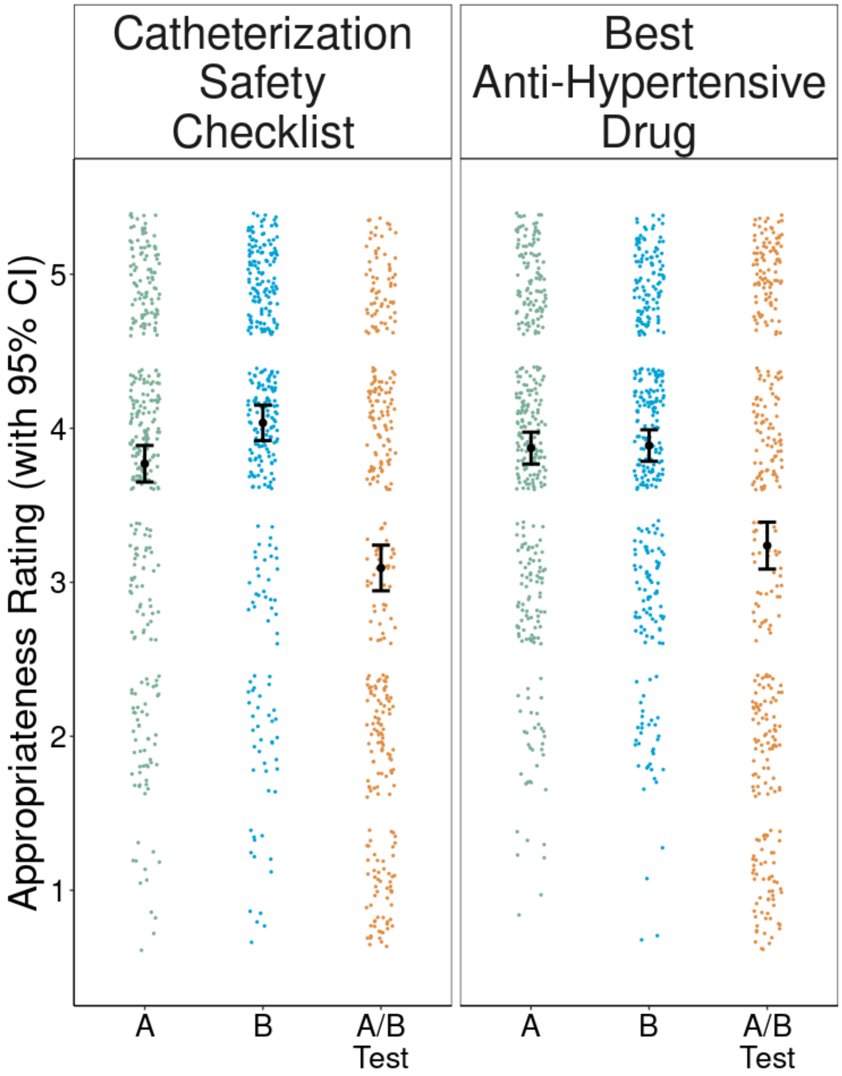


Figure S2

Lay Sentiments About Covid-19 pRCTs

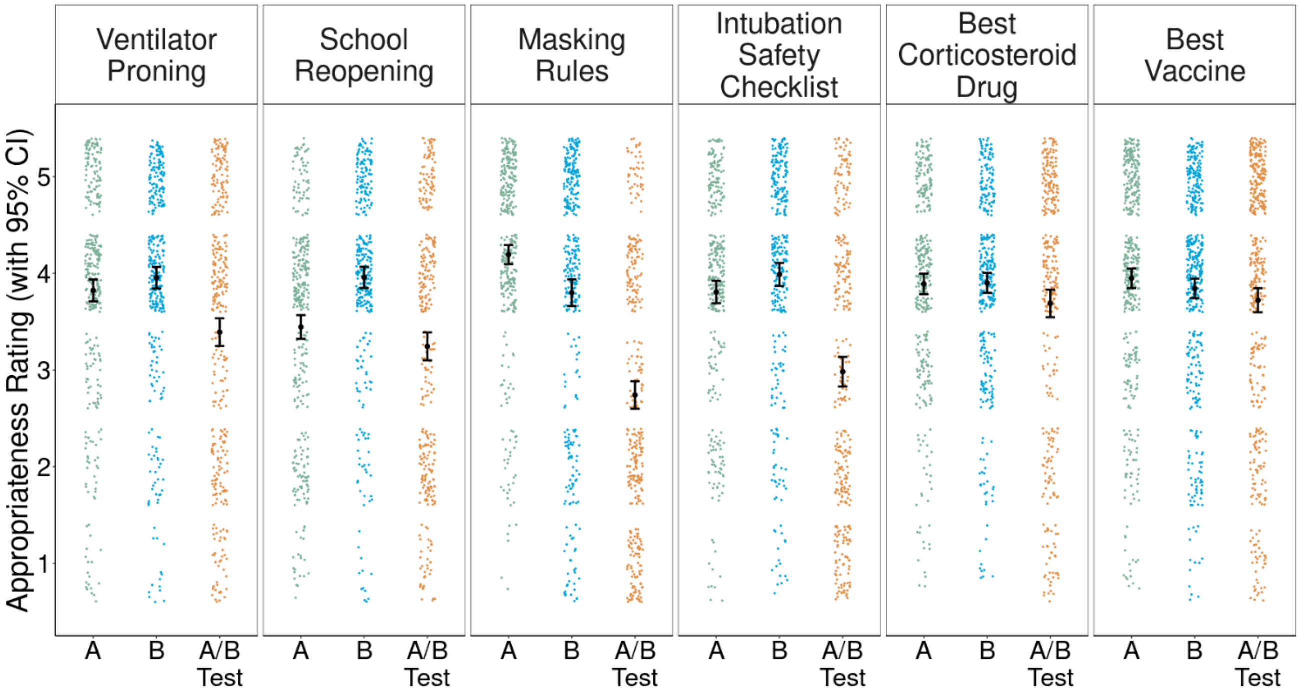
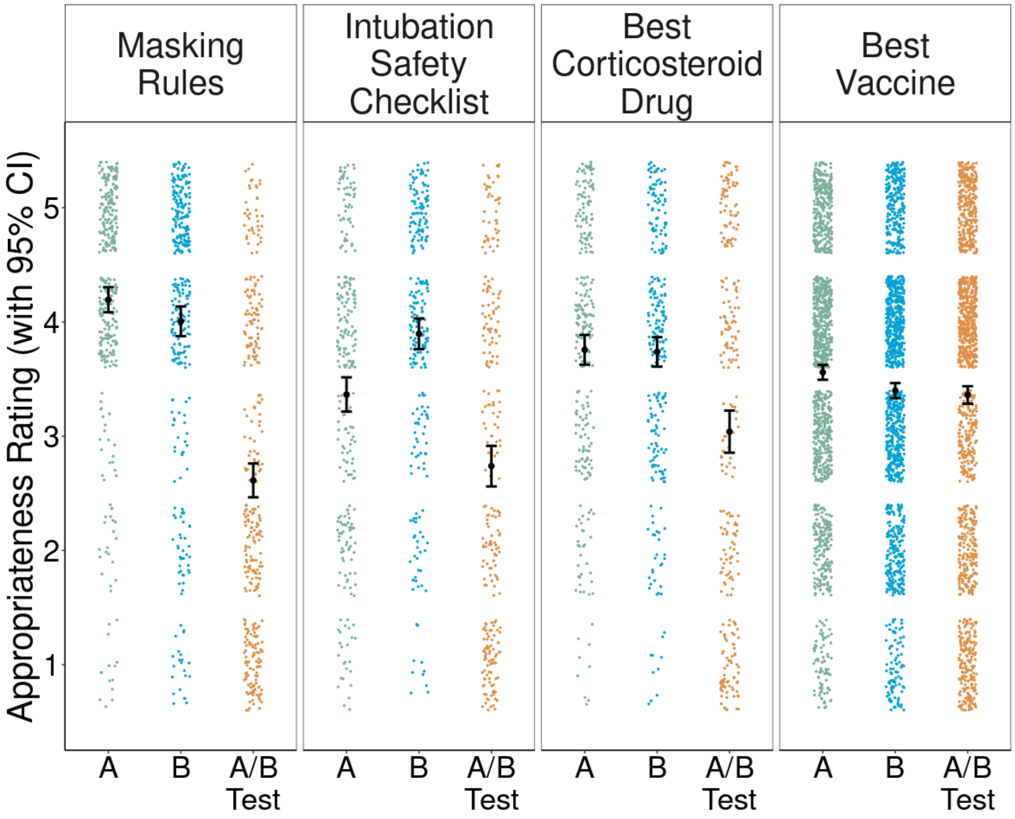


Figure S3

Clinician Sentiments About Covid-19 pRCTs



In Table S6A-C, we present the descriptive and inferential results for all vignettes discussed in the main text.

Table S6A

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Lay Sentiments About pRCTs						
					A/B Effect	*t* (342) = 9.74***, *d* = 0.69 ± .16
					Mean(A,B) > AB	58% ± 5%
	A	3.77 (1.12)	27%	32%	Reverse A/B effect	*t* (342) = -9.74***, *d* = -0.69 ± .16
Catheterization Safety Checklist (*n* = 343 laypeople)	B	4.03 (1.09)	42%	21%	AB > Mean(A,B)	27% ± 4%
	AB	3.09 (1.40)	32%	48%	Experiment Aversion	*t* (342) = 3.70***, *d* = 0.25 ± .14
	Mean(A,B)	3.90 (0.84)	-	-	Min(A,B) > AB	41% ± 5%
	Min(A,B)	3.42 (1.16)	-	-	Experiment Appreciation	*t* (342) = -14.61***, *d* = -1.13 ± .20
	Max(A,B)	4.39 (0.81)	-	-	AB > Max(A,B)	15% ± 3%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	28% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	3% ± 1%
					A/B Effect	*t* (356) = 6.68***, *d* = 0.52 ± .16
					Mean(A,B) > AB	47% ± 5%
	A	3.87 (1.00)	25%	27%	Reverse A/B effect	*t* (356) = -6.68***, *d* = -0.52 ± .16
Best Anti-Hypertensive Drug (*n* = 357 laypeople)	B	3.89 (0.99)	25%	28%	AB > Mean(A,B)	31% ± 5%
	AB	3.24 (1.47)	50%	45%	Experiment Aversion	*t* (356) = 5.96***, *d* = 0.46 ± .16
	Mean(A,B)	3.88 (0.95)	-	-	Min(A,B) > AB	44% ± 5%
	Min(A,B)	3.82 (1.03)	-	-	Experiment Appreciation	*t* (356) = -7.26***, *d* = -0.57 ± .17
	Max(A,B)	3.94 (0.95)	-	-	AB > Max(A,B)	29% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	34% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	18% ± 4%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

*p < .05

**p < .01

***p < .001

Table S6B

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					Inferential Results	
Vignette	Variable	Mean (SD)	% Ranking Best	% Ranking Worst	Test Description	Test Outcome
Lay Sentiments About Covid-19 pRCTs						
Intubation Safety Checklist (n = 346 laypeople)	A	3.81 (1.10)	29%	29%	A/B Effect Mean(A,B) > AB	t (345) = 10.69***, d = 0.75 ± .16 58% ± 5%
	B	3.99 (1.13)	43%	19%	Reverse A/B effect AB > Mean(A,B)	t (345) = -10.69***, d = -0.75 ± .16 25% ± 4%
	AB	2.98 (1.46)	29%	52%	Experiment Aversion Min(A,B) > AB	t (345) = 5.28***, d = 0.35 ± .14 45% ± 5%
	Mean(A,B)	3.90 (0.88)	-	-	Experiment Appreciation AB > Max(A,B)	t (345) = -14.94***, d = -1.14 ± .19 14% ± 3%
	Min(A,B)	3.46 (1.19)	-	-	Experiment Rejection (A,B = 3,4,5; AB = 1,2)	31% ± 5%
	Max(A,B)	4.34 (0.84)	-	-	Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	4% ± 2%
Best Corticosteroid Drug (n = 357 laypeople)	A	3.89 (1.03)	17%	32%	A/B Effect Mean(A,B) > AB	t (356) = 2.28*, d = 0.17 ± .15 34% ± 5%
	B	3.90 (1.00)	18%	37%	Reverse A/B effect AB > Mean(A,B)	t (356) = -2.28*, d = -0.17 ± .15 38% ± 5%
	AB	3.69 (1.37)	65%	31%	Experiment Aversion Min(A,B) > AB	t (356) = 1.55, p = .123, d = 0.12 ± .15 31% ± 5%
	Mean(A,B)	3.90 (0.99)	-	-	Experiment Appreciation AB > Max(A,B)	t (356) = -2.99**, d = -0.23 ± .15 35% ± 5%
	Min(A,B)	3.83 (1.04)	-	-	Experiment Rejection (A,B = 3,4,5; AB = 1,2)	22% ± 4%
	Max(A,B)	3.96 (0.98)	-	-	Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	17% ± 4%
Best Vaccine (n = 450 laypeople)	A	3.95 (1.09)	26%	27%	A/B Effect Mean(A,B) > AB	t (449) = 2.41*, d = 0.15 ± .12 34% ± 4%
	B	3.84 (1.09)	19%	39%	Reverse A/B effect AB > Mean(A,B)	t (449) = -2.41*, d = -0.15 ± .12 36% ± 4%
	AB	3.72 (1.34)	55%	34%	Experiment Aversion Min(A,B) > AB	t (449) = 0.61, p = .546, d = 0.04 ± .12 29% ± 4%
	Mean(A,B)	3.90 (1.03)	-	-	Experiment Appreciation AB > Max(A,B)	t (449) = -4.06***, d = -0.25 ± .12 32% ± 4%
	Min(A.B)	3.77 (1.13)	-	-	Experiment Rejection (A,B = 3,4,5; AB = 1,2)	17% ± 3%
	Max(A,B)	4.03 (1.04)	-	-	Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	13% ± 3%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

*p < .05

**p < .01

Table S6B, continued

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Lay Sentiments About Covid-19 pRCTs						
					A/B Effect	*t* (338) = 6.42***, *d* = 0.39 ± .12
					Mean(A,B) > AB	46% ± 5%
	A	3.45 (1.15)	17%	46%	Reverse A/B effect	*t* (338) = -6.42***, *d* = -0.39 ± .12
	B	3.96 (1.03)	53%	14%	AB > Mean(A,B)	28% ± 5%
School	AB	3.24 (1.36)	30%	40%	Experiment Aversion	*t* (338) = 0.47, *p* = .638, *d* = 0.03 ± .12
Reopening	Mean(A,B)	3.70 (0.90)	-	-	Min(A,B) > AB	28% ± 5%
(*n* = 339	Min(A,B)	3.28 (1.15)	-	-	Experiment Appreciation	*t* (338) = -11.25***, *d* = -0.75 ± .15
laypeople)	Max(A,B)	4.12 (0.91)	-	-	AB > Max(A,B)	15% ± 3%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	19% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	4% ± 2%
					A/B Effect	*t* (356) = 6.07***, *d* = 0.42 ± .14
					Mean(A,B) > AB	45% ± 5%
	A	3.82 (1.09)	21%	33%	Reverse A/B effect	*t* (356) = -6.07***, *d* = -0.42 ± .14
	B	3.96 (1.07)	36%	25%	AB > Mean(A,B)	31% ± 5%
Ventilator	AB	3.39 (1.38)	43%	42%	Experiment Aversion	*t* (356) = 2.63**, *d* = 0.17 ± .13
Proning	Mean(A,B)	3.89 (0.96)	-	-	Min(A,B) > AB	36% ± 5%
(*n* = 357	Min(A,B)	3.61 (1.11)	-	-	Experiment Appreciation	*t* (356) = -8.927***, *d* = -0.64 ± .16
laypeople)	Max(A,B)	4.17 (0.99)	-	-	AB > Max(A,B)	22% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	23% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	6% ± 2%
					A/B Effect	*t* (359) = 14.55***, *d* = 1.07 ± .18
					Mean(A,B) > AB	68% ± 5%
	A	4.19 (0.95)	44%	14%	Reverse A/B effect	*t* (359) = -14.55***, *d* = -1.07 ± .18
	B	3.80 (1.34)	38%	27%	AB > Mean(A,B)	21% ± 4%
Masking	AB	2.74 (1.38)	18%	59%	Experiment Aversion	*t* (359) = 7.63***, *d* = 0.56 ± .15
Rules	Mean(A,B)	4.00 (0.91)	-	-	Min(A,B) > AB	50% ± 5%
(*n* = 360	Min(A,B)	3.47 (1.22)	-	-	Experiment Appreciation	*t* (359) = -20.85***, *d* = -1.57 ± .22
laypeople)	Max(A,B)	4.53 (0.84)	-	-	AB > Max(A,B)	8% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	38% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	3% ± 1%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appriate" or less appropriate.

*p < .05

**p < .01

***p < .001

Table S6C

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Clinician Sentiments About Covid-19 pRCTs						
Intubation Safety Checklist (*n* = 271 clinicians)					A/B Effect	*t* (270) = 9.00***, *d* = 0.71 ± .17
					Mean(A,B) > AB	57% ± 6%
	A	3.37 (1.26)	19%	32%	Reverse A/B effect	*t* (270) = -9.00***, *d* = -0.71 ± .17
	B	3.90 (1.12)	53%	14%	AB > Mean(A,B)	23% ± 5%
	AB	2.74 (1.49)	28%	54%	Experiment Aversion	*t* (270) = 3.98***, *d* = 0.30 ± .15
	Mean(A,B)	3.63 (0.96)	-	-	Min(A,B) > AB	43% ± 6%
	Min(A.B)	3.14 (1.23)	-	-	Experiment Appreciation	*t* (270) =-12.70***, *d* = -1.08 ± .21
	Max(A,B)	4.12 (1.01)	-	-	AB > Max(A,B)	16% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	28% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	6% ± 2%
Best Corticosteroid Drug (*n* = 275 clinicians)					A/B Effect	*t* (274) = 6.59***, *d* = 0.52 ± .17
					Mean(A,B) > AB	48% ± 6%
	A	3.76 (1.10)	28%	28%	Reverse A/B effect	*t* (274) = -6.59***, *d* = -0.52 ± .17
	B	3.74 (1.09)	23%	26%	AB > Mean(A,B)	27% ± 5%
	AB	3.04 (1.56)	49%	46%	Experiment Aversion	*t* (274) = 6.18***, *d* = 0.49 ± .17
	Mean(A,B)	3.75 (1.08)	-	-	Min(A,B) > AB	46% ± 6%
	Min(A,B)	3.71 (1.11)	-	-	Experiment Appreciation	*t* (274) = -6.93***, *d* = -0.55 ± .17
	Max(A,B)	3.79 (1.08)	-	-	AB > Max(A,B)	26% ± 5%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	34% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	15% ± 4%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

**p* < .05

***p* < .01

****p* < .001

Table S6C, continued

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					***Inferential Results***	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Clinician Sentiments About Covid-19 pRCTs						
					A/B Effect	*t* (348) = 16.50***, *d* = 1.27 ± .20
					Mean(A,B) > AB	72% ± 5%
	A	4.19 (1.05)	39%	15%	Reverse A/B effect	*t* (348) = -16.50***, *d* = -1.27 ± .20
	B	4.01 (1.24)	44%	22%	AB > Mean(A,B)	16% ± 3%
Masking	AB	2.61 (1.41)	17%	62%	Experiment Aversion	*t* (348) = 9.72***, *d* = 0.74 ± .17
Rules	Mean(A,B)	4.10 (0.88)	-	-	Min(A,B) > AB	57% ± 5%
(*n* = 349	Min(A,B)	3.58 (1.20)	-	-	Experiment Appreciation	*t* (348) = -22.58***, *d* = -1.74 ± .24
clinicians)	Max(A,B)	4.62 (0.82)	-	-	AB > Max(A,B)	6% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	43% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	2% ± 1%
					A/B Effect	*t* (1253) = 2.50*, *d* = 0.10 ± .07
					Mean(A,B) > AB	35% ± 3%
	A	3.56 (1.17)	27%	28%	Reverse A/B effect	*t* (1253) = -2.50*, *d* = -0.10 ± .07
	B	3.40 (1.18)	17%	39%	AB > Mean(A,B)	34% ± 3%
Best	AB	3.36 (1.38)	56%	33%	Experiment Aversion	*t* (1253) = -0.89, *p* = .375, *d* = -0.03 ± .07
Vaccine	Mean(A,B)	3.48 (1.09)	-	-	Min(A,B) > AB	29% ± 2%
(*n* = 1254	Min(A,B)	3.32 (1.18)	-	-	Experiment Appreciation	*t* (1253) = -5.49***, *d* = -0.22 ± .08
clinicians)	Max(A,B)	3.64 (1.16)	-	-	AB > Max(A,B)	30% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	20% ± 2%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	20% ± 2%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

**p* < .05

***p* < .01

****p* < .001

Comparisons to previously published work

To compare these results to our previous findings reporting sentiments about experiments, as we do in the main text, please refer to Heck et al. (2020) [4]. For example, in the Results section "Lay Sentiments About pRCTs," we say, "these levels of experiment aversion near the height of the pandemic were slightly (but not significantly) higher than those we observed among similar laypeople in 2019 (41% ± 5% in 2020 vs. 37% ± 6% in 2019 for Catheterization Safety Checklist, p = .31 ; 44% ± 5% in 2020 vs. 40% ± 6% in 2019 for Best Anti-Hypertensive Drug, p = .32)." We extracted the percentage of participants who were experiment averse in 2019 from Heck et al. (2020) [4]. We then performed a two-sample z-test for proportions to compare the 2019 and 2020 proportions. As noted in the main text, we did not find a significant difference between the percentage of people who were experiment averse in 2019 and the percentage of people who were experiment averse in the current studies which took place in 2020 and 2021 (Catheterization Safety Checklist: $\chi^2(1) = 1.034$, p = .309, Anti- Hypertensive Drug: $\chi^2(1) = 0.998$, p = .318).

Results not presented in the main text

Results of Best Vaccine vignette (initial ambiguous version)

The only vignette which showed no A/B Effect was the initial ambiguous version of Best Vaccine (see Table S6D). The two versions of Best Vaccine both presented a public health official's decision to either distribute an mRNA-based vaccine to every county in their state, distribute an inactivated-virus vaccine to every county, or run an experiment in which counties are randomized to receive one of the two vaccine types. However, in version 1, the wording unintentionally implied that residents could choose their vaccine (by going elsewhere) if they did not wish to be subject to the official's decision (including intervention implementation or A/B test), while in version 2 we eliminated this possible interpretation; we suspect this had the effect of making the experiment condition in version 1 less aversive, since people could effectively opt- out of it, and our goal in this research is to study pragmatic, real-world situations in which avoiding randomization is typically not a realistic option.

Table S6D

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
					A/B Effect	*t* (349) = -0.72, *p* = .473, *d* = -0.05 ± .15
					Mean(A,B) > AB	33% ± 5%
Best Vaccine (initial ambiguous version; *n* = 350 laypeople)	A	3.58 (1.08)	21%	29%	Reverse A/B effect	*t* (349) = 0.72, *p* = .473, *d* = 0.05 ± .15
	B	3.47 (1.10)	21%	40%	AB > Mean(A,B)	45% ± 5%
	AB	3.59 (1.37)	58%	31%	Experiment Aversion	*t* (349) = -2.28*, *d* = -0.17 ± .15
	Mean(A,B)	3.53 (1.02)	-	-	Min(A,B) > AB	29% ± 5%
	Min(A,B)	3.38 (1.11)	-	-	Experiment Appreciation	*t* (349) = -0.84, *p* = .399, *d* = -0.07 ± .15
	Max(A,B)	3.67 (1.05)	-	-	AB > Max(A,B)	40% ± 5%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	21% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	24% ± 4%

Order effect in clinician study

For the clinician study of the Catheterization Safety Checklist, Best Anti-Hypertensive Drug, and Masking Rules vignettes, participants were randomly assigned to one of these three vignettes and then completed the remaining two vignettes in random order. For consistency with the rest of this project and with our previous approach (Meyer et al., 2019) [3], we analyze data from this study as a between-subjects design where we only consider the first vignette that every participant completed.

While conducting an interim analysis on the data for this study, we observed an intriguing and unexpected order effect of presentation.

For the first 601 complete responses we received, we observed an effect of presentation order on participants' appropriateness ratings of the A/B test condition within the Best Anti-Hypertensive Drug vignette. Participants who received the Best Anti-Hypertensive Drug vignette first rated the A/B test an average of 2.95 (SD = 1.57), participants who received this vignette second rated the A/B test an average of 3.48 (SD = 1.39), and participants who received this vignette last rated the A/B test an average of 3.78 (SD = 1.41). This suggests that participants who read about other policies and A/B tests before considering the Best Anti-Hypertensive Drug vignette found the A/B test in the Best Anti-Hypertensive Drug vignette to be less objectionable than participants who received this vignette earlier in the survey. The relationship between presentation order (1, 2, or 3) and appropriateness rating of the A/B test was *r* = .23. This order effect did not emerge for the other two vignettes or for ratings of either intervention (A or B).

After observing this order effect but before examining any additional data, we preregistered this order effect with the goal of replicating it in an independent sample. 294 new participants completed the study after this interim analysis, and we analyzed the data from this sample independently from the sample that generated the order effect. Table S7 displays ratings of the A/B condition within each scenario grouped by the order in which participants received them.

The order effect observed with the Best Anti-Hypertensive Drug A/B test condition replicated (r = .15), as did the absence of any similar order effect for the other conditions.

Table S7

Ratings of A/B test in Clinician Sample

Exploratory Sample (N = 601)	**Best Corticosteroid Drug A/B Rating (SD)**	**Intubation Safety Checklist A/B Rating (SD)**	**Masking Rules A/B Rating (SD)**
Target Scenario First	2.95 (1.57)	2.79 (1.49)	2.63 (1.43)
Target Scenario Second	3.48 (1.39)	2.53 (1.35)	2.66 (1.44)
Target Scenario Last	3.78 (1.41)	2.78 (1.38)	2.57 (1.29)

Confirmatory Sample (N=294)	**Best Corticosteroid Drug A/B Rating (SD)**	**Intubation Safety Checklist A/B Rating (SD)**	**Masking Rules A/B Rating (SD)**
Target Scenario First	3.22 (1.54)	2.63 (1.50)	2.58 (1.38)
Target Scenario Second	3.49 (1.51)	2.76 (1.39)	2.38 (1.42)
Target Scenario Last	3.77 (1.33)	2.69 (1.15)	2.51 (1.38)

Heterogeneity in experiment aversion

In both the lay participant sample and the clinician sample, associations between demographic variables, including educational attainment, having a degree in a STEM field, years of experience in the medical field, and role in the healthcare system, and sentiment about pRCTs (e.g., A/B effect, experiment aversion, experiment appreciation) are consistently small (r < |.13|, therefore explaining less than 2% of the variance; Tables S8–11).

In the lay sample, women show larger AB and experiment aversion effects (e.g., larger difference between mean intervention rating/lowest-rated intervention rating and AB test rating; r = .067–.068, p < .001) and a smaller experiment appreciation effect (e.g., smaller difference between AB test and highest-rated intervention rating; r = –.064, p < .001). Lay participants who are more conservative (in general and with respect to social and economic issues) or more likely to be strong Republicans show lower levels of an AB effect and experiment aversion (i.e., smaller difference between mean intervention rating/lowest-rated intervention rating and AB test rating; all rs < –.094, ps < .0001). These participants also show significantly more experiment appreciation, though the strength of the association is weaker (rs = .037–.046, p < .0001).
Finally, we find that people who are non-religious show a larger degree of experiment aversion (r = .061, p < .001; they also show a larger AB effect, r = .051, but p = .007 which is greater than p < .005, the standard proposed in Benjamin et al. (2018)[17] for exploratory analyses without a priori hypotheses). For all other variables, we find no significant associations between the individual difference measures and experiment sentiments (all rs < |.051|, all ps > .005).

In the clinician sample, the strongest association was between self-reported comfort with research methods and statistics and experiment aversion—clinicians who report being more comfortable with research methods and statistics are more likely to appreciate the A/B test (r = .070, p = .001).

Table S8

Correlations between lay participant characteristics and sentiments about experiments

	Size of A/B effect		A/B effect		Size of experiment aversion		Experiment aversion		Experiment rejection		Size of experiment appreciation		Experiment appreciation		Experiment endorsement	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Age	-0.008	0.662	-0.020	0.286	-0.020	0.270	-0.038	0.043	-0.046	0.012	-0.004	0.809	-0.016	0.389	-0.033	0.073
Sex (1 = male, 2 = female)	0.068	<.001	0.048	0.010	0.067	<.001	0.039	0.035	0.059	0.002	-0.064	<.001	-0.071	<.001	-0.036	0.053
Race (0 = all other, 1 = Nonhispanic White)	-0.004	0.814	-0.017	0.360	-0.001	0.945	-0.016	0.388	0.003	0.867	0.007	0.706	0.001	0.937	-0.012	0.533
Education	0.047	0.011	0.033	0.075	0.049	0.008	0.051	0.006	0.029	0.114	-0.042	0.024	-0.023	0.216	-0.019	0.298
Income	0.020	0.293	0.005	0.787	0.020	0.273	0.011	0.571	0.005	0.777	-0.017	0.353	-0.025	0.184	-0.026	0.158
Political Ideology (1 = Very Liberal, 5 = Very Conservative)	-0.114	< .0001	-0.087	< .0001	-0.118	< .0001	-0.101	< .0001	-0.091	< .0001	0.101	< .0001	0.043	0.022	0.045	0.015
Political Ideology (Social) (1 = Very Liberal, 5 = Very Conservative)	-0.123	< .0001	-0.099	< .0001	-0.128	< .0001	-0.118	< .0001	-0.106	< .0001	0.109	< .0001	0.039	0.036	0.052	0.005
Political Ideology (Economic) (1 = Very Liberal, 5 = Very Conservative)	-0.094	< .0001	-0.065	<.001	-0.095	< .0001	-0.082	< .0001	-0.073	< .0001	0.085	< .0001	0.046	0.013	0.040	0.031
Political Party (1 = Strong Democrat, 7 = Strong Republican)	-0.096	< .0001	-0.073	< .0001	-0.098	< .0001	-0.075	< .0001	-0.075	< .0001	0.087	< .0001	0.037	0.050	0.035	0.063
Conservatism (mean of z-scored Political Ideology, Political Ideology (Social), Political Ideology (Economic), and Political Party)	-0.117	<.0001	-0.089	< .0001	-0.121	< .0001	-0.103	< .0001	-0.095	< .0001	0.105	< .0001	0.045	0.015	0.047	0.012
Non-religious (0 = Religious (any religion), 1 = non-religious)	0.051	0.007	0.027	0.150	0.061	<.001	0.049	0.009	0.046	0.015	-0.036	0.053	-0.013	0.496	-0.021	0.266
STEM degree (0 = no, 1 = yes)	0.023	0.208	0.016	0.399	0.027	0.154	0.026	0.157	0.027	0.142	-0.019	0.318	0.016	0.403	0.024	0.205

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S9

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Sex											
Male	0.479	1.620	45.6	0.183	1.650	35.7	23.2	-0.775	1.730	25.0	9.8
Female	0.703	1.630	50.4	0.408	1.680	39.5	28.4	-0.998	1.710	19.1	7.8
Other	0.571	1.880	28.6	0.429	1.810	28.6	28.6	-0.714	1.980	28.6	0.0
Prefer not to answer	0.900	1.880	60.0	0.800	1.920	40.0	20.0	-1.000	1.870	20.0	0.0
Race											
Black/African-American	0.504	1.597	49.8	0.149	1.647	37.2	21.8	-0.858	1.681	21.5	9.6
Hispanic or Latino	0.692	1.646	50.2	0.429	1.675	38.8	28.8	-0.954	1.726	20.1	7.8
White	0.601	1.631	47.7	0.309	1.671	37.2	26.2	-0.893	1.724	21.7	8.4
Asian	0.594	1.634	47.1	0.296	1.645	39.2	26.1	-0.892	1.757	23.2	10.5
Other	0.679	1.730	48.7	0.256	1.831	38.5	23.1	-1.103	1.818	25.6	5.1
Prefer not to answer	1.200	1.623	60.0	0.933	1.624	40.0	33.3	-1.467	1.767	13.3	6.7
Education											
Less than high school	1.580	1.440	75.0	1.330	1.610	58.3	41.7	-1.830	1.400	0.0	0.0
High school degree	0.403	1.550	42.2	0.093	1.650	30.6	22.0	-0.713	1.610	20.9	9.0
Some college	0.524	1.690	47.5	0.216	1.720	36.3	25.2	-0.831	1.790	24.2	10.2
Four-year college degree	0.643	1.620	48.7	0.361	1.650	38.4	26.7	-0.925	1.710	21.4	8.0
Some graduate school	0.673	1.600	50.0	0.379	1.640	37.9	28.2	-0.968	1.700	20.2	6.5
Graduate degree	0.713	1.590	50.6	0.419	1.620	41.7	27.8	-1.010	1.690	19.8	8.2
Prefer not to answer	0.750	1.720	50.0	0.667	1.750	33.3	16.7	-0.833	1.720	16.7	0.0
Income											
< $20,000	0.672	1.570	47.8	0.380	1.650	37.7	26.8	-0.964	1.640	17.4	6.9
$20,000-$40,000	0.480	1.700	46.6	0.215	1.730	37.1	25.0	-0.745	1.790	21.8	10.8
$40,000-$60,000	0.592	1.630	49.4	0.220	1.670	36.9	25.4	-0.930	1.750	20.5	8.9
$60,000-$80,000	0.629	1.620	49.5	0.376	1.640	38.0	27.4	-0.883	1.710	20.9	10.5
$80,000-$100,000	0.741	1.520	50.0	0.488	1.530	41.3	27.2	-0.994	1.640	18.9	6.0
> $100,000	0.608	1.620	47.2	0.302	1.680	37.5	25.7	-0.914	1.700	21.0	7.4
Prefer not to answer	0.861	1.940	47.2	0.556	2.080	38.9	36.1	-1.170	1.930	19.4	2.8
No response	-0.250	0.866	25.0	-0.500	1.000	0.0	0.0	0.000	0.816	25.0	0.0

Table S9, continued

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Political Ideology											
Very liberal	0.888	1.740	54.3	0.590	1.780	44.1	31.1	-1.190	1.830	19.8	6.1
Liberal	0.753	1.650	51.6	0.491	1.680	42.3	29.8	-1.010	1.740	20.2	8.2
Moderate	0.557	1.570	47.5	0.247	1.600	36.2	25.4	-0.867	1.670	21.1	8.1
Conservative	0.380	1.600	43.8	0.058	1.650	33.1	21.4	-0.703	1.700	25.0	11.2
Very conservative	0.307	1.520	39.0	0.026	1.570	27.7	18.6	-0.589	1.500	24.2	9.5
Prefer not to answer	0.684	1.680	57.9	0.263	1.560	31.6	21.1	-1.110	1.940	21.1	15.8
No response	0.625	0.750	50.0	0.250	0.957	50.0	50.0	-1.000	0.816	0.0	0.0
Political Ideology (Social)											
Very liberal	0.927	1.720	55.7	0.628	1.760	46.3	33.3	-1.230	1.810	19.1	5.5
Liberal	0.714	1.610	51.2	0.445	1.640	41.1	28.5	-0.983	1.710	20.9	8.2
Moderate	0.498	1.600	45.2	0.205	1.660	35.2	25.0	-0.791	1.680	22.1	9.4
Conservative	0.321	1.590	42.5	-0.016	1.630	30.6	19.8	-0.658	1.710	25.1	12.1
Very conservative	0.362	1.500	40.6	0.059	1.550	28.9	18.8	-0.665	1.590	22.6	8.0
Prefer not to answer	0.528	1.540	55.6	0.222	1.560	33.3	11.1	-0.833	1.650	16.7	11.1
No response	-1.000	NA	0.0	-2.000	NA	0.0	0.0	0.000	NA	0.0	0.0
Political Ideology (Economic)											
Very liberal	0.795	1.760	49.4	0.514	1.770	40.5	28.6	-1.080	1.870	19.9	6.7
Liberal	0.800	1.630	53.8	0.512	1.670	43.7	31.5	-1.090	1.730	18.9	7.8
Moderate	0.594	1.600	48.2	0.307	1.650	38.0	25.5	-0.882	1.670	21.4	8.4
Conservative	0.401	1.580	44.2	0.076	1.620	33.5	22.4	-0.726	1.710	25.5	10.4
Very conservative	0.435	1.600	42.9	0.165	1.650	30.7	21.7	-0.705	1.660	22.7	9.6
Prefer not to answer	0.783	1.540	65.2	0.435	1.530	39.1	21.7	-1.130	1.660	13.0	8.7
No response	-1.000	0.000	0.0	-1.500	0.707	0.0	0.0	0.500	0.707	50.0	0.0
Political Party											
Strong Democrat	0.869	1.710	54.6	0.582	1.720	43.9	28.7	-1.160	1.820	19.6	7.6
Democrat	0.701	1.630	50.7	0.411	1.690	39.7	29.9	-0.990	1.700	19.9	6.7
Independent (but lean Democrat)	0.755	1.620	51.9	0.470	1.640	42.0	29.6	-1.040	1.730	21.0	8.6
Independent	0.468	1.590	43.7	0.173	1.630	34.0	23.3	-0.762	1.670	22.1	9.2
Independent (but lean Republican)	0.437	1.720	42.4	0.144	1.730	33.9	24.7	-0.731	1.830	28.8	14.8
Republican	0.387	1.550	44.8	0.076	1.610	33.4	20.9	-0.699	1.640	22.5	8.8
Strong Republican	0.432	1.500	44.0	0.130	1.570	32.6	20.7	-0.734	1.580	21.7	7.6
Prefer not to answer	0.615	1.580	56.4	0.282	1.490	41.0	23.1	-0.949	1.790	20.5	10.3
No response	-1.000	NA	0.0	-2.000	NA	0.0	0.0	0.000	NA	0.0	0.0

Table S9, continued

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Religion											
Christian - Protestant	0.515	1.620	45.9	0.212	1.680	34.9	24.3	-0.818	1.700	22.5	10.0
Christian - Catholic	0.483	1.510	46.7	0.176	1.550	34.4	21.6	-0.790	1.610	20.7	6.4
Christian - Other	0.589	1.650	48.3	0.298	1.690	37.3	25.4	-0.881	1.740	22.9	9.7
Jewish	0.868	1.720	54.7	0.453	1.840	43.4	32.1	-1.280	1.770	13.2	7.6
Muslim	0.357	1.700	45.7	-0.057	1.800	28.6	20.0	-0.771	1.780	31.4	17.1
Buddhist	0.840	1.690	54.0	0.520	1.570	48.0	32.0	-1.160	1.940	24.0	14.0
Hindu	-0.129	1.550	38.7	-0.452	1.570	29.0	16.1	-0.194	1.620	35.5	19.4
Non-religious	0.704	1.650	49.9	0.435	1.680	40.7	28.5	-0.973	1.750	21.1	8.0
Other	0.673	1.780	49.0	0.337	1.810	40.4	31.7	-1.010	1.880	22.1	8.7
Prefer not to answer	1.090	1.570	58.8	0.794	1.650	41.2	38.2	-1.380	1.600	11.8	0.0
No response	1.250	1.770	50.0	1.000	1.410	50.0	50.0	-1.500	2.120	0.0	0.0
STEM degree											
No	0.587	1.620	47.9	0.289	1.650	37.2	25.6	-0.885	1.720	21.3	8.4
Yes	0.680	1.680	49.8	0.397	1.740	40.3	28.5	-0.963	1.750	22.9	10.0
Prefer not to answer	0.400	1.510	40.0	0.200	1.510	30.0	15.0	-0.600	1.570	25.0	0.0
No response	0.250	1.060	50.0	-0.500	0.707	0.0	0.0	-1.000	1.410	0.0	0.0

Note. If there is an NA in the SD column, that indicates that there was only 1 respondent in that group so there is no variability in responses to report.
Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S10

Correlations between clinician characteristics and sentiments about experiments

	Size of A/B effect		A/B effect		Size of experiment aversion		Experiment aversion		Experiment rejection		Size of experiment appreciation		Experiment appreciation		Experiment endorsement	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Sex (1 = male, 2 = female)	0.016	0.453	0.016	0.457	0.000	0.991	-0.011	0.619	-0.021	0.326	-0.030	0.165	-0.026	0.226	-0.032	0.134
Number of research methods/statistics training units	-0.005	0.812	0.000	0.992	0.000	0.999	0.016	0.471	0.017	0.428	0.010	0.659	0.019	0.382	0.010	0.643
Comfort with research methods/statistics	-0.036	0.100	-0.018	0.410	-0.039	0.071	-0.021	0.335	-0.016	0.446	0.030	0.165	0.070	0.001	0.045	0.035
Number of research methods/statistics activities	-0.019	0.375	-0.022	0.301	-0.006	0.796	0.006	0.778	0.020	0.360	0.031	0.157	0.041	0.056	0.023	0.279
Currently involved in research	-0.002	0.912	-0.012	0.570	-0.009	0.691	-0.016	0.470	-0.022	0.309	-0.004	0.870	-0.024	0.267	0.009	0.693
Position (0 = non-prescriber, 1 = prescriber)	0.033	0.121	0.029	0.176	0.040	0.061	0.042	0.050	0.052	0.016	-0.025	0.250	-0.020	0.347	-0.021	0.338
Years in medicine	0.016	0.452	-0.004	0.865	0.011	0.599	-0.007	0.734	0.006	0.792	-0.020	0.362	0.029	0.185	-0.003	0.879

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S11

Means and percentages of sentiments about experiments by demographic variable in clinician sample

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Sex											
Male	0.456	1.800	43.9	0.270	1.800	38.5	28.2	-0.642	1.890	26.5	17.2
Female	0.529	1.750	45.9	0.271	1.750	37.2	25.8	-0.786	1.890	23.6	14.2
Other	0.000	1.870	40.0	0.000	1.870	40.0	20.0	0.000	1.870	20.0	20.0
Source of research methods/statistics training											
Undergraduate coursework	0.483	1.755	44.2	0.258	1.753	37.7	26.5	-0.707	1.870	25.0	14.1
Professional school instruction	0.571	1.767	46.0	0.314	1.756	38.2	27.1	-0.828	1.916	22.8	14.7
Postgraduate coursework	0.624	1.818	49.4	0.402	1.809	41.5	29.4	-0.847	1.936	24.5	14.5
CME/CEU courses	0.463	1.788	47.1	0.217	1.767	38.6	26.6	-0.708	1.925	25.7	16.7
Self-instruction via peer-reviewed literature	0.333	1.820	41.2	0.097	1.798	32.9	23.2	-0.559	1.949	27.3	16.6
Other	0.722	1.902	46.7	0.478	1.915	41.1	32.2	-0.967	1.986	22.2	14.4
Comfort with research methods/statistics											
Not at all	0.682	1.760	45.8	0.432	1.780	37.7	26.3	-0.932	1.870	18.2	12.7
Somewhat	0.516	1.710	45.7	0.282	1.690	37.8	26.8	-0.750	1.840	22.5	14.0
Moderately	0.482	1.770	46.5	0.237	1.770	38.3	26.6	-0.727	1.880	26.8	15.1
Very	0.491	1.910	43.9	0.203	1.900	34.0	23.1	-0.778	2.070	29.2	17.9
Extremely	0.105	2.020	31.6	-0.079	2.050	28.9	23.7	-0.289	2.100	26.3	23.7
Research methods/statistics activities											
Read results of RCT in peer-reviewed journal article	0.521	1.772	45.5	0.284	1.762	38.0	27.2	-0.718	1.898	24.7	15.0
Changed typical prescription/recommendation after personally reading results of RCT in peer-reviewed journal article	0.430	1.813	43.3	0.217	1.814	36.8	26.3	-0.643	1.921	26.6	16.7
Published scientific paper in peer-reviewed journal	0.530	1.692	43.3	0.339	1.681	38.2	29.9	-0.720	1.802	22.8	13.4
Conducted or worked on a team conducting an RCT	0.371	1.745	42.9	0.114	1.725	35.1	20.9	-0.628	1.902	25.8	16.3
Took a course/class in statistics, biostatistics, research methods	0.505	1.775	45.0	0.277	1.770	37.8	27.3	-0.732	1.892	25.4	15.2
Analyzed data for statistical significance outside of course requirement	0.470	1.781	43.7	0.251	1.766	36.7	26.2	-0.690	1.912	26.2	15.4
Used statistical software	0.588	1.803	49.3	0.389	1.795	42.5	31.7	-0.787	1.915	26.7	14.9

Table S11, continued

Means and percentages of sentiments about experiments by demographic variable in clinician sample

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Currently involved in research											
Yes	0.526	1.740	47.4	0.316	1.720	39.7	29.2	-0.747	1.860	27.3	13.9
No	0.512	1.760	45.3	0.265	1.760	37.2	25.9	-0.759	1.890	23.8	14.9
Position											
Doctor	0.556	1.730	45.5	0.374	1.720	39.9	28.7	-0.738	1.840	23.1	13.7
Physician Assistant	0.757	1.780	53.0	0.508	1.780	44.3	34.4	-1.010	1.890	21.9	13.1
Nurse Practitioner	0.500	1.910	45.9	0.184	1.970	36.7	25.5	-0.816	2.030	23.5	14.3
Nurse (RN)	0.436	1.720	43.8	0.181	1.720	35.2	23.9	-0.620	1.850	25.3	15.1
Nurse (LPN)	0.410	1.790	42.1	0.150	1.760	33.5	22.6	-0.629	1.960	24.8	17.3
Nurse (Other)	1.180	1.910	65.0	0.800	1.910	55.0	35.0	-1.550	2.060	10.0	10.0
Genetic Counselor	---	---	---	---	---	---	---	---	---	---	---
Non-prescribing clinician or staff without clinical credential	---	---	---	---	---	---	---	---	---	---	---
Medical student	1.170	1.770	65.2	0.935	1.790	56.5	45.7	-1.410	1.830	15.2	8.7
Faculty or Professor	1.120	2.050	62.5	0.875	2.030	50.0	37.5	-1.380	2.200	25.0	12.5
Other	0.727	2.000	45.5	0.618	1.980	41.8	32.7	-0.836	2.060	25.5	16.4
Years in medical field											
< 1 year	0.582	1.540	47.5	0.377	1.540	39.3	32.8	-0.787	1.660	24.6	8.2
1-2 years	0.560	1.720	48.4	0.333	1.710	41.3	29.4	-0.786	1.840	23.8	14.3
3-5 years	0.392	1.570	44.8	0.140	1.570	36.0	21.3	-0.643	1.690	23.4	13.6
6-10 years	0.423	1.730	43.3	0.205	1.760	36.5	24.6	-0.641	1.830	26.4	15.1
> 10 years	0.555	1.820	45.9	0.303	1.810	37.5	27.1	-0.807	1.950	23.7	15.3

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

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Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	6-8
Objectives	3	State specific objectives, including any prespecified hypotheses	9
Methods			
Study design	4	Present key elements of study design early in the paper	9-14
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	9, 13-14
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	9, 13-14
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	13
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9-14
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	SM 3-4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	13
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	SM 7
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	N/A

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9, 13-14
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	SM 14-18, SM 28-35
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	14-18 SM 21-25
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	SM 26-35
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20-22
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20-22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	27

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at

http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Aversion to pragmatic randomized controlled trials: three survey experiments with clinicians and laypeople in the United States

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Aversion to pragmatic randomized controlled trials: three survey experiments with clinicians and laypeople in the United States

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Abstract

Objectives: Pragmatic randomized controlled trials (pRCTs) are essential for determining the real-world safety and effectiveness of healthcare interventions. However, both laypeople and clinicians often demonstrate experiment aversion: preferring to implement either of two interventions for everyone rather than comparing them to determine which is best. We studied whether clinician and layperson views of pRCTs for Covid-19 or other interventions became more positive early in the pandemic, which increased both the urgency and public discussion of pRCTs.

Design: Randomized survey experiments.

Setting: Geisinger, a network of hospitals and clinics in central and northeastern Pennsylvania, U.S.; Amazon Mechanical Turk, a research participant platform used to recruit online participants residing across the U.S. Data was collected between August 2020 and January 2021.

Participants: 2,149 clinicians (the types of people who conduct or make decisions about conducting pRCTs) and 2,909 laypeople (the types of people who are included in pRCTs as patients) in 2020 and 2021. The layperson sample ranges in age from 18 to 88 years old (mean = 38.4, SD = 12.8) and the majority were White (74.6%) and female (55.9%). The clinician sample was primarily female (80.8%), comprised doctors (14.9%), physician assistants (8.5%), registered nurses (53.6%), and other medical professionals, including other nurses, genetic counselors, and medical students (23%), and the majority of clinicians had more than 10 years of experience (62.3%).

Outcome measures: Participants read vignettes in which a hypothetical decision-maker who sought to improve health could choose to implement intervention A for all, implement intervention B for all, or experimentally compare A and B and implement the superior intervention. Participants rated and ranked the appropriateness of each decision. Experiment aversion was defined as the degree to which a participant rated the experiment below their lowest-rated intervention.

Results: In a mid-pandemic survey of laypeople, we found significant aversion to experiments involving catheterization checklists and hypertension drugs unrelated to the treatment of Covid-19 (Cohen's d = 0.25-0.46, $p < .001$). Similarly, among both laypeople and clinicians, we found significant aversion to most (comparing different checklist, proning, and mask protocols; Cohen's d = 0.17-0.56, $p < .001$) but not all non-pharmaceutical Covid-19 experiments (comparing school reopening protocols; Cohen's d = 0.03, p = .64). Interestingly, we found the lowest experiment aversion to pharmaceutical Covid-19 experiments (comparing new drugs and new vaccine protocols for treating the novel coronavirus; Cohen's d = 0.04-0.12, p = .12-.55). Across all vignettes and samples, 28% to 57% of participants expressed experiment aversion, whereas only 6% to 35% expressed experiment appreciation by rating the trial higher than the participant's highest-rated intervention.

Conclusions: Advancing evidence-based medicine through pRCTs will require anticipating and addressing experiment aversion among patients and healthcare professionals.

Study registration: https://osf.io/u945y/?view_only=a901fde13ddb423899074eb79964c6cd

Strengths and limitations of this study

- The decision-science approach used in this paper enables measurement of aversion towards pragmatic randomized controlled trials (pRCTs) in large and diverse samples of laypeople and clinicians.
- The size of the experiment aversion effect is measured in eight pRCT vignettes (in the layperson sample) and four pRCT vignettes (in the clinician sample) that describe a range of pRCTs from pharmaceutical medical interventions to non-pharmaceutical medical interventions to public health interventions, and specific to the Covid-19 pandemic as well as more general medical situations.
- The large sample sizes ensured sufficient statistical power to detect experiment aversion in each vignette and sample.
- The samples may not perfectly represent all healthcare professionals or members of the general public as they are convenience samples of clinicians at a specific teaching hospital system in the United States and laypeople on a specific online crowdworking platform.
- Participants expressed attitudes and judgments about the appropriateness of carrying out pRCTs or implementing policies, but were not in a position to make a real decision to execute the pRCTs or policies.

INTRODUCTION

Pragmatic randomized controlled trials (pRCTs) are crucial for understanding how to safely, effectively, and equitably prevent and treat disease and deliver healthcare. Randomized evaluation is the gold standard in medicine, largely because it permits one to infer that an intervention *caused* an outcome, such as reduction of symptoms or improvement in a biomarker. Randomized experiments have repeatedly upended conventional clinical wisdom and the results of observational studies [1,2] and are urgently needed to evaluate new technologies [3,4]. Compared to more explanatory trials, trials that are further towards the pragmatic end of the spectrum [5] evaluate effectiveness of the intervention in more real-world contexts. Such pragmatism is critical for ensuring that causal evidence from randomized evaluation speaks to the effects of interventions in the circumstances in which they would be implemented (or maintained).

Yet despite their importance to healthcare quality and safety, pRCTs often prove controversial—even when they compare interventions that are within the standard of care or are otherwise unobjectionable, and about which the relevant expert community is in equipoise. Several recently published pRCTs—including Surfactant, Positive Pressure, and Oxygenation Randomized Trial (SUPPORT) [6], Flexibility in Duty Hour Requirements for Surgical Trainees (FIRST) [7], and Individualized Comparative Effectiveness of Models Optimizing Patient Safety and Resident Education (iCOMPARE) [8]—have received considerable criticism from physician-scientists, ethicists, and regulators [9,10] and in the public square [11–14]. Although criticisms of pRCTs can be complex, nuanced, and sometimes valid, many appear to reflect a rejection of the very idea that a randomized experiment was conducted, as opposed to simply giving everyone one of the interventions that was trialed. Our research applies concepts and methods from the behavioral and decision sciences to systematically explore whether, when, and why people might genuinely object to running pRCTs in healthcare, public health, and other domains.

In prior studies—inspired by several “notorious pRCTs,” including technology industry “A/B tests” [15–17]—we confirmed that substantial shares of both laypeople and clinicians can be averse to randomized evaluation of efforts to improve health [18,19]. People rated a pRCT designed to compare the effectiveness of two interventions as less appropriate than the average appropriateness of implementing either one, untested, for everyone. We called this phenomenon the “A/B effect” [18]. In some cases, the lower average rating of an experiment could be driven not by dislike of experiments, per se, but by many raters’ belief that one of the experiment’s arms is inferior to the other [18–21]. Importantly, such beliefs are often based on intuition rather than evidence and have the potential to undermine evidence-based medicine. Yet this form of experiment rejection is not illogical, given the individual’s own beliefs. We also, however, documented a more peculiar (if no less dangerous) phenomenon of “experiment aversion,” which occurred when people rated the pRCT as significantly less appropriate than implementing *their own* least-preferred intervention contained within the trial. In this pattern of decision-making, in other words, people who perceive that one intervention is good and the other is less good prefer that everyone receive the less good (or even bad) intervention rather than half the people receiving the better one, and without comparing the two to determine whether one is really better than the other [19]. Such judgments could reflect a more general skepticism about or opposition to pRCTs, at least within specific domains of inquiry. For instance, people may be averse to the inequality or disparate treatment that is necessarily (temporarily) imposed by any RCT (pRCT or otherwise), the uncertainty signaled by agents (often trusted experts) who decide they do not already know what works and need to conduct a pRCT, the process of assigning people to treatments “randomly” as opposed to using expert judgment, or something else viewed as undesirable. Both patterns of negative sentiments about experiments can impede efforts to assure and improve health outcomes.

The Covid-19 pandemic presented the potential for an inflection point in attitudes towards pRCTs. In April 2020, 72 Covid-19 drug trials were already underway [22] and more traditional, explanatory RCTs became daily, front-page news. Because explanatory and pragmatic RCTs share many key features that participants in our prior research often cited as partial explanations for their lower ratings of experiments—including random assignment to different conditions [18]—that sustained exposure to explanatory RCTs might have educated people about the value of healthcare pRCTs, too, and/or made them seem less exceptional and more normative. Our previous research also suggests that another cause of experiment aversion is an illusion of knowledge—a (mis)perception that experts already must know what works best and should simply implement those interventions without further study. But Covid-19 was a novel disease, and—at least in the case of pharmaceutical interventions—no sensible person thought the correct treatments were already obvious. People therefore may have been less averse to Covid-19 pRCTs (e.g., trials comparing Covid-19 proning protocols or masking rules) than to pRCTs that test interventions for familiar conditions or problems, such as hypertension or hospital-acquired infections. On the other hand, because of the urgency attached to Covid-19, people may have been *more* averse to Covid-19 RCTs, being even less inclined to risk giving someone a treatment that might turn out to “lose” in a comparison study [23,24]. Finally, even if the pandemic did not affect public attitudes towards explanatory or pragmatic RCTs, it could have affected the attitudes of clinicians, many of whom were involved in Covid-19 research.

Because clinicians strongly influence whether particular RCTs are conducted (both explanatory and pragmatic), their attitudes matter. Here, we investigated attitudes towards pRCTs in the first year of the pandemic by conducting a series of preregistered studies conducted between August 2020 and February 2021.

METHODS

Study setting

The study was conducted online using the Qualtrics platform [25]. For the layperson sample, we used the CloudResearch service [26,27] to recruit adult crowd workers on Amazon Mechanical Turk [28] living in the U.S. to participate in a brief online survey. These services provide samples that are broadly representative of the U.S. population and are well-accepted in social science research as providing as good or better-quality, diverse samples of research participants than common convenience samples such as student volunteers, with results that are similar to probability sampling methods [29–31]. Clinicians of various levels in healthcare were recruited by email (following a procedure successfully used in several previous studies including [18]) from Geisinger, a network of hospitals and clinics in central and northeastern Pennsylvania, U.S. with a medical school and a research institute. Geisinger's IRB determined that these surveys were exempt (IRB# 2017-0449).

Study design

Data was collected between August 2020 and January 2021 (Table S1). First, we used decision-making vignettes from our previous work to ask whether the extraordinary publicity around (primarily explanatory) Covid-19 RCTs reduced general healthcare experiment aversion by the public. Next, we adapted these vignettes to determine whether the public was averse to pRCTs on pharmaceutical and/or non-pharmaceutical interventions (NPIs) for Covid-19. Finally, we recruited a large clinician sample to investigate how their attitudes compared to those of laypeople.

Participants were evenly randomized to read one of the vignettes. Randomization was accomplished using a proprietary least filled quota algorithm built into the Qualtrics survey software, such that aside from participants who withdrew before completing the survey, the same number of participants are allocated to each vignette (see Supplemental Materials for additional details). Each vignette described a problem that the decision-maker could address in one of three ways: by implementing intervention A for all patients or relevant members of the public (A); by implementing intervention B for all patients or relevant members of the public (B); or by conducting an experiment in which patients or relevant members of the public are randomly assigned to A or B and the superior intervention is then implemented for all (A/B). For example, in Best Anti-Hypertensive Drug, some doctors in a walk-in clinic prescribe “Drug A” while others prescribe “Drug B” (both of which are affordable, tolerable, and FDA approved), and “Dr. Jones” prescribes either A for all his hypertensive patients, B for all those patients, or runs a randomized experiment to compare the effectiveness of A and B (See Table 1 for two additional examples, Table S2 [Supplemental Materials] for all vignette names, and pp. 8-13 in the Supplemental Materials for all vignette text.) To develop the vignettes, we consulted the literature and our knowledge, as experts in bioethics and psychological science, of pRCTs that have historically proved controversial (see Table S3 in the Supplemental Materials for motivations for all vignettes). All vignettes describe an RCT that is highly pragmatic in nature (i.e., high on PRECIS-2 eligibility, recruitment, setting, organization, follow-up, and primary outcome domains [5]). For instance, all patients with the relevant condition who attend the clinic/hospital for care become members of the trial and the trial is situated within the clinic/hospital where their care would typically take place. (Similarly, in the public health scenarios, all students in the school district and all residents of the state where these trials occur are included in the trial.) In addition, our vignettes are silent about whether consent will be obtained. Trials that include only those who opt into them are less pragmatic if they are testing the effectiveness of an intervention that would be imposed on people as a matter of policy or practice. IRBs customarily waive consent when it would make low-risk pRCTs impracticable, including by rendering the results uninformative about how an intervention would fare in practice [32]. In separate work, we found that substantial shares of people object to such experiments even when we specify that consent will be obtained [33].

Next, following a standard decision-science approach commonly used in social and moral psychology for evaluating decisions [34], participants rated each option on a scale of appropriateness from 1 (“very inappropriate”) to 5 (“very appropriate”), with 3 as a neutral midpoint. Participants then rank-ordered the options from best to worst and provided demographic information.

Table 1. Vignette text for Catheterization Safety Checklist and Ventilator Proning

	Catheterization Safety Checklist	Ventilator Proning
Background	Some medical treatments require a doctor to insert a plastic tube into a large vein. These treatments can save lives, but they can also lead to deadly infections.	Some coronavirus (Covid-19) patients have to be sedated and placed on a ventilator to help them breathe. Even with a ventilator, these patients can have dangerously low blood oxygenation levels, which can result in death. Current standards suggest that laying ventilated patients on their stomach for 12-16 hours per day can reduce pressure on the lungs and might increase blood oxygen levels and improve survival rates.
Intervention A	A hospital director wants to reduce these infections, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All patients having this procedure will then be treated by doctors with this list attached to their clothing.	A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 12-13 hours per day.
Intervention B	A hospital director wants to reduce these infections, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All patients having this procedure will then be treated in rooms with this list posted on the wall.	A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 15-16 hours per day.
A/B test	A hospital director thinks of two different ways to reduce these infections, so he decides to run an experiment by randomly assigning patients to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After a year, the director will have all patients treated in whichever way turns out to have the highest survival rate.	A hospital director thinks of two different ways to save as many ventilated Covid-19 patients as possible, so he decides to run an experiment by randomly assigning ventilated Covid-19 patients to one of two test conditions. Half of these patients will be placed on their stomach for 12-13 hours per day. The other half of these patients will be placed on their stomach for 15-16 hours per day. After one month, the director will have all ventilated Covid-19 patients treated in whichever way turns out to have the highest survival rate.

Participants

Based on a power analysis, we determined that recruiting ~350 participants (laypeople and clinicians) per vignette (Catheterization Safety Checklist, Best Anti-Hypertensive Drug, Intubation Safety Checklist, Best Corticosteroid Drug, Masking Rules, School Reopening, and Ventilator Proning) would yield 95% power to detect an effect as small as Cohen's $d = 0.19$ at $\alpha = .05$. These sample sizes are consistent with our previous work using the same methods (but different vignettes, [19]).

For Best Vaccine, based on a prior study (see Supplemental Materials for full details), we hypothesized a smaller effect size, which resulted in a power analysis that determined that recruiting ~450 lay participants would yield 80% power to detect an effect as small as Cohen's $d = 0.13$ and 95% power to detect as small as Cohen's $d = 0.17$ (sample size consistent with [19]). For the clinician sample, we based our power analysis for Best Vaccine on the number of responses we collected in the first clinician survey testing the Masking Rules, Intubation Safety Checklist, and Best Corticosteroid vignettes. We assumed ~900 responses which we determined would yield 95% power to detect an effect as small as $d = 0.12$.

Across all vignettes, there were a total of 2,909 lay participants. They ranged in age from 18 to 88 with a mean age of 38 years old (SD = 12.8). The majority of participants were White (75%), female (56%), and college educated (30% having completed some college, 36% having earned a four-year degree, and 21% having earned a graduate degree; 21% of participants had a STEM degree) with a median household income of $40,000 to $60,000. The sample is more liberal (44%) and Democrat (38%) than conservative (28%) and Republican (21%) and a plurality of participants identified as non-religious (38%).

The clinician sample (N = 2,149) was comprised of doctors (15%), physician assistants (9%), nurse practitioners (5%), nurses (67%; RN: 54%; LPN: 12%, other: 1%), and other medical professionals (including genetic counselors and medical students; 4%). We determined the ratio of different types of clinicians from their self-reported position in the survey. We did not estimate in advance the proportion of certain types of clinicians who would respond. The majority of the clinicians were female (81%) and had been working in health care for more than 10 years (62%). A majority of clinicians reported being somewhat or moderately comfortable with research methods and statistics (77%) and had two sources of formal or informal training or education in research methods and statistics (e.g., undergraduate, professional school, or postgraduate coursework; 58%). (In these clinician samples, because survey responses were made fully anonymous to encourage greater participation and honest responding, we were unable to restrict participation in later waves to clinicians who had not participated in earlier waves. Therefore, some clinicians who completed the Best Vaccine vignette may have earlier completed the Masking Rules, Intubation Safety Checklist, and Best Corticosteroid Drug vignettes.) See Table S4-5 for detailed demographics of lay participants and clinicians by vignette.

Data analysis

We define the "A/B Effect" as the degree to which participants' ratings of the A/B test were lower than the average of their ratings of implementing A and B [18]. "Experiment aversion" is the degree to which participants rated the A/B test lower than their own lowest-rated intervention (either A or B for each person) [19]. "Experiment appreciation" is the opposite: the degree to which the experiment is rated higher than each participant's highest-rated intervention. For all measures, we performed paired t-tests at α = .05 and calculated Cohen's *d* recovered from the *t*-statistic, *n*, and correlation between the two measures being compared [35,36]. We also calculated the percentage of participants who ranked the A/B test as the worst (or best) option the decision-maker could implement as well as the percentage of participants who showed an A/B Effect, were experiment averse, or were experiment appreciative. We analyzed data using R version 4.3.0. Participant response data, preregistrations, materials, and analysis code have been deposited in Open Science Framework [37].

Patient and public involvement

We included laypeople as participants in our studies because they are typically included in pRCTs as patients or (in the case of some public health pRCTs and pRCTs in other domains) as members of the public and are therefore important stakeholders. Decisions about whether to participate in or conduct pRCTs are made against the backdrop of individuals' personal views and/or anticipation of potential backlash or other public reactions; therefore, how patients and clinicians feel about experiments is relevant to if and how advancements in healthcare are made. All participant responses were anonymous and, thus, results cannot be disseminated back to our participants.

RESULTS

In the following results, we group the vignettes by theme: those eliciting lay participants sentiments about pRCTs unrelated to the treatment of Covid-19, those eliciting lay participants sentiments about pRCTs related to the treatment, prevention of, or public health response to Covid-19, and those eliciting clinician sentiments about pRCTs related to the treatment, prevention of, or public health response to Covid-19.

Lay sentiments about pRCTs

To elicit lay sentiments about pRCTs, participants responded to one of two vignettes: Catheterization Safety Checklist (which described two locations where a hospital director could display a safety checklist for clinicians; see Table 1; *n* = 343) or Best Anti-Hypertensive Drug (which described two drugs a doctor could prescribe for his hypertensive patients; *n* = 357).

We found substantial negative reactions to A/B testing in both vignettes (Table 2A), replicating our pre-pandemic findings [18,19]. Although in most cases the mean rating of the A/B test was near the neutral midpoint, implementing policies was substantially preferred to A/B testing (Figure 1A) and large proportions of participants objected to the A/B test (Figure 1B). In Catheterization Safety Checklist (Figure 1A), we found evidence of the A/B Effect: participants rated the A/B test significantly below the average ratings they gave to implementing interventions A and B (*d* = 0.69, 95% CI: (0.53, 0.85); Table S6A). Here, 41% ± 5% (95% CI) of participants expressed experiment aversion (rating the A/B test lower than their own lowest-rated intervention; *d* = 0.25, 95% CI: (0.11, 0.39); Table S6A). When ranking the three options from best to worst, only 32% placed the A/B test first, while 48% placed it last (Table S6A).

We also observed an A/B Effect in Best Anti-Hypertensive Drug (Figure 1B); *d* = 0.52, 95% CI: (0.36, 0.68); Table S6A), where 44% ± 5% also expressed experiment aversion (*d* = 0.46, 95% CI: (0.30, 0.52); Table S6A). Notably, participants were averse to this experiment even though there is no reason to prefer "Drug A" to "Drug B," and patients are effectively already randomized to A or B based on which clinician happens to see them—which occurs wherever unwarranted variation in practice determines treatments, such as walk-in clinics and emergency departments. Here, however, similar proportions of people ranked the A/B test best and worst (50% vs. 45%; $p = 0.16$; Table S6A).

These levels of experiment aversion near the height of the pandemic were slightly (but not significantly) higher than those we observed among similar laypeople in 2019 (41% ± 5% in 2020 vs. 37% ± 6% in 2019 for Catheterization Safety Checklist, $p = 0.31$; 44% ± 5% in 2020 vs. 40% ± 6% in 2019 for Best Anti-Hypertensive Drug, $p = 0.32$) [19].

Table 2. Sentiments about experiments by vignette and population

	Negative sentiment				Positive sentiment			
	Experiment Aversion	A/B Effect	More people averse than appreciative?	More people rank AB test worst than best?	More people rank AB test best than worst?	More people appreciative than averse?	Reverse A/B Effect	Experiment Appreciation
(A) Lay Sentiments About pRCTs								
Catheterization Safety Checklist	✓	✓	✓	✓				
Best Anti-Hypertensive Drug	✓	✓	✓					
(B) Lay Sentiments About Covid-19 pRCTs								
Ventilator Proning	✓	✓	✓					
School Reopening		✓	✓	✓				
Masking Rules	✓	✓	✓	✓				
Intubation Safety Checklist	✓	✓	✓	✓				
Best Corticosteroid Drug		✓			✓			
Best Vaccine		✓			✓			
(C) Clinician Sentiments About Covid-19 pRCTs								
Masking Rules	✓	✓	✓	✓				
Intubation Safety Checklist	✓	✓	✓	✓				
Best Corticosteroid Drug	✓	✓	✓					
Best Vaccine		✓*			✓			

Notes. Experiment Aversion refers to the difference between the lowest-rated intervention and the rating of the A/B test. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. The Reverse A/B Effect refers to the difference between the rating of the A/B test and the average rating of the two interventions. Experiment Appreciation refers to the difference between the rating of the A/B test and the rating of the highest-rated intervention. See Table S6A-C in the Supplemental Materials for detailed results (including Cohen's ds and 95% CIs) for all measures of sentiment about experiments.

Checkmarks (✓) represent a statistically significant effect at p < .05. In one case, the checkmark is followed by an asterisk (*). This indicates that while the effect reaches statistical significance, the effect size is very small and might have only reached significance due to the large sample size (three times as large as that for other vignettes).

Variables to the right of the thick vertical line are the reverse of those on the left. If no checkmark appears in either of the corresponding columns to the left and right of the thick vertical line (e.g., "More people rank

A/B test worst than best?" and "More people rank A/B test best than worst?"), that means that there is no significant difference (e.g., there is no statistically significant difference between the proportion of people ranked that A/B test worst and the proportion of people who ranked the A/B test best).

Lay sentiments about Covid-19 pRCTs

To elicit lay sentiments about Covid-19 pRCTs, we asked lay participants to read one of the following vignettes: Masking Rules (which described two masking policies, of varying scope; *n* = 360); School Reopening (two school schedules designed to increase social distancing; *n* = 339); Best Vaccine (two types of vaccine—mRNA versus inactivated virus; *n* = 450); Ventilator Proning (two protocols for positioning ventilated Covid-19 patients; see Table 1; *n* = 357); Intubation Safety Checklist (adapted from above to apply to Covid-19; *n* = 347); and Best Corticosteroid Drug (adapted from above to apply to Covid-19; *n* = 357).

In all six Covid-19 vignettes, we found evidence of the A/B Effect (Table 2B, Figure 2A). In three, however, we did not find experiment aversion: Best Vaccine[1], Best Corticosteroid Drug, and School Reopening. In the first two of these, participants rated the two interventions very similarly and the experiment only slightly lower (Figure 2B). These vignettes also elicited the largest proportion of participants (65% in Best Vaccine and 56% in Best Corticosteroid Drug; Table S6B) in any vignette who ranked the A/B test best among the three options, compared to 31–34% of participants who ranked it worst (Table S6B). In School Reopening, experiment aversion was not observed because participants on average clearly preferred intervention B to A and rated the experiment similar to intervention A [20,21]. 53% of participants ranked intervention B as the best of the three options (compared to 17% choosing intervention A and 30% choosing the A/B test; Table S6B).

[1] See Table S6D for results from a previous version of Best Vaccine which unintentionally implied that vignette participants could choose their vaccine.

In the other three vignettes, participants rated the A/B test condition as significantly less appropriate than their lowest-rated intervention (Masking Rules: d = 0.56, 95% CI: (0.41, 0.71); Ventilator Proning: d = 0.17, 95% CI: (0.04, 0.30); Intubation Safety Checklist: d = 0.36, 95% CI: (0.21, 0.49)). These levels of aversion to Covid-19 RCTs are similar to the levels of aversion to non-Covid-19 RCTs both before [19] and during the pandemic (see above).

Clinician sentiments about Covid-19 pRCTs

Clinicians responded to one[2] of four Covid-19-related vignettes: Masking Rules (n = 349), Intubation Safety Checklist (n = 271), Best Corticosteroid Drug (n = 275), or Best Vaccine (n = 1254). We observed an A/B effect in all four vignettes (Figures 3A-B). In two, clinicians, like laypeople, were also significantly experiment averse (Masking Rules: d = 0.74, 95% CI: (0.57, 0.91; Table S6C); Intubation Safety Checklist: d = 0.30, 95% CI: (0.15, 0.45); Table S6C). In Best Vaccine, clinicians, like laypeople, did not show any significant difference in their ratings of the A/B test and their lowest-rated intervention (d = –0.03, 95% CI: (–0.10, 0.04); Table S6C). Again, like laypeople, 58% of clinicians ranked the vaccine A/B test as the best of the three options, the highest proportion of any clinician-rated vignette.

Clinicians differed from laypeople in their response to Best Corticosteroid Drug. Laypeople did not show experiment aversion, but clinicians rated the A/B test as significantly less appropriate than their lowest-rated intervention (d = 0.49, 95% CI: (0.32, 0.66); Table S6C). This difference may be due to clinicians' greater familiarity with the treatment of Covid-19.

[2] Clinicians in the first survey were randomly assigned to one of the three vignettes (Masking Rules, Intubation Safety Checklist, and Best Corticosteroid Drug) and then completed the remaining vignettes in random order. For consistency with the rest of this project and with our previous approach [18], we analyzed data from this survey as a between-subjects design where we only consider the first vignette that every participant completed. See Table S7 and pp. 27-28 in the Supplemental Materials for further discussion.

Clinicians may also have seen an urgent need for any drugs to treat Covid-19 [24] and thus rated adopting a clear treatment intervention as more appropriate than an RCT.

Heterogeneity in experiment aversion

Collapsed across studies, political ideology explained 1.5% of the variance ($p < .001$) in sentiments about experiments, with conservatives slightly less averse to experiments than liberals. Less or no variation was explained by all other demographics, including educational attainment (0.2%, $p = .008$), STEM degree (0.1%, $p = .15$), and prescribers versus other clinicians (0.2%, $p = .061$); see Tables S8-11 in the Supplemental Materials for further discussion.

DISCUSSION

In three preregistered survey experiments, we observed considerable experiment aversion among laypeople during the first year of the Covid-19 pandemic, despite increased exposure to the nature and purpose of (largely explanatory) RCTs. Neither laypeople nor clinicians were overall less averse to Covid-19 pRCTs, despite the fact that confidence in anyone's knowledge of what works should have been even more circumscribed than in the everyday contexts of hypertension and catheter infections. To the contrary, most Covid-19 vignettes were met with experiment aversion. This is consistent with an emphasis during the pandemic that we must "do" instead of "learn," a false dichotomy that fails to recognize that implementing an untested intervention is itself a nonconsensual experiment from which, unlike an RCT, little or nothing can be learned [38–40]. Participants may have been averse to the uncertainty that the decision to conduct an experiment conveys. They may have perceived the experiment as more risky than implementing either of the policies it contains. Or they may have experienced hindsight bias, believing that the experiment was unfair to whomever received the least effective policy, neglecting the fact that the results were not known in advance. For whatever reason, across all vignettes and samples, between 28% and 57% of participants demonstrated experiment aversion, while only 6%–35% demonstrated experiment appreciation (by rating the pRCT higher than their highest-rated intervention).

Although in most cases the mean rating of the A/B test was near the neutral midpoint, in none of our 12 studies were more people appreciative of than averse to the pRCT, in none was the average pRCT rating higher than the average intervention rating, and in none was the pRCT rating higher than each participant's highest-rated intervention, on average. Notably, unlike trials with placebo or no-contact controls, the A/B tests in our vignettes compared two active, plausible interventions, neither of which was obviously known ex ante to be superior. Yet substantial shares of participants still preferred that one intervention simply be implemented without bothering to determine which (if either) worked best.

The most positive sentiment towards experiments was observed in both laypeople and clinicians in the vignettes involving Covid-19 drugs and vaccines. Here we observed the highest proportions of participants who demonstrated experiment appreciation (31%–46%) and who ranked the pRCT first (49%–65%). This result could be explained by differences in the pRCT length (ranging from one to twelve months) and perceived severity of the pRCT outcome ("best outcome" and "fewest cases of Covid-19" in Best Corticosteroid and Best Vaccine, respectively vs., e.g., "highest survival rate" in Ventilator Proning). But this result is also consistent with our previous findings that the illusion of knowledge—here, the belief that either the participant herself or some expert already does or should know the right thing to do and should simply do it—biases people to prefer universal intervention implementation to pRCTs [18,19]. One possible solution is to teach patients that clinicians typically have many options for treating a condition, that often no one knows which option is best, and that a pRCT is the optimal way to figure that out. Similarly, highlighting unwarranted variation in practice during medical training may help reduce clinicians' negative sentiments towards experiments. Rightly or wrongly, both laypeople and clinicians might (a) appropriately recognize that near the start of a pandemic, no one knows which existing drugs, if any, are safe and effective in treating a novel disease, and that new vaccines need to be tested, yet (b) fail to sufficiently appreciate the level of uncertainty around NPIs like masking, proning, and social distancing, which can also benefit from rigorous evaluation. This is consistent with the dearth of RCTs (explanatory or pragmatic) of Covid-19 NPIs [41]: of the more than 4,000 Covid-19 trials registered worldwide as of August 2021, only 41 tested NPIs [42]. Explaining critical concepts like clinical equipoise or unwarranted variation in medical and NPI practice might diminish experiment aversion.

Limitations

While our lay participant samples were large, diverse, and demographically similar to the general U.S. population (see Table S4), they may not be perfectly representative of other populations. Similarly, Geisinger, the network of hospitals with which the clinicians were affiliated, may not be representative of all hospitals, specifically in their exposure to research and A/B tests such as those described in our vignettes. Geisinger is primarily comprised of teaching hospitals, and has a medical school, but is not associated with a university and, therefore, our results may not generalize either to clinicians who practice at large academic medical centers (e.g., Massachusetts General Hospital or Johns Hopkins Hospital) where RCTs are often conducted or, on the other hand, to clinicians who practice at small community hospitals that have little exposure to research. In addition, because the clinician sample was largely made up of individuals with only some research training and experience, these results may not generalize to clinicians who have extensive research training and experience and conduct RCTs (or pRCTs) themselves. Similarly, a large proportion of the clinician sample were nurses and thus the level of experiment aversion observed in these studies may not be representative of the views of physicians and advanced practitioners. Importantly, however, the support of nurses and non-investigator clinical and operational leaders is often needed to conduct a pRCT, and these groups do not always have substantial research experience. Moreover, in both samples, our primary goal was not to estimate the percentage of people in the relevant population who hold negative views of pRCTs, but rather to ascertain experimentally whether laypeople and clinicians display the patterns of negative sentiments about pRCTs that we have found previously [18,19], when confronted with vignettes during, or about, a novel situation (the Covid-19 pandemic). Thus, though the sample may not perfectly represent all healthcare professionals or members of the general public, the results demonstrate the repeated presence of negative sentiments, and a lack of positive sentiments, towards experiments across eight distinct situations among segments of populations whose opinions matter.

Furthermore, because experiment aversion and appreciation are likely socio-cultural phenomena, we should expect that the presence or size of the effects we report may differ among societies and over time [43]. However, contrary to recent claims [44], the similarity in aversion to experiments between laypeople and clinicians suggests that these results generalize across populations that differ in their level of knowledge of RCTs. In addition, our findings here and elsewhere [18,19] show that experiment aversion occurs in health and non-health scenarios and, within the health domain, in both clinical and public health scenarios, and regarding both pharmaceutical and non-pharmaceutical interventions.

Finally, as noted above, all vignettes discussed in this paper are silent about whether the consent of patients and/or clinicians would be obtained. Previous work that did not directly compare judgments about pRCTs versus treatment implementation suggests that when given the option, laypeople prefer to be asked for consent (e.g., for a study comparing the effectiveness of two marketed hypertension drugs, a scenario somewhat related to one of ours [45,46]). Additionally, other research has found neither experiment aversion nor appreciation (as we define it here and elsewhere [33]) after introducing a critical element of voluntariness by asking respondents how likely they would be to "choose to be treated" at a hospital that is conducting a pRCT [44]. In separate work, we found that when vignettes explicitly specify that prior consent is obtained, negative sentiment towards pRCTs is reduced—but not eliminated [33]. However, individual consent would undermine the external validity of pRCTs, and is anyhow rarely feasible in such settings [32,47,48], e.g., tests of policy interventions such as providing safety checklists and promulgating public health rules.

CONCLUSION

Critics rightly note that RCTs have limited external validity when they employ overly selective inclusion/exclusion criteria or are executed in ways that deviate from how interventions would be operationalized in diverse, real-world settings. However, the solution is not to abandon randomized evaluation, but to incorporate it into routine clinical care and healthcare delivery via pRCTs [1,48–50]. It has been many years since the U.S. Institute of Medicine urged research of many varieties to be embedded in care [51]. More recently, the UK Royal College of Physicians and National Institute for Health and Care Research issued a joint position statement similarly advocating the integration of research into care [52]. In addition, the U.S. Food and Drug Administration now promotes pRCTs to support post-marketing monitoring and other regulatory decision-making [53,54], a priority also highlighted in the UK Medicines and Healthcare products Regulatory Agency's 2021-2023 Delivery Plan [55] and guidance on RCTs [56]. Pragmatic RCTs have been fielded successfully and informed healthcare practice and policy [47,57,58], but they remain far from ubiquitous and they require buy-in to be successful, as shown by the case of a Norwegian school reopening trial during the pandemic that was abandoned due to lack of such support [59,60]. Broadening the use of pRCTs will require not only redoubling investment in interoperable electronic health records and recalibrating regulators' views of the comparative risks of research versus idiosyncratic practice variation [1], but also anticipating and addressing experiment aversion among patients and healthcare professionals. Better understanding experiment aversion and then discovering strategies to mitigate it will help grow the evidence base necessary for evidence-based decision-making and, ultimately, improved patient outcomes.

ETHICS APPROVAL

Geisinger's IRB determined that the study surveys were exempt from ethical approval, including any requirement of informed consent, under 45 C.F.R. § 46.104(2)(i) (IRB# 2017-0449). Nevertheless, prospective participants were invited to take a survey and told the broad topic, the estimated time it would take, and the compensation offered. Those who proceeded were deemed to have tacitly consented. Participants could quit the survey at any time.

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DATA AVAILABILITY STATEMENT

Participant response data, preregistrations, materials, and analysis code have been deposited in Open Science Framework (https://osf.io/6p5c7/?view_only=eaeb95cb754247028f1d1ed94414cbd2).

CONTRIBUTORS

P.R.H., P.H., C.F.C, and M.N.M. designed the studies and collected the data. P.R.H. and R.L.V. analyzed the data. R.L.V., R.M.M., C.F.C., and M.N.M. wrote the first draft of the manuscript. P.R.H. and P.H. provided critical revisions. R.L.V. and P.R.H. contributed equally to this work. M.N.M. and C.F.C. contributed equally to this work. M.N.M. and C.F.C. are responsible for the overall content as guarantors.

COMPETING INTERESTS

The authors are or were, at the time the research was conducted, affiliated with the same non-profit health system (Geisinger) from which the clinician sample was recruited.

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Figure captions

Figure 1. Lay sentiments about pRCTs

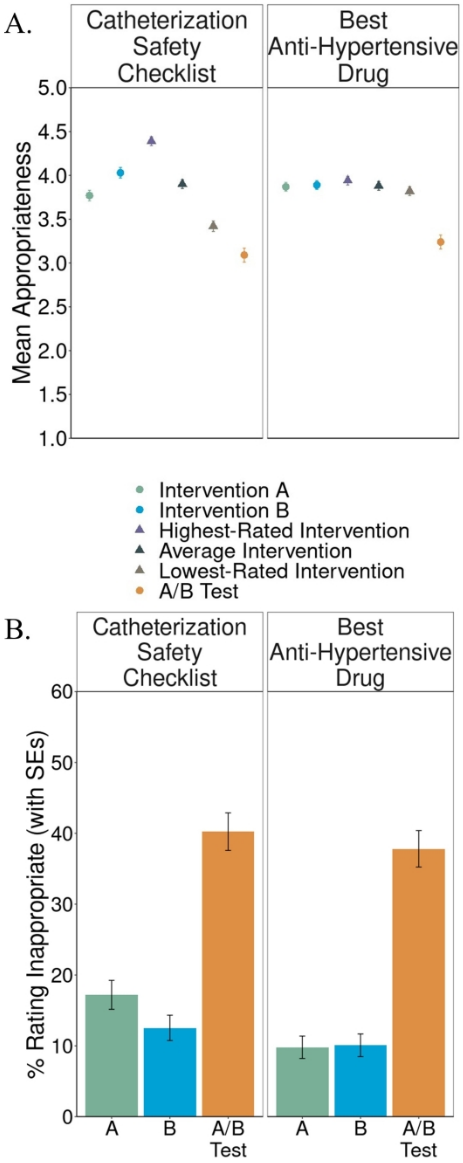
Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—"very inappropriate" or "somewhat inappropriate"— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

Figure 2. Lay sentiments about Covid-19 pRCTs

Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—“very inappropriate” or “somewhat inappropriate”— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

Figure 3. Clinician sentiments about Covid-19 pRCTs

Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—“very inappropriate” or “somewhat inappropriate”— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.



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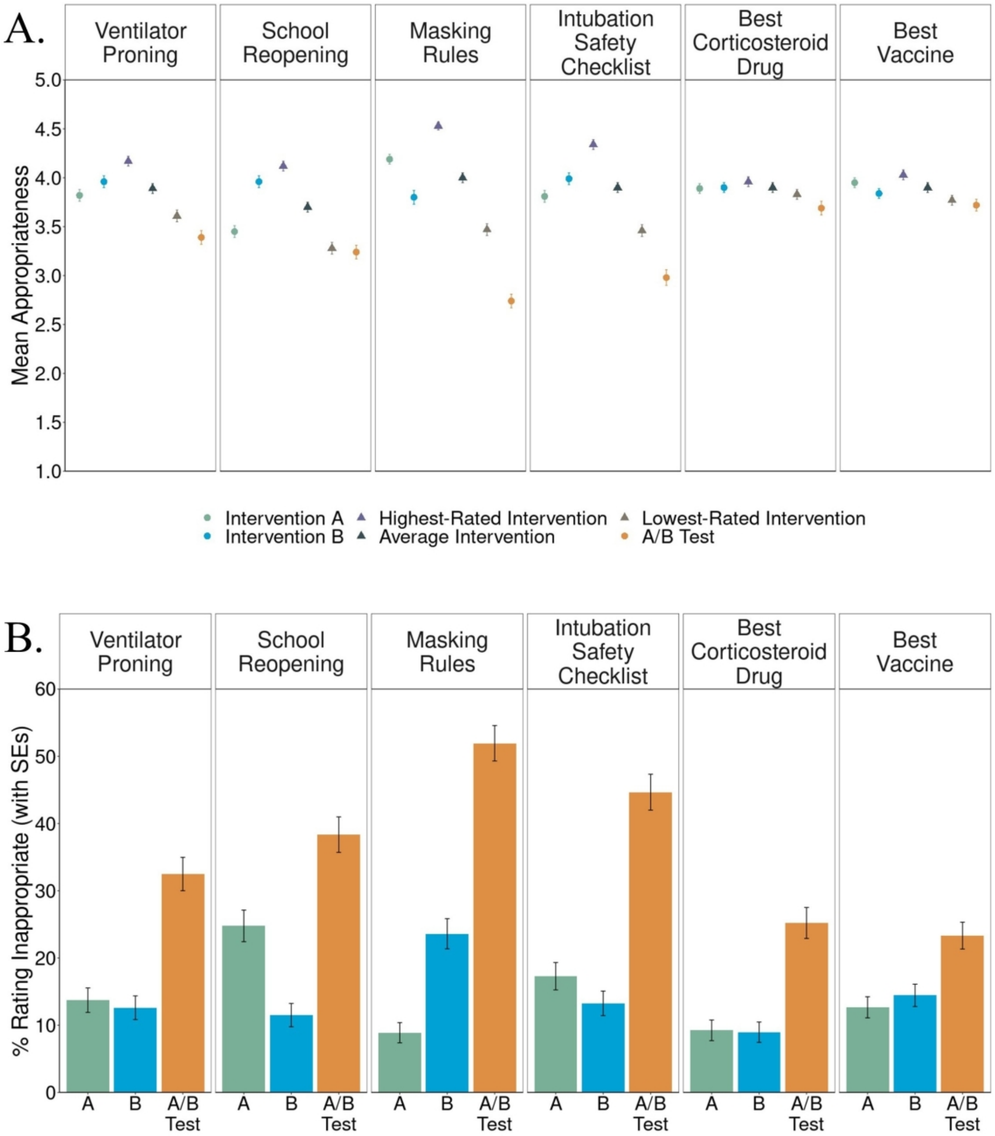

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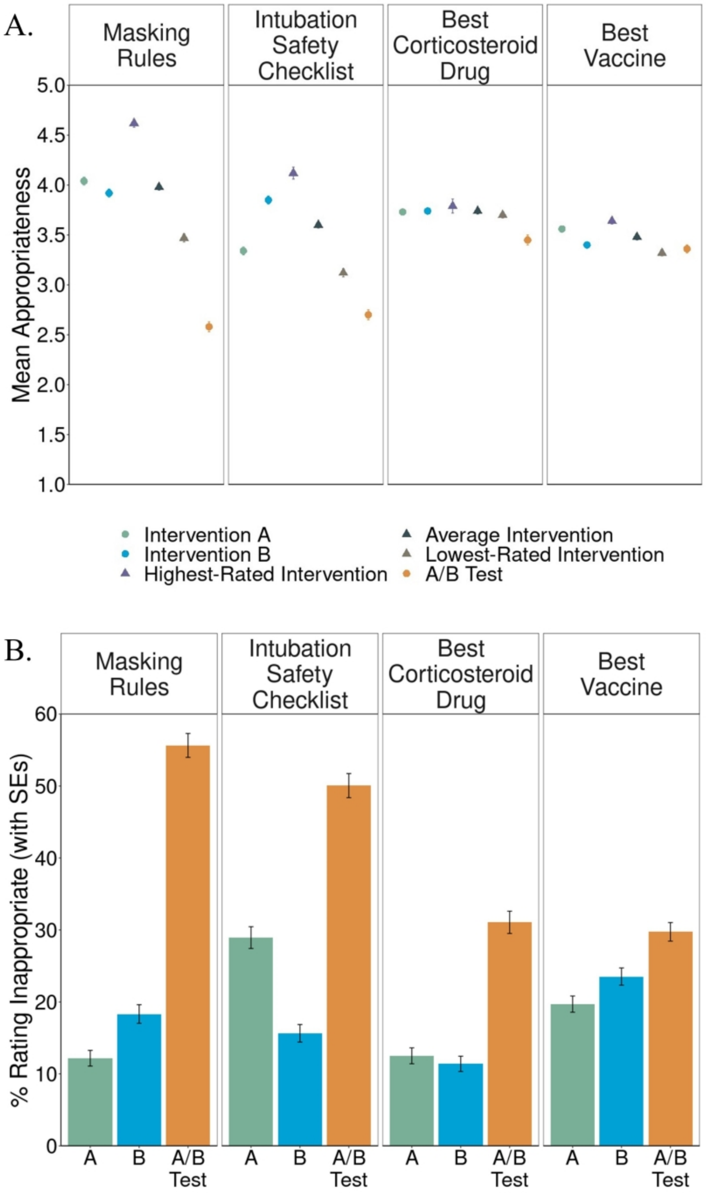


Notes. (A) Mean appropriateness ratings, on a 1–5 scale, with SEs, for intervention A, intervention B, the highest-rated intervention, the average intervention, the lowest-rated intervention, and the A/B test. Circles represent measures directly collected from participants. Triangles represent averages derived from the direct measures. The distance of the mean appropriateness of the lowest-rated intervention (brown triangle) minus the mean appropriateness of the A/B test (orange circle) represents experiment aversion. The distance of the mean appropriateness of the A/B test (orange circle) minus the mean appropriateness of the highest-rated intervention (purple triangle) represents experiment appreciation. (B) Appropriateness ratings transformed into percentages (and SEs) of participants objecting (defined as assigning a rating of 1 or 2—"very inappropriate" or "somewhat inappropriate"— on a 1–5 scale) to implementing intervention A, intervention B, and the A/B test.

190x320mm (300 x 300 DPI)

Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople in the United States

Supplemental Materials

Table of Contents

Methods

In the main text, we grouped the vignettes thematically into three sets: "Lay Sentiments About pRCTs," "Lay Sentiments About Covid-19 pRCTs," and "Clinician Sentiments About Covid-19 pRCTs." However, when we collected data, we grouped our vignettes differently such that we started with vignettes that we have used in previous published work and their respective Covid-19 derivatives, then we developed and tested novel Covid-19 specific vignettes separately, and then, again separately, we tested a Covid-19 vaccine vignette. We followed a similar pattern in our clinician sample: we first tested three Covid-19 specific vignettes (two which were derivatives of vignettes from our previous work, one which was new to this work) and then separately, we tested a Covid-19 vaccine vignette. These groupings are important for understanding how participants were randomly assigned to vignettes and why there are slight discrepancies (or large discrepancies in the case of the Best Vaccine vignette in the clinician sample[1]) in the number of participants in each vignette (see Table S1).

Table S1

Population, sample size, and dates of data collection for each vignette

Preregistration #	Vignette	Population	Sample size	Dates of data collection
1	Catheterization Safety Checklist	MTurk workers	343	August 13, 2020
	Intubation Safety Checklist	MTurk workers	347	August 13, 2020
	Best Anti-Hypertensive Drug	MTurk workers	357	August 13, 2020
	Best Corticosteroid Drug	MTurk workers	357	August 13, 2020
2	Masking Rules	MTurk workers	360	September 30-October 2, 2020
	School Reopening	MTurk workers	339	September 30-October 2, 2020
	Best Vaccine (ambiguous version)*	MTurk workers	350	September 30-October 2, 2020
	Ventilator Proning	MTurk workers	357	September 30-October 2, 2020
3	Intubation Safety Checklist	Clinicians	271	November 13-December 9, 2020
	Best Corticosteroid Drug	Clinicians	275	November 13-December 9, 2020
	Masking Rules	Clinicians	349	November 13-December 9, 2020
4	Best Vaccine	MTurk workers	450	January 8, 2021
5	Best Vaccine	Clinicians	1254	January 25-February 9, 2021

Note. Within each data collection batch, participants were randomly assigned to one of the vignettes. In the clinician sample (preregistration #3), clinicians saw all three vignettes in randomized order. The sample size reported here is the number of clinicians who saw that vignette first.
*Our first attempt at the Best Vaccine vignette included wording that unintentionally made the experiment condition less aversive. For this reason, this vignette is not included in the main analyses.

As shown in Table 1, in the first round of survey experiments (preregistration #1), the first set of lay participants were randomly assigned to read and respond to either Catheterization Safety Checklist, Best Anti-Hypertensive Drug, Intubation Safety Checklist, or Best Corticosteroid Drug. Then, in a second round of survey experiments (preregistration #2), a second, separate, set of lay participants were randomly assigned to read and respond to either Masking Rules, School Reopening, Ventilator Proning, or an unintentionally ambiguous version of Best Vaccine (results of which are reported in the SM). A third set of lay participants (preregistration #4) were recruited to read and respond to a correct version of Best Vaccine (no other vignette was included and, thus, no randomization was necessary). In the clinician sample, one set of clinicians (preregistration #3) was recruited to read and respond to Masking Rules, Intubation Safety Checklist, and Best Corticosteroid in a randomized order. All clinicians in this sample read and responded to all three vignettes. However, only their responses to the first vignette they read are considered for the purpose of the analyses presented in the main text. A second set of clinicians (preregistration #5) was recruited to read and respond to Best Vaccine (no other vignette was included and, thus, no randomization was necessary). However, because the clinician survey was fully anonymous, it is possible that there is some overlap between participants in the first and second clinician samples.

[1] The Best Vaccine vignette was combined with another study that required a sample size much larger than the sample sizes in our previous vignette studies to have adequate statistical power.

For clarity, in the main text of this article we used different names for the vignettes than those used in the preregistrations and in previous publications (see Table S2).

Table S2

Original vignette names from preregistrations and previous work and corresponding name in main text

Original vignette name	Main text vignette name Hospital
Safety Checklist (also called Checklist)	Catheterization Safety Checklist Best
Drug: Walk-In Clinic (also called Best Drug)	Best Anti-Hypertensive Drug
Checklist (Covid-19)	Intubation Safety Checklist
Best Drug (Covid-19)	Best Corticosteroid Drug
Ventilator Proning	Ventilator Proning
School Reopening	School Reopening
Mask Requirements	Masking Rules
Modified Covid-19 Vaccines	Best Vaccine
Vaccine Distribution	(not reported in main text)

Note. Vignette names in this article were changed from those in previous work and in our preregistrations in order to clarify the content for readers.

Preregistrations, sample sizes, and power analyses

Our research questions, power analyses and sample sizes, and analysis plans were all preregistered at Open Science Framework (OSF) before data collection. These sample size precommitments are copied from each preregistration document which can be found on OSF at https://osf.io/u945y/?view_only=a901fde13ddb423899074eb79964c6cd.

Preregistration 1 (Catheterization Safety Checklist, Best Anti-Hypertensive Drug, Intubation Safety Checklist, Best Corticosteroid Drug vignettes):

“We predict that, using a two-tailed, paired t-test with α = .05 within each scenario, participants will rate the A/B test condition as significantly less appropriate than their own average rating of the two policy conditions, mean(A,B). This is the test for the “A/B Effect.” Recruiting 350 participants for each scenario provides 95% power to detect an effect as small as d = 0.19, which is substantially smaller than the effect sizes we have observed using the Hospital Safety Checklist and Best Drug: Walk-In Clinic vignettes in past research.”

Preregistration 2 (Ventilator Proning, School Reopening, Masking Rules, and Best Vaccine (initial ambiguous version) vignettes):

“We predict that, using a two-tailed, paired t-test with α = .05 within each scenario, participants will rate the A/B test condition as significantly less appropriate than their own average rating of the two policy conditions, mean(A,B). This is the test for the “A/B Effect.” Recruiting 350 participants for each scenario provides 95% power to detect an effect as small as d = 0.19, which is substantially smaller than the effect sizes we have observed using the Hospital Safety Checklist and Best Drug: Walk-In Clinic vignettes in past research.”

Preregistration 3 (Clinicians; Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes):

Note that because of time constraints around the possible starting dates of our clinician surveys, we launched this study before preregistering it, and we did not report an explicit power analysis before collecting the data. Because this study follows a similar structure to the studies above, however, it was reasonable to apply the previous sample size and power analysis considerations. We did, however, preregister our approach and research plan twice during this study: once during data collection, before any analyses had been conducted, and again after all data had been collected (but before analyzing any of them).

> Preregistration 3.1: "At the time of this preregistration, we have received 655 complete responses. No data have been explored or analyzed at this point. We will conduct an interim analysis on this dataset using the same analyses we have previously preregistered, and we may continue to collect more data from this population."
>
> Preregistration 3.2: "Data collection is now complete and we have closed the survey. On 11/24/2020, we conducted an interim analysis on 601 complete responses. Since then, we have received an additional 295 complete responses, to which we remain blind."

Preregistration 4 (Best Vaccine):

"We recruited 350 participants for the original Covid-19 vaccines study. Because we are running this study to determine whether even a small effect emerges, we will increase the sample size to 450 participants. This provides 80% power to detect an effect as small as d = 0.13 in a repeated- measures, two-tailed t-test, and 95% power to detect an effect as small as d = 0.17."

Preregistration 5 (Clinicians; Best Vaccine):

"Our previous survey of healthcare providers resulted in approximately 900 complete responses; we expect a similar response rate for this survey. This sample size provides 95% power to detect an effect as small as d = 0.12 using a two-tailed, repeated measures t-test. Even if we only receive 600 complete responses, we will have 95% power to detect an effect as small as d = 0.15."

Procedure and design

Several aspects of the procedure and experimental design were consistent across the studies reported here. Below, we describe these consistent features and note in specific studies where we deviated from them.

For the lay participant samples, we used the CloudResearch service to recruit crowd workers on Amazon Mechanical Turk (MTurk) to participate in a 3–5-minute survey experiment. These services provide samples that are broadly representative of the U.S. population and are well-accepted in social science research as providing as good or better-quality data than convenience samples such as student volunteers, with results that are similar to probability sampling methods [1,2]. Participants were excluded from recruitment in any of the studies reported here if they had participated in any of our previous studies on this topic. Across all laypeople vignettes, the completion rate of participants starting the survey was 91.5%. The Geisinger IRB determined that these anonymous surveys were exempt (IRB# 2017-0449).

For the clinician samples, we recruited healthcare providers (including physicians, physician assistants, nurse practitioners, and nurses) from a large health system in the Northeastern U.S via email. Each provider received either one or two emails about the study during the recruitment window. In the first clinician study (Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes), we first tested the email recruitment system by sending out the survey invitation email to just 200 clinicians. Clinicians who completed the survey based on this survey invitation were included in the final sample. Then, all clinicians were sent the recruitment email on November 19, 2020, followed by a reminder email on December 3, 2020. In the second clinician study (Best Vaccine), the initial recruitment email was sent January 25, 2021, with the follow-up email sent February 2, 2021. In the first clinician study, 5,925 clinicians were emailed and 895 completed the survey. In the second clinician study, 6,993 clinicians were emailed and 1,254 completed the survey. In these samples, because survey responses were fully anonymous, we were not able to restrict participation based on our previous studies, so some participants who completed the Best Vaccine vignette may have earlier completed the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes.

In all cases, participants completed an online survey hosted by Qualtrics. After opening the survey, participants were evenly randomized to one of the possible vignettes being studied using the "evenly present elements" function in the survey flow of Qualtrics.[2,3] Qualtrics uses a least filled quota system which preferentially randomizes participants to the condition with the lowest count of responses at the time they enter the survey. The exact algorithm used by Qualtrics is proprietary. In the case of data collection batches 4 and 5, there was only one vignette being tested that all participants saw. At this point, we used the exact same procedure detailed in Heck et al. (2020) [4]. First, participants were instructed to read about several possible decisions made by different decision-makers[4], and to try to treat each decision as separate from the others. All scenarios contained a brief "background" text at the top of the page that summarized a problem, followed by three "situations," each of which detailed the decision-maker's choice to adopt intervention A, intervention B, or to run an A/B test by randomly assigning people to one of two test conditions. These conditions were presented in fully counterbalanced order; each participant received one of six possible orders (i.e., Situation 1 = A, Situation 2 = B, and Situation 3 = A/B; Situation 1 = A/B, Situation 2 = B, and Situation 3 = A; etc.…). At no point did we observe a meaningful effect of presentation order, so we collapsed across this variable for all analyses.

[2] For the clinician study of the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes, clinicians were randomly assigned to one of these three scenarios and then completed the remaining two scenarios in random order. For consistency with the rest of this project and with our previous survey experiment with clinicians regarding the A/B effect (3, Study 6), and in order to make the results from clinician samples comparable to those with lay samples (in which each participant only ever saw one scenario), we analyze data from this study as a between-subjects design where we only consider the first scenario that every participant completed. See the section "Order Effect in Clinician Study" elsewhere in this appendix for further analyses.

[3] The clinician version of the Best Vaccine vignette was combined with another study being conducted by a subset of researchers on this team. The materials for Best Vaccine were presented after the survey materials from the other study. Data from the other study are unrelated to the research questions tested here and will be reported separately.

For our primary outcome measures, participants were asked to rate the appropriateness of the decisions made in Situation 1, Situation 2, and Situation 3 ("How appropriate is the director's decision in Situation 1/2/3?"), using a 1-5 scale (1 = "Very inappropriate", 2 = "Inappropriate", 3 = "Neither inappropriate nor appropriate", 4 ="Appropriate", 5 = "Very appropriate"). Participants then specified a ranked order of the three decisions ("Among these three decisions, which decision do you think the director should make? Please drag and drop the options below into your preferred order from best to worst. You must click on at least one option before you can proceed."), with 1 being the best decision and 3 being the worst. The last item on this page asked participants to explain why they chose these ratings and rankings in a couple of sentences ("In a couple of sentences, please tell us why you chose the ratings and rankings you chose.").

Following these primary measures, participants completed standard demographic items on the next page. For MTurk participants, these were measures of sex, race/ethnicity, age, educational attainment, household income, religious belief or affiliation, whether they have a degree in a STEM field or not, and four items identifying political orientation and affiliation. As part of an ongoing study in our laboratory (whose results will be reported elsewhere), these participants were randomized to one of six conditions for this demographic questionnaire where we varied the option to select "prefer not to answer" and whether the items were mandatory, optional, or requested (but not required). For clinician participants, demographic items were mandatory response and were limited to the following: sex, sources of training in research methods and statistics, self-reported comfort with research methods and statistics, past experience with activities related to research methods and statistics (e.g., publishing a scientific paper or analyzing data), current involvement in research, position (e.g., doctor, physician assistant, nurse, medical student, etc.), length of time working in the medical field, and field of specialty.

After completing the survey, MTurk participants were given a completion code to receive payment ($0.40). Clinician participants were invited to enter into a lottery to win a $50 Amazon gift card by following a link to an independent survey where they could enter their email address. All participants were thanked for their participation and offered the opportunity to comment on the survey.

[4] In all vignettes, the protagonist (e.g., the hospital director or Dr. Jones) was male for ease of comparison to our previous work using these vignettes. Future work should examine the impact of the characteristics of the decision-maker on evaluations of their decisions regarding policy imposition and conducting RCTs.

Measures

We computed several variables to measure participants' sentiments about pRCTs.

Following Meyer et al. (2019) [3], we define an "A/B effect" as the difference between participants' mean policy rating and their rating of the A/B test—that is, the degree to which the policies are (on average) rated higher than the A/B test. We also report the percentage of participants whose mean policy rating is higher than their rating of the A/B test.

Following Heck et al. (2020 [4]; see also Mislavsky et al., 2019 [5]), we define "experiment aversion" as the difference between participants' rating of their own lowest-rated policy and their rating of the A/B test. We also report the percentage of participants who express experiment aversion.

"Experiment rejection" (first reported in Heck et al., 2020 [4], but without this name) occurs when a participant rates the A/B test as inappropriate (1 or 2 on the 5-point scale) while also rating each policy as neutral or appropriate (3–5 on the scale).

A "reverse A/B effect" is the difference between participants' rating of the A/B test and their mean policy rating—that is, the degree to which the A/B test is rated higher than the policies (on average). We also report the percentage of participants whose rating of the A/B test is higher than their mean policy rating.

"Experiment appreciation" is the difference between participants' rating of the A/B test and their rating of their own highest-rated policy. We also report the percentage of participants who express experiment appreciation.

"Experiment endorsement" occurs when a participant rates the A/B as appropriate (4 or 5 on the 5-point scale) while also rating each intervention as neutral or inappropriate (1–3 on the scale).

In all cases where a *d*-value was calculated (i.e., A/B effect, experiment aversion, reverse A/B effect, experiment appreciation), we used Cohen's *d* recovered from the *t*-statistic, *n*, and correlation between the two measures being compared (Dunlap et al., 1996 [6], equation 3: $d = t\mathrm{c}[2(1-r)/n]^{½}$; see also http://jakewestfall.org/blog/index.php/category/effect-size/kewestfall.org [7]. To calculate this *d*-value, we use the following R code: effsize::cohen.d(x,y, paired = TRUE).

In Figures 1B, 2B, and 3B, we transformed participants A, B, and A/B ratings on the continuous 5-point Likert scale into a binary objected/did not object variable (where objecting was defined as assigning a rating of 1 or 2—"very inappropriate" or "somewhat inappropriate"— on the 1–5 scale). We do this only for visualization and do not perform any statistical analyses on this transformed objected/did not object variable. Instead, as is standard in social and moral psychology, we treated appropriateness ratings elicited on the 5-point Likert scale as continuous. Therefore, we use t-tests to test the differences between the ratings of the A/B test and the interventions (lowest, average, and highest). Other methodologies and statistical analyses like a discrete choice approach, in which participants would see and evaluation two of the three possible decisions (e.g., intervention A vs. A/B test) at a time, or the Stuart-Maxwell test, which requires a kxk matrix of categorical variables, would not be appropriate.

Vignettes

Our vignettes were inspired by discussions about the ethics of real-world RCTs (see Table S3).

Table S3

Literature calling for or reporting an RCT similar to what is proposed in each vignette

Vignette name	Relevant literature
Catheterization Safety Checklist	Pronovost et al. [8], Urbach et al. [9], Arriaga et al. [10]
Best Anti-Hypertensive Drug	ROMP Ethics Study [11], Sinnott et al. [12]
Intubation Safety Checklist	Turner et al. [13]
Best Corticosteroid Drug	Wagner et al. [14]
Ventilator Proning	Elharrar et al. [15], Sartini et al. [16], Caputo et al. [17]
School Reopening	Fretheim et al. [18, 19], Helsingen et al. [20], Angrist et al. [21], Kolata [22]
Masking Rules	Abaluck et al. [23], Jefferson et al. [24], Bundgaard et al. [25]
Best Vaccine	Bach [26]

The following section shows the exact vignette text that participants read in these studies (with the exception of the bolded titles, which are never shown to participants).

Catheterization Safety Checklist

(Originally from Heck et al. (2020) [4], adapted from Meyer et al. (2019) [2])

Background: Some medical treatments require a doctor to insert a plastic tube into a large vein. These treatments can save lives, but they can also lead to deadly infections.

Situation 1

A hospital director wants to reduce these infections, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All patients having this procedure will then be treated by doctors with this list attached to their clothing.

Situation 2

A hospital director wants to reduce these infections, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All patients having this procedure will then be treated in rooms with this list posted on the wall.

Situation 3

A hospital director thinks of two different ways to reduce these infections, so he decides to run an experiment by randomly assigning patients to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After a year, the director will have all patients treated in whichever way turns out to have the highest survival rate.

Best Anti-Hypertensive Drug

(Originally from Heck et al. (2020) [4], adapted from Meyer et al. (2019) [2])

Background: Several drugs have been approved by the US. Food and Drug Administration as safe and effective for treating high blood pressure. Doctor Jones works in a multi-doctor walk-in clinic where patients see whichever doctor is available. Some doctors in the clinic prescribe drug A for high blood pressure, while others prescribe drug B. Both drugs are affordable and patients can tolerate their side effects.
Situation 1

Doctor Jones wants to provide good treatment to his patients, so he decides that his patients who need high blood pressure medication will be prescribed drug A.

Situation 2

Doctor Jones wants to provide good treatment to his patients, so he decides that his patients who need high blood pressure medication will be prescribed drug B.

Situation 3

Doctor Jones thinks of two different ways to provide good treatment to his patients, so he decides to run an experiment by randomly assigning his patients who need high blood pressure medication to one of two test conditions. Half of patients will be prescribed drug A, and the other half will be prescribed drug B. After a year, he will only prescribe to new patients whichever drug has had the best outcomes for his patients.

Intubation Safety Checklist

Background: Some treatments for coronavirus (Covid-19) patients require a doctor to insert a plastic breathing tube into the throat. These treatments can save lives, but they can also lead to deadly fluid buildup in the lungs.

Situation 1

A hospital director wants to reduce these cases of fluid buildup, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All coronavirus patients having this procedure will then be treated by doctors with this list attached to their clothing.

Situation 2

A hospital director wants to reduce these cases of fluid buildup, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All coronavirus patients having this procedure will then be treated in rooms with this list posted on the wall.

Situation 3

A hospital director thinks of two different ways to reduce these cases of fluid buildup, so he decides to run an experiment by randomly assigning coronavirus patients who need a breathing tube to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall. After two months, the director will have all patients treated in whichever way turns out to have the highest survival rate.

Best Corticosteroid Drug

Background: Several corticosteroids (a family of anti-inflammatory drugs) have been approved by the U.S. Food and Drug Administration as safe and effective for treating a variety of diseases. There is some evidence that corticosteroids can also help certain coronavirus (Covid-19) patients, and many doctors prescribe corticosteroids for these patients. Doctor Jones works in a multi-doctor emergency department where patients see whichever doctor is available. Some doctors in the emergency department prescribe corticosteroid A for coronavirus symptoms, while others prescribe corticosteroid B. Both corticosteroids are affordable and patients can tolerate their side effects.

Situation 1

Doctor Jones wants to provide good treatment to his patients, so he decides that his coronavirus patients who need medication will be prescribed corticosteroid A.

Situation 2

Doctor Jones wants to provide good treatment to his patients, so he decides that his coronavirus patients who need medication will be prescribed corticosteroid B.

Situation 3

Doctor Jones thinks of two different ways to provide good treatment to his coronavirus patients, so he decides to run an experiment by randomly assigning his patients who need medication to one of two test conditions. Half of coronavirus patients will be prescribed corticosteroid A, and the other half will be prescribed corticosteroid B. After two months, he will only prescribe to new coronavirus patients whichever corticosteroid has had the best outcomes for his patients.

Ventilator Proning

Background: Some coronavirus (Covid-19) patients have to be sedated and placed on a ventilator to help them breathe. Even with a ventilator, these patients can have dangerously low blood oxygenation levels, which can result in death. Current standards suggest that laying ventilated patients on their stomach for 12-16 hours per day can reduce pressure on the lungs and might increase blood oxygen levels and improve survival rates.

Situation 1

A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 12-13 hours per day.

Situation 2

A hospital director wants to save as many ventilated Covid-19 patients as possible, so he decides that all of these patients will be placed on their stomach for 15-16 hours per day.

Situation 3

A hospital director thinks of two different ways to save as many ventilated Covid-19 patients as possible, so he decides to run an experiment by randomly assigning ventilated Covid-19 patients to one of two test conditions. Half of these patients will be placed on their stomach for 12-13 hours per day. The other half of these patients will be placed on their stomach for 15-16 hours per day. After one month, the director will have all ventilated Covid-19 patients treated in whichever way turns out to have the highest survival rate.

Best Vaccine (ambiguous version; results not reported in main analyses)

Background: Imagine that several vaccines have been approved by the U.S. Food and Drug Administration as safe and effective for preventing Covid-19. Vaccine A uses mRNA molecules to provide the cells with a blueprint for how to destroy the virus. Vaccine B uses deactivated or weakened coronavirus to help the body create an immune resistance to the disease. Both vaccines are affordable, similarly priced, and people can tolerate their side effects. However, people can only receive one of these two vaccines.

Situation 1

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine A for free. People can get any other vaccine somewhere else, if they want.

Situation 2

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine B for free. People can get any other vaccine somewhere else, if they want.

Situation 3

The director of public health for a state thinks of two different ways to reduce Covid-19 cases, so he decides to run an experiment by randomly assigning clinics in the state to one of two test conditions. Half of the clinics will offer Vaccine A for free, and the other half will offer Vaccine B for free. People can get any other vaccine somewhere else, if they want.[5] After six months, he will direct the state to offer whichever vaccine has resulted in the fewest cases of Covid-19.

Best Vaccine

Background: Imagine that several vaccines have been approved by the U.S. Food and Drug Administration as safe and effective for preventing Covid-19. Vaccine A uses mRNA molecules to provide the cells with a blueprint for how to destroy the virus. Vaccine B uses deactivated or weakened coronavirus to help the body create an immune resistance to the disease. Both vaccines are affordable, similarly priced, and people can tolerate their side effects.

Situation 1

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine A for free.

Situation 2

The director of public health for a state wants to reduce Covid-19 cases. So he decides that all clinics in the state will offer Vaccine B for free.

Situation 3

The director of public health for a state thinks of two different ways to reduce Covid-19 cases, so he decides to run an experiment by randomly assigning clinics in the state to one of two test conditions. Half of the clinics will offer Vaccine A for free, and the other half will offer Vaccine B for free. After six months, he will direct the state to offer whichever vaccine has resulted in the fewest cases of Covid-19.

[5] This wording unintentionally implied that residents could choose their vaccine (by going elsewhere) if they did not wish to be subject to the official's decision (including policy implementation or A/B test); we suspect this had the effect of making the experiment condition less aversive, since people could effectively opt-out of it, and our goal in this research is to study pragmatic, real-world situations in which avoiding randomization is not a realistic option.

School Reopening

Background: This Fall, school districts must decide whether to reopen their doors to students, teachers, and staff despite the risks of spreading coronavirus (Covid-19). Many school and public health officials have decided to use a “hybrid model” of teaching that offers some of the benefits of face-to-face learning time while attempting to minimize the risks related to Covid-19.

Situation 1

A superintendent at a large school district wants to provide good education to his students while slowing the spread of Coronavirus. So, he decides that students will attend school according to an even-odd schedule. Students in even-numbered grades (e.g., 2nd grade, 4th grade, etc.) will attend school in the morning and learn remotely in the afternoons, while students in odd- numbered grades will attend school in the afternoon and learn remotely in the mornings.

Situation 2

A superintendent at a large school district wants to provide good education to his students while slowing the spread of Coronavirus. So, he decides that students will attend school according to an A-day/B-day schedule. Students in the A group will attend school in person on Monday, Tuesday, and Wednesday morning, and students in the B group will attend school in person on Wednesday afternoon, Thursday, and Friday. Students will learn remotely on the days they do not attend school.

Situation 3

A superintendent at a large school district thinks of two different ways to provide good education to his students while slowing the spread of Coronavirus. So, he decides to conduct an experiment by randomly assigning schools in the district to one of two test conditions. For half of schools, students will attend school according to an even-odd schedule. Students in even-numbered grades (e.g., 2nd grade, 4th grade, etc.) will attend school in the morning and learn remotely in the afternoons, while students in odd-numbered grades will attend school in the afternoon and learn remotely in the mornings. For the other half of schools, students will attend school according to an A-day/B-day schedule. Students in the A group will attend school in person on Monday, Tuesday, and Wednesday morning, and students in the B group will attend school in person on Wednesday afternoon, Thursday, and Friday. Students will learn remotely on the days they do not attend school. At the end of the semester, all schools will adopt, for future semesters when the pandemic threat level remains similar, whichever policy has resulted in the best combination of test scores on state aptitude tests and number of Covid-19 cases.

Masking Rules

Background: Public health officials have considered different rules about when and where people must wear masks or other face coverings to reduce the spread of coronavirus (Covid-19).
Increasing mask use can reduce the spread of the disease, but highly restrictive mask policies can substantially reduce compliance rates.

Situation 1

A state health department director wants to reduce coronavirus spread within his state, so he decides that all counties will require masks in all businesses and public buildings.

Situation 2

A state health department director wants to reduce coronavirus spread within his state, so he decides that all counties will require masks in all businesses, public buildings, and outdoor public spaces.

Situation 3

A state health department director thinks of two different ways to reduce coronavirus spread within his state, so he decides to run an experiment by randomly assigning counties within the state to one of two test conditions. Half of counties will require masks in all businesses and public buildings. The other half of counties will require masks in all businesses, public buildings, and outdoor public spaces. After one month, the director will require all counties to adopt whichever policy has led to the fewest cases of Covid-19 for as long as the pandemic threat level remains high.

Results

Sample demographics

Lay participants

Across all vignettes reported in the main text (i.e., excluding the initial ambiguous version of the Best Vaccine vignette), there were a total of 2,909 lay participants. They ranged in age from 18 to 88 years old (mean = 38.4, SD = 12.8) and the majority were White (74.6%) and female (55.9%). 35.7% had a 4-year college degree, 29.7% had some college, and 20.5% had a graduate degree. 21.3% of participants had a degree in a STEM field. The most frequently selected income level was between $20,000 and $40,000 (20.7%). A majority of participants reported being moderate, leaning liberal, or being liberal both generally and specifically with regards to social and economic issues. Similarly, a majority of participants reported being independent, leaning Democrat, or being Democrat in their political party affiliations. 37.7% of participants reported being non-religious. Of those who reported being religious, the most reported religion was Protestant (24.2%). See Table S4 for demographic breakdowns by vignette and in the combined lay participant sample.

Table S4

Demographics of lay participants by vignette

	Catheterization Safety Checklist	Best Anti-Hypertensive Drug	Intubation Safety Checklist	Best Corticosteroid Drug	Best Vaccine (first attempt)	Best Vaccine	School Reopening	Ventilator Proning	Masking Rules	All vignettes
Total N	343	357	346	357	350	450	339	357	360	2909
Age [Mean (SD)]	37.9 (12.9)	38.6 (12.9)	37.9 (12.4)	38.0 (12.7)	36.7 (12.0)	37.7 (12.6)	38.7 (13.0)	38.4 (12.7)	39.0 (12.8)	38.4 (12.8)
Sex (%)										
Male	51.3%	41.5%	48.1%	51.5%	36.6%	38.4%	39.2%	40.9%	39.7%	43.6%
Female	47.8%	58.0%	51.9%	48.2%	63.1%	60.9%	60.5%	58.8%	60.0%	55.9%
Other	0.6%	0.6%	0.0%	0.0%	0.3%	0.4%	0.3%	0.3%	0.3%	0.2%
Prefer not to answer	0.3%	0.0%	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%
Race - select all that apply (%)										
Black/African-American	11.1%	5.0%	8.4%	10.1%	10.9%	11.3%	9.7%	6.7%	8.9%	9.0%
Hispanic or Latino	8.2%	8.4%	7.2%	8.4%	8.3%	5.6%	5.9%	9.5%	7.5%	7.5%
White	72.0%	78.7%	71.5%	72.0%	70.9%	72.7%	77.0%	77.6%	75.8%	74.6%
Asian	12.5%	8.7%	15.3%	12.6%	12.6%	13.3%	8.6%	7.0%	7.8%	10.8%
Other	1.2%	1.7%	1.2%	0.3%	3.4%	0.9%	1.8%	1.7%	2.2%	1.3%
Prefer not to answer	0.9%	0.6%	0.0%	0.6%	0.3%	0.9%	0.6%	0.3%	0.3%	0.5%
Education (%)										
Less than high school	0.6%	0.8%	0.3%	0.3%	0.6%	0.2%	0.3%	9.8%	0.8%	0.4%
High school degree	5.5%	7.8%	8.9%	9.2%	9.1%	10.2%	10.3%	29.4%	11.4%	9.2%
Some college	32.7%	32.2%	24.2%	28.0%	30.3%	32.0%	26.3%	33.6%	31.9%	29.7%
Four-year college degree	37.3%	35.6%	39.5%	35.9%	37.1%	35.8%	37.8%	3.1%	30.6%	35.7%
Some graduate school	4.4%	3.4%	4.6%	4.2%	4.6%	5.1%	4.4%	23.8%	4.7%	4.3%
Graduate degree	19.2%	19.9%	22.5%	22.1%	18.3%	16.2%	20.9%	0.3%	20.6%	20.5%
Prefer not to answer	0.3%	0.3%	0.0%	0.3%	0.0%	0.4%	0.0%	0.0%	0.0%	0.2%
Income (%)										
< $20,000	11.1%	8.4%	9.2%	7.6%	12.0%	9.3%	9.4%	11.2%	9.7%	9.5%
$20,000-$40,000	17.8%	22.1%	21.6%	25.8%	19.7%	20.2%	18.9%	19.0%	19.7%	20.7%
$40,000-$60,000	24.5%	18.8%	19.0%	20.2%	21.4%	20.4%	21.2%	19.9%	20.8%	20.6%
$60,000-$80,000	13.7%	17.4%	16.1%	17.9%	18.6%	17.8%	16.5%	19.3%	19.2%	17.3%
$80,000-$100,000	11.4%	13.7%	11.0%	9.5%	10.6%	12.2%	13.3%	8.4%	12.2%	11.5%
> $100,000	20.7%	18.5%	21.3%	17.4%	17.1%	18.7%	20.4%	19.6%	16.9%	19.1%
Prefer not to answer	0.9%	1.1%	0.9%	1.4%	0.3%	1.3%	0.3%	2.5%	1.4%	1.2%
No response	0.0%	0.0%	0.9%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%
Political Ideology (%)										
Very liberal	12.2%	12.6%	13.0%	11.2%	10.6%	13.1%	12.7%	12.0%	12.8%	12.5%
Liberal	32.1%	30.3%	32.3%	35.9%	29.4%	31.1%	30.4%	30.8%	28.6%	31.4%
Moderate	29.2%	25.5%	28.2%	26.1%	31.1%	27.3%	27.7%	24.9%	28.3%	27.1%
Conservative	19.8%	20.2%	20.7%	17.1%	21.7%	18.7%	20.9%	21.3%	23.6%	20.2%
Very conservative	5.8%	10.6%	5.2%	9.5%	6.3%	8.9%	7.4%	9.8%	5.8%	7.9%
Prefer not to answer	0.9%	0.6%	0.3%	0.3%	0.9%	0.9%	0.6%	0.8%	0.8%	0.7%
No response	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.1%

Table S4, continued

Demographics of lay participants by vignette

	Catheterization Safety Checklist	Best Anti-Hypertensive Drug	Intubation Safety Checklist	Best Corticosteroid Drug	Best Vaccine (first attempt)	Best Vaccine	School Reopening	Ventilator Proning	Masking Rules	All vignettes
Political ideology on social issues (%)										
Very liberal	18.7%	16.8%	19.6%	13.7%	17.7%	18.0%	17.7%	17.6%	17.5%	17.5%
Liberal	34.1%	33.3%	33.4%	40.3%	31.1%	30.4%	36.6%	34.2%	31.7%	34.1%
Moderate	21.6%	23.8%	23.9%	19.9%	26.0%	25.6%	19.8%	21.8%	23.3%	22.6%
Conservative	16.6%	15.4%	17.3%	17.1%	18.0%	16.0%	18.3%	16.0%	19.4%	17.0%
Very conservative	8.2%	10.4%	5.2%	8.4%	6.3%	9.1%	6.8%	9.8%	7.5%	8.2%
Prefer not to answer	0.9%	0.3%	0.6%	0.6%	0.9%	0.9%	0.6%	0.6%	0.6%	0.6%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
Political ideology on economic issues (%)										
Very liberal	9.9%	12.0%	13.5%	11.2%	8.0%	13.8%	11.8%	11.4%	11.9%	11.9%
Liberal	28.3%	21.6%	27.1%	28.3%	24.9%	23.3%	27.7%	23.0%	19.7%	24.8%
Moderate	28.0%	27.5%	25.1%	25.2%	27.7%	28.4%	24.2%	27.5%	32.2%	27.3%
Conservative	23.0%	24.9%	24.8%	22.1%	30.9%	22.0%	24.2%	24.8%	26.4%	24.1%
Very conservative	9.3%	13.7%	8.6%	12.0%	7.4%	11.3%	11.2%	12.9%	9.2%	11.1%
Prefer not to answer	1.5%	0.3%	0.9%	1.1%	1.1%	0.9%	0.6%	0.6%	0.6%	0.8%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.0%	0.0%	0.1%
Political party (%)										
Strong Democrat	14.9%	10.9%	12.4%	13.7%	12.0%	13.6%	13.0%	14.0%	12.8%	13.2%
Democrat	23.3%	22.7%	27.7%	28.9%	26.3%	24.4%	22.7%	21.0%	21.7%	24.1%
Independent (but lean Democrat)	15.7%	16.2%	14.7%	12.9%	13.4%	14.9%	17.4%	14.3%	15.8%	15.2%
Independent	15.7%	16.8%	17.6%	14.3%	16.9%	16.9%	13.6%	15.1%	18.1%	16.0%
Independent (but lean Republican)	7.0%	8.7%	7.8%	10.4%	9.4%	8.7%	10.6%	10.9%	10.6%	9.3%
Republican	16.3%	14.6%	14.1%	12.0%	13.1%	15.3%	15.6%	14.0%	13.9%	14.5%
Strong Republican	4.1%	8.4%	4.3%	7.3%	6.9%	4.9%	6.5%	9.0%	6.4%	6.3%
Prefer not to answer	2.9%	1.7%	1.4%	0.6%	2.0%	1.3%	0.3%	1.7%	0.8%	1.3%
No response	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
Religion (%)										
Christian - Protestant	26.2%	24.6%	23.6%	21.0%	24.6%	24.2%	25.4%	24.4%	23.9%	24.2%
Christian - Catholic	17.5%	16.5%	15.9%	18.2%	17.7%	14.0%	17.1%	13.8%	15.3%	16.6%
Christian - Other	11.1%	11.2%	8.1%	11.2%	11.7%	11.1%	11.8%	10.9%	12.2%	11.0%
Jewish	2.6%	1.7%	1.7%	1.7%	1.7%	1.3%	1.8%	1.4%	2.5%	1.8%
Muslim	2.0%	0.8%	1.4%	0.6%	0.3%	0.9%	1.2%	1.1%	1.7%	1.2%
Buddhist	2.3%	1.4%	2.0%	1.7%	1.1%	2.0%	2.4%	0.6%	1.4%	1.7%
Hindu	1.2%	0.6%	2.6%	1.1%	1.7%	1.6%	0.3%	0.6%	0.6%	1.1%
Non-religious	32.7%	38.1%	40.9%	40.3%	36.6%	40.0%	35.4%	35.0%	36.4%	37.7%
Other	3.5%	3.6%	2.6%	3.4%	3.7%	3.8%	4.1%	3.4%	4.2%	3.6%
Prefer not to answer	0.9%	1.4%	1.2%	0.6%	0.9%	1.1%	0.6%	1.7%	1.9%	1.2%
No response	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.3%	0.0%	0.1%
STEM degree (%)										
No	77.6%	77.0%	75.2%	76.8%	77.4%	80.7%	78.5%	78.4%	78.6%	77.9%
Yes	21.9%	22.1%	23.3%	22.4%	22.3%	18.7%	21.5%	20.2%	21.1%	21.3%
Prefer not to answer	0.6%	0.8%	1.4%	0.8%	0.0%	0.0%	0.0%	1.0%	0.0%	0.7%
No response	0.0%	0.0%	0.0%	0.0%	0.3%	0.7%	0.0%	0.3%	0.3%	0.1%

Clinicians

There were 2,149 clinician responses across all vignettes. In the clinician samples, survey responses were anonymous, so we could not restrict participation based on our previous studies so some participants who completed the Intubation Safety Checklist, Best Corticosteroid Drug, and Masking Rules vignettes may have also completed the Best Vaccine vignette. For this reason, demographics are reported separately by vignette in Table S5. Across vignettes, a majority of clinicians were female. Over 50% of participants in the sample were registered nurses, followed by physicians and physician assistants. Over 50% of participants in the sample reported that they had been in the medical field for over 10 years. The clinicians reported that they had received training in research methods and statistics via an average of 1.5 of the sources we listed, and that they engaged in an average of 2.5 research methods and statistics activities. Most clinicians reported being somewhat to moderately comfortable with research methods and statistics.

Table S5

Demographics of clinicians by vignette

	Intubation Safety Checklist	Best Corticosteroid Drug	Masking Rules	Best Vaccine
Total N	271	275	349	1254
Sex (%)				
Male	18.1%	22.5%	18.1%	18.7%
Female	81.9%	77.1%	81.4%	81.2%
Other	0.0%	0.4%	0.6%	0.2%
Source of research methods/statistics training - select all that apply (%)				
Undergraduate coursework	48.7%	49.5%	48.7%	47.4%
Professional school instruction	40.2%	31.3%	34.4%	34.4%
Postgraduate coursework	26.2%	20.7%	22.1%	21.1%
CME/CEU courses	27.7%	25.1%	24.1%	25.8%
Self-instruction via peer-reviewed literature	19.2%	15.6%	17.2%	21.3%
Other	7.0%	4.0%	3.2%	3.9%
Total number of research methods/statistics training [mean (SD)]	1.69 (1.22)	1.46 (1.02)	1.50 (1.13)	1.54 (1.16)
Comfort with research methods/statistics (%)				
Not at all	8.9%	12.7%	10.9%	11.1%
Somewhat	37.6%	44.4%	45.8%	46.6%
Moderately	39.5%	32.0%	32.7%	30.8%
Very	11.8%	9.1%	8.9%	9.9%
Extremely	2.2%	1.8%	1.7%	1.7%
Research methods/statistics activities - select all that apply (%)				
Read results of RCT in peer-reviewed journal article	81.2%	75.3%	71.9%	71.2%
Changed typical prescription/recommendation after personally reading results of RCT in peer-reviewed journal article	41.0%	33.1%	33.0%	39.8%
Published scientific paper in peer-reviewed journal	13.3%	12.4%	9.7%	12.0%
Conducted or worked on a team conducting an RCT	18.5%	20.0%	19.2%	17.1%
Took a course/class in statistics, biostatistics, research methods	73.1%	69.8%	69.1%	68.5%
Analyzed data for statistical significance outside of course require	23.6%	21.8%	19.2%	21.1%
Used statistical software	12.2%	11.6%	11.5%	9.3%
Total number of research methods/statistics activities [mean (SD)]	2.63 (1.69)	2.44 (1.71)	2.34 (1.66)	2.39 (1.72)
Currently involved in research (%)	10.7%	9.1%	9.7%	9.6%
Position (%)				
Doctor	14.8%	14.5%	12.6%	15.7%
Physician Assistant	12.5%	6.9%	9.5%	7.7%
Nurse Practitioner	6.3%	2.5%	4.3%	4.7%
Nurse (RN)	51.3%	57.1%	55.6%	52.8%
Nurse (LPN)	6.3%	9.5%	8.0%	15.6%
Nurse (Other)	1.8%	1.1%	1.4%	0.6%
Genetic Counselor	0.0%	0.0%	0.0%	0.0%
Non-prescribing clinician or staff without clinical credential	0.0%	0.0%	0.0%	0.0%
Medical student	5.2%	5.5%	4.6%	0.1%
Faculty or Professor	0.4%	0.7%	0.3%	0.3%
Other	1.5%	2.2%	3.7%	2.6%
Years in medical field (%)				
< 1 year	2.6%	2.9%	3.2%	2.8%
1-2 years	6.3%	5.5%	6.0%	5.8%
3-5 years	15.1%	11.3%	12.6%	13.6%
6-10 years	16.6%	14.2%	15.8%	15.8%
> 10 years	59.4%	66.2%	62.5%	62.0%

Note. Reported here are the demographics of the clinicians who saw the Intubation Safety Checklist, Best Corticosteroid Drug, or Masking Rules vignette first (responses to the Best Vaccine vignette were collected at a different time). All clinicians who participated in this study completed all vignettes but in randomized order. In the main text, we only analyze responses to the first vignette, so we report demographics similarly here.

Results presented in main text

In Figures S1-3, we show all individual appropriateness ratings (1 = very inappropriate, 5 = very appropriate) for intervention A, intervention B, and the A/B test across all vignettes.

Figure S1

Lay Sentiments About pRCTs

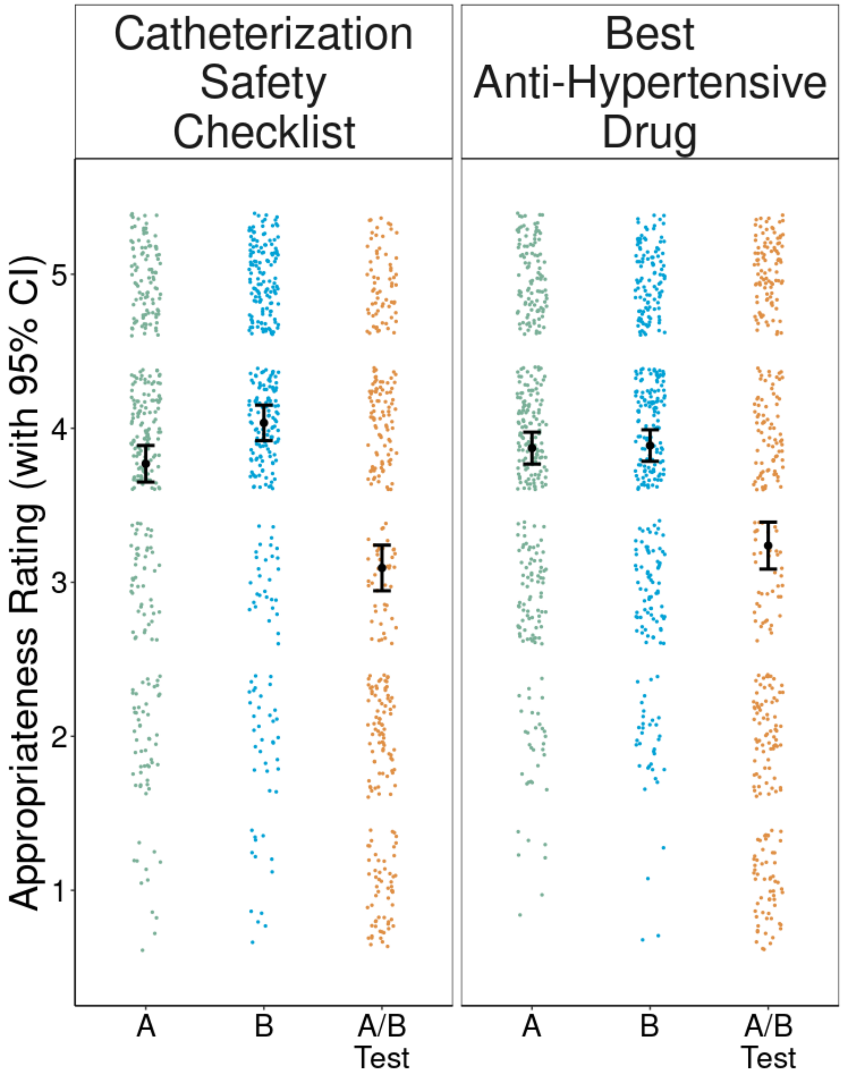


Figure S2

Lay Sentiments About Covid-19 pRCTs

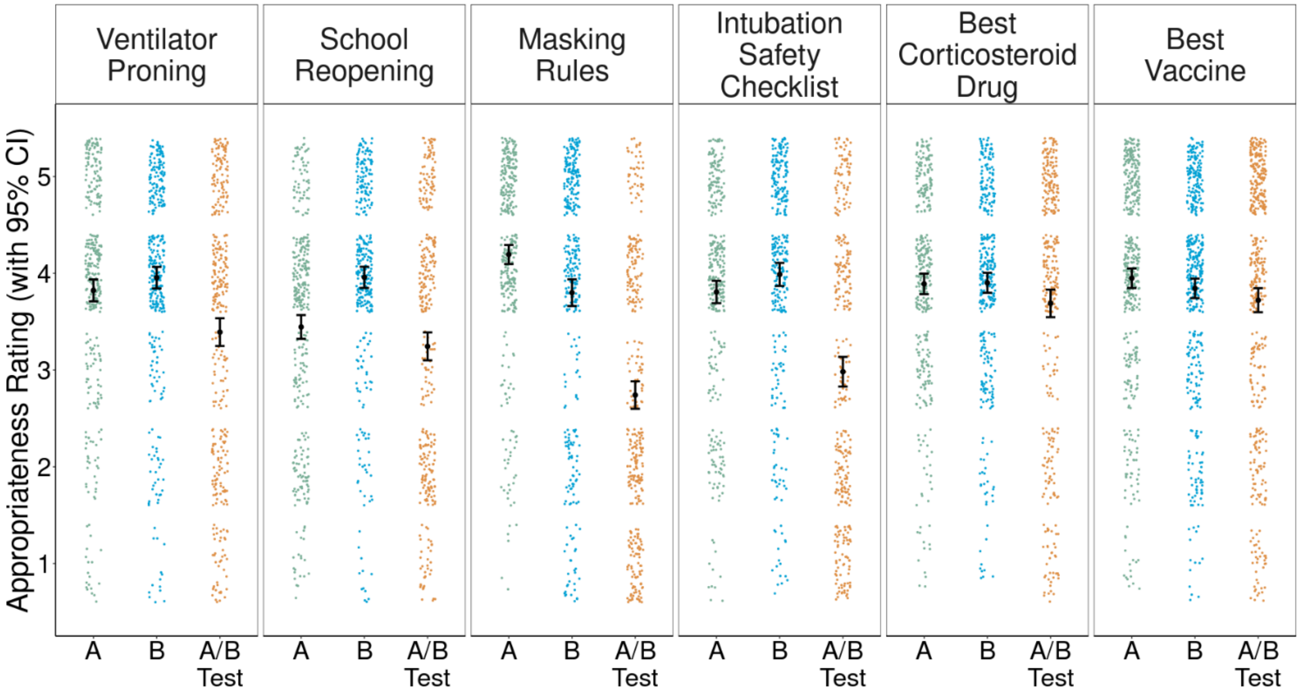
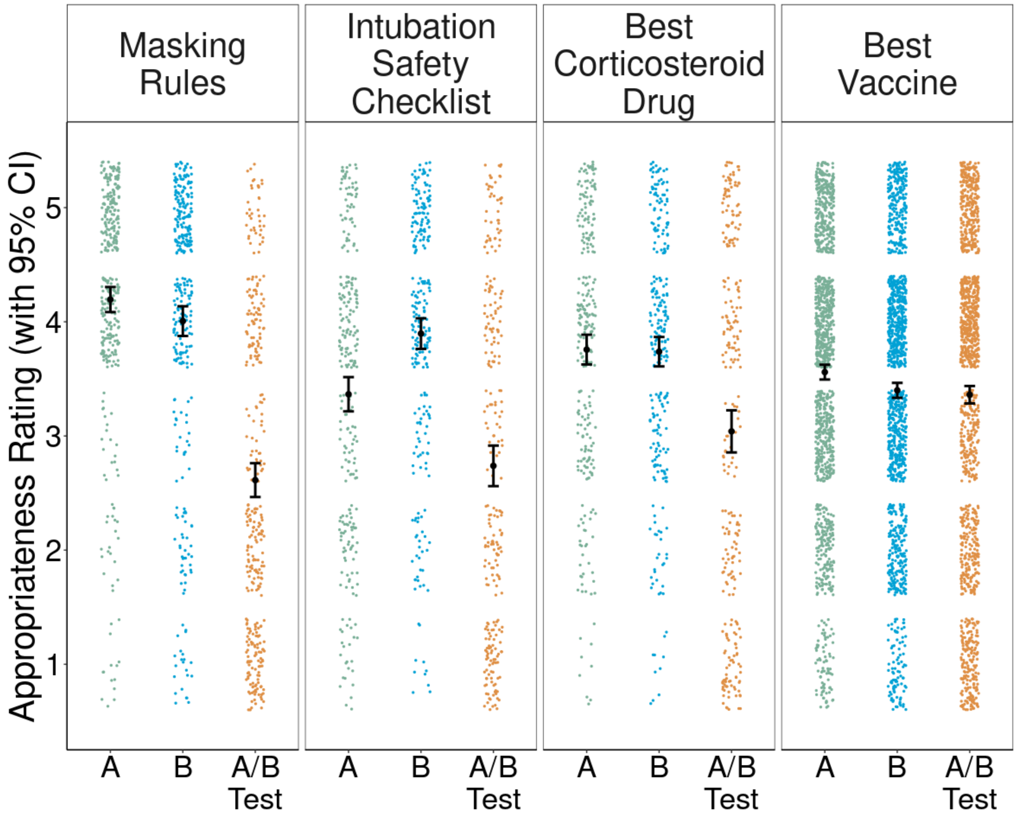


Figure S3

Clinician Sentiments About Covid-19 pRCTs



In Table S6A-C, we present the descriptive and inferential results for all vignettes discussed in the main text.

Table S6A

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

		Descriptive Results			***Inferential Results***	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Lay Sentiments About pRCTs						
Catheterization Safety Checklist (*n* = 343 laypeople)					A/B Effect	*t* (342) = 9.74***, *d* = 0.69 ± .16
					Mean(A,B) > AB	58% ± 5%
	A	3.77 (1.12)	27%	32%	Reverse A/B effect	*t* (342) = -9.74***, *d* = -0.69 ± .16
	B	4.03 (1.09)	42%	21%	AB > Mean(A,B)	27% ± 4%
	AB	3.09 (1.40)	32%	48%	Experiment Aversion	*t* (342) = 3.70***, *d* = 0.25 ± .14
	Mean(A,B)	3.90 (0.84)	-	-	Min(A,B) > AB	41% ± 5%
	Min(A,B)	3.42 (1.16)	-	-	Experiment Appreciation	*t* (342) = -14.61***, *d* = -1.13 ± .20
	Max(A,B)	4.39 (0.81)	-	-	AB > Max(A,B)	15% ± 3%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	28% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	3% ± 1%
Best Anti-Hypertensive Drug (*n* = 357 laypeople)					A/B Effect	*t* (356) = 6.68***, *d* = 0.52 ± .16
					Mean(A,B) > AB	47% ± 5%
	A	3.87 (1.00)	25%	27%	Reverse A/B effect	*t* (356) = -6.68***, *d* = -0.52 ± .16
	B	3.89 (0.99)	25%	28%	AB > Mean(A,B)	31% ± 5%
	AB	3.24 (1.47)	50%	45%	Experiment Aversion	*t* (356) = 5.96***, *d* = 0.46 ± .16
	Mean(A,B)	3.88 (0.95)	-	-	Min(A,B) > AB	44% ± 5%
	Min(A,B)	3.82 (1.03)	-	-	Experiment Appreciation	*t* (356) = -7.26***, *d* = -0.57 ± .17
	Max(A,B)	3.94 (0.95)	-	-	AB > Max(A,B)	29% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	34% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	18% ± 4%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

*p < .05

**p < .01

***p < .001

Table S6B

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

		Descriptive Results			*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Lay Sentiments About Covid-19 pRCTs						
Intubation Safety Checklist (*n* = 346 laypeople)					A/B Effect	*t* (345) = 10.69***, *d* = 0.75 ± .16
					Mean(A,B) > AB	58% ± 5%
	A	3.81 (1.10)	29%	29%	Reverse A/B effect	*t* (345) = -10.69***, *d* = -0.75 ± .16
	B	3.99 (1.13)	43%	19%	AB > Mean(A,B)	25% ± 4%
	AB	2.98 (1.46)	29%	52%	Experiment Aversion	*t* (345) = 5.28***, *d* = 0.35 ± .14
	Mean(A,B)	3.90 (0.88)	-	-	Min(A,B) > AB	45% ± 5%
	Min(A,B)	3.46 (1.19)	-	-	Experiment Appreciation	*t* (345) = -14.94***, *d* = -1.14 ± .19
	Max(A,B)	4.34 (0.84)	-	-	AB > Max(A,B)	14% ± 3%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	31% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	4% ± 2%
Best Corticosteroid Drug (*n* = 357 laypeople)					A/B Effect	*t* (356) = 2.28*, *d* = 0.17 ± .15
					Mean(A,B) > AB	34% ± 5%
	A	3.89 (1.03)	17%	32%	Reverse A/B effect	*t* (356) = -2.28*, *d* = -0.17 ± .15
	B	3.90 (1.00)	18%	37%	AB > Mean(A,B)	38% ± 5%
	AB	3.69 (1.37)	65%	31%	Experiment Aversion	*t* (356) = 1.55, *p* = .123, *d* = 0.12 ± .15
	Mean(A,B)	3.90 (0.99)	-	-	Min(A,B) > AB	31% ± 5%
	Min(A,B)	3.83 (1.04)	-	-	Experiment Appreciation	*t* (356) = -2.99**, *d* = -0.23 ± .15
	Max(A,B)	3.96 (0.98)	-	-	AB > Max(A,B)	35% ± 5%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	22% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	17% ± 4%
Best Vaccine (*n* = 450 laypeople)					A/B Effect	*t* (449) = 2.41*, *d* = 0.15 ± .12
					Mean(A,B) > AB	34% ± 4%
	A	3.95 (1.09)	26%	27%	Reverse A/B effect	*t* (449) = -2.41*, *d* = -0.15 ± .12
	B	3.84 (1.09)	19%	39%	AB > Mean(A,B)	36% ± 4%
	AB	3.72 (1.34)	55%	34%	Experiment Aversion	*t* (449) = 0.61, *p* = .546, *d* = 0.04 ± .12
	Mean(A,B)	3.90 (1.03)	-	-	Min(A,B) > AB	29% ± 4%
	Min(A.B)	3.77 (1.13)	-	-	Experiment Appreciation	*t* (449) = -4.06***, *d* = -0.25 ± .12
	Max(A,B)	4.03 (1.04)	-	-	AB > Max(A,B)	32% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	17% ± 3%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	13% ± 3%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

**p* < .05

***p* < .01

Table S6B, continued

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					Inferential Results	
Vignette	Variable	Mean (SD)	% Ranking Best	% Ranking Worst	Test Description	Test Outcome
Lay Sentiments About Covid-19 pRCTs						
					A/B Effect	t (338) = 6.42***, d = 0.39 ± .12
					Mean(A,B) > AB	46% ± 5%
	A	3.45 (1.15)	17%	46%	Reverse A/B effect	t (338) = -6.42***, d = -0.39 ± .12
	B	3.96 (1.03)	53%	14%	AB > Mean(A,B)	28% ± 5%
School	AB	3.24 (1.36)	30%	40%	Experiment Aversion	t (338) = 0.47, p = .638, d = 0.03 ± .12
Reopening	Mean(A,B)	3.70 (0.90)	-	-	Min(A,B) > AB	28% ± 5%
(n = 339	Min(A,B)	3.28 (1.15)	-	-	Experiment Appreciation	t (338) = -11.25***, d = -0.75 ± .15
laypeople)	Max(A,B)	4.12 (0.91)	-	-	AB > Max(A,B)	15% ± 3%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	19% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	4% ± 2%
					A/B Effect	t (356) = 6.07***, d = 0.42 ± .14
					Mean(A,B) > AB	45% ± 5%
	A	3.82 (1.09)	21%	33%	Reverse A/B effect	t (356) = -6.07***, d = -0.42 ± .14
	B	3.96 (1.07)	36%	25%	AB > Mean(A,B)	31% ± 5%
Ventilator	AB	3.39 (1.38)	43%	42%	Experiment Aversion	t (356) = 2.63**, d = 0.17 ± .13
Proning	Mean(A,B)	3.89 (0.96)	-	-	Min(A,B) > AB	36% ± 5%
(n = 357	Min(A,B)	3.61 (1.11)	-	-	Experiment Appreciation	t (356) = -8.927***, d = -0.64 ± .16
laypeople)	Max(A,B)	4.17 (0.99)	-	-	AB > Max(A,B)	22% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	23% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	6% ± 2%
					A/B Effect	t (359) = 14.55***, d = 1.07 ± .18
					Mean(A,B) > AB	68% ± 5%
	A	4.19 (0.95)	44%	14%	Reverse A/B effect	t (359) = -14.55***, d = -1.07 ± .18
	B	3.80 (1.34)	38%	27%	AB > Mean(A,B)	21% ± 4%
Masking	AB	2.74 (1.38)	18%	59%	Experiment Aversion	t (359) = 7.63***, d = 0.56 ± .15
Rules	Mean(A,B)	4.00 (0.91)	-	-	Min(A,B) > AB	50% ± 5%
(n = 360	Min(A,B)	3.47 (1.22)	-	-	Experiment Appreciation	t (359) = -20.85***, d = -1.57 ± .22
laypeople)	Max(A,B)	4.53 (0.84)	-	-	AB > Max(A,B)	8% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	38% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	3% ± 1%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

*p < .05

**p < .01

***p < .001

Table S6C

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

		Descriptive Results			*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Clinician Sentiments About Covid-19 pRCTs						
					A/B Effect	*t* (270) = 9.00***, *d* = 0.71 ± .17
					Mean(A,B) > AB	57% ± 6%
	A	3.37 (1.26)	19%	32%	Reverse A/B effect	*t* (270) = -9.00***, *d* = -0.71 ± .17
Intubation Safety Checklist (*n* = 271 clinicians)	B	3.90 (1.12)	53%	14%	AB > Mean(A,B)	23% ± 5%
	AB	2.74 (1.49)	28%	54%	Experiment Aversion	*t* (270) = 3.98***, *d* = 0.30 ± .15
	Mean(A,B)	3.63 (0.96)	-	-	Min(A,B) > AB	43% ± 6%
	Min(A.B)	3.14 (1.23)	-	-	Experiment Appreciation	*t* (270) =-12.70***, *d* = -1.08 ± .21
	Max(A,B)	4.12 (1.01)	-	-	AB > Max(A,B)	16% ± 4%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	28% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	6% ± 2%
					A/B Effect	*t* (274) = 6.59***, *d* = 0.52 ± .17
					Mean(A,B) > AB	48% ± 6%
	A	3.76 (1.10)	28%	28%	Reverse A/B effect	*t* (274) = -6.59***, *d* = -0.52 ± .17
Best Corticosteroid Drug (*n* = 275 clinicians)	B	3.74 (1.09)	23%	26%	AB > Mean(A,B)	27% ± 5%
	AB	3.04 (1.56)	49%	46%	Experiment Aversion	*t* (274) = 6.18***, *d* = 0.49 ± .17
	Mean(A,B)	3.75 (1.08)	-	-	Min(A,B) > AB	46% ± 6%
	Min(A,B)	3.71 (1.11)	-	-	Experiment Appreciation	*t* (274) = -6.93***, *d* = -0.55 ± .17
	Max(A,B)	3.79 (1.08)	-	-	AB > Max(A,B)	26% ± 5%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	34% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	15% ± 4%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

**p* < .05

***p* < .01

****p* < .001

Table S6C, continued

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Clinician Sentiments About Covid-19 pRCTs						
Masking Rules (*n* = 349 clinicians)					A/B Effect	*t* (348) = 16.50***, *d* = 1.27 ± .20
					Mean(A,B) > AB	72% ± 5%
	A	4.19 (1.05)	39%	15%	Reverse A/B effect	*t* (348) = -16.50***, *d* = -1.27 ± .20
	B	4.01 (1.24)	44%	22%	AB > Mean(A,B)	16% ± 3%
	AB	2.61 (1.41)	17%	62%	Experiment Aversion	*t* (348) = 9.72***, *d* = 0.74 ± .17
	Mean(A,B)	4.10 (0.88)	-	-	Min(A,B) > AB	57% ± 5%
	Min(A,B)	3.58 (1.20)	-	-	Experiment Appreciation	*t* (348) = -22.58***, *d* = -1.74 ± .24
	Max(A,B)	4.62 (0.82)	-	-	AB > Max(A,B)	6% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	43% ± 5%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	2% ± 1%
Best Vaccine (*n* = 1254 clinicians)					A/B Effect	*t* (1253) = 2.50*, *d* = 0.10 ± .07
					Mean(A,B) > AB	35% ± 3%
	A	3.56 (1.17)	27%	28%	Reverse A/B effect	*t* (1253) = -2.50*, *d* = -0.10 ± .07
	B	3.40 (1.18)	17%	39%	AB > Mean(A,B)	34% ± 3%
	AB	3.36 (1.38)	56%	33%	Experiment Aversion	*t* (1253) = -0.89, *p* = .375, *d* = -0.03 ± .07
	Mean(A,B)	3.48 (1.09)	-	-	Min(A,B) > AB	29% ± 2%
	Min(A,B)	3.32 (1.18)	-	-	Experiment Appreciation	*t* (1253) = -5.49***, *d* = -0.22 ± .08
	Max(A,B)	3.64 (1.16)	-	-	AB > Max(A,B)	30% ± 2%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	20% ± 2%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	20% ± 2%

Note. The A/B Effect refers to the difference between the average rating of the two interventions and the rating of the A/B test. Mean(A,B) > AB is the percentage of people whose average intervention rating was higher than their rating of the A/B test. The Reverse A/B Effect refers to difference between the rating of the A/B test and the average rating of the two interventions. AB > Mean(A,B) is the percentage of people who rating of the A/B test was higher than their average intervention rating. Experiment Aversion refers to the difference between the rating of the A/B test and the lowest-rated intervention. Min(A,B) > AB is the percentage of people whose lowest-rated intervention is rated higher than their rating of the A/B test. Experiment Appreciation refers to the difference between the rating of the highest-rated intervention and the rating of the A/B test. AB > Max(A,B) is the percentage of people whose rating of the A/B test is higher than the rating of their highest-rated intervention. Experiment Rejection is the percentage of people who rated interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate. Experiment Endorsement is the percentage of people who rated the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate.

*p < .05
**p < .01
***p < .001

Comparisons to previously published work

To compare these results to our previous findings reporting sentiments about experiments, as we do in the main text, please refer to Heck et al. (2020) [4]. For example, in the Results section "Lay Sentiments About pRCTs," we say, "these levels of experiment aversion near the height of the pandemic were slightly (but not significantly) higher than those we observed among similar laypeople in 2019 (41% ± 5% in 2020 vs. 37% ± 6% in 2019 for Catheterization Safety Checklist, *p* = .31 ; 44% ± 5% in 2020 vs. 40% ± 6% in 2019 for Best Anti-Hypertensive Drug, *p* = .32)." We extracted the percentage of participants who were experiment averse in 2019 from Heck et al. (2020) [4]. We then performed a two-sample z-test for proportions to compare the 2019 and 2020 proportions. As noted in the main text, we did not find a significant difference between the percentage of people who were experiment averse in 2019 and the percentage of people who were experiment averse in the current studies which took place in 2020 and 2021 (Catheterization Safety Checklist: $\chi^2(1) = 1.034$, *p* = .309, Anti- Hypertensive Drug: $\chi^2(1) = 0.998$, *p* = .318).

Results not presented in the main text

Results of Best Vaccine vignette (initial ambiguous version)

The only vignette which showed no A/B Effect was the initial ambiguous version of Best Vaccine (see Table S6D). The two versions of Best Vaccine both presented a public health official's decision to either distribute an mRNA-based vaccine to every county in their state, distribute an inactivated-virus vaccine to every county, or run an experiment in which counties are randomized to receive one of the two vaccine types. However, in version 1, the wording unintentionally implied that residents could choose their vaccine (by going elsewhere) if they did not wish to be subject to the official's decision (including intervention implementation or A/B test), while in version 2 we eliminated this possible interpretation; we suspect this had the effect of making the experiment condition in version 1 less aversive, since people could effectively opt- out of it, and our goal in this research is to study pragmatic, real-world situations in which avoiding randomization is typically not a realistic option.

Table S6D

Descriptive and inferential results of ratings and rankings of interventions and experiment for all vignettes

Descriptive Results					*Inferential Results*	
Vignette	**Variable**	**Mean (SD)**	**% Ranking Best**	**% Ranking Worst**	**Test Description**	**Test Outcome**
Best Vaccine (initial ambiguous version; *n* = 350 laypeople)					A/B Effect	*t* (349) = -0.72, *p* = .473, *d* = -0.05 ± .15
					Mean(A,B) > AB	33% ± 5%
	A	3.58 (1.08)	21%	29%	Reverse A/B effect	*t* (349) = 0.72, *p* = .473, *d* = 0.05 ± .15
	B	3.47 (1.10)	21%	40%	AB > Mean(A,B)	45% ± 5%
	AB	3.59 (1.37)	58%	31%	Experiment Aversion	*t* (349) = -2.28*, *d* = -0.17 ± .15
	Mean(A,B)	3.53 (1.02)	-	-	Min(A,B) > AB	29% ± 5%
	Min(A,B)	3.38 (1.11)	-	-	Experiment Appreciation	*t* (349) = -0.84, *p* = .399, *d* = -0.07 ± .15
	Max(A,B)	3.67 (1.05)	-	-	AB > Max(A,B)	40% ± 5%
					Experiment Rejection (A,B = 3,4,5; AB = 1,2)	21% ± 4%
					Experiment Endorsement (AB = 4,5; A,B = 1,2,3)	24% ± 4%

Order effect in clinician study

For the clinician study of the Catheterization Safety Checklist, Best Anti-Hypertensive Drug, and Masking Rules vignettes, participants were randomly assigned to one of these three vignettes and then completed the remaining two vignettes in random order. For consistency with the rest of this project and with our previous approach (Meyer et al., 2019) [3], we analyze data from this study as a between-subjects design where we only consider the first vignette that every participant completed.

While conducting an interim analysis on the data for this study, we observed an intriguing and unexpected order effect of presentation.

For the first 601 complete responses we received, we observed an effect of presentation order on participants' appropriateness ratings of the A/B test condition within the Best Anti-Hypertensive Drug vignette. Participants who received the Best Anti-Hypertensive Drug vignette first rated the A/B test an average of 2.95 (SD = 1.57), participants who received this vignette second rated the A/B test an average of 3.48 (SD = 1.39), and participants who received this vignette last rated the A/B test an average of 3.78 (SD = 1.41). This suggests that participants who read about other policies and A/B tests before considering the Best Anti-Hypertensive Drug vignette found the A/B test in the Best Anti-Hypertensive Drug vignette to be less objectionable than participants who received this vignette earlier in the survey. The relationship between presentation order (1, 2, or 3) and appropriateness rating of the A/B test was *r* = .23. This order effect did not emerge for the other two vignettes or for ratings of either intervention (A or B).

After observing this order effect but before examining any additional data, we preregistered this order effect with the goal of replicating it in an independent sample. 294 new participants completed the study after this interim analysis, and we analyzed the data from this sample independently from the sample that generated the order effect. Table S7 displays ratings of the A/B condition within each scenario grouped by the order in which participants received them.

The order effect observed with the Best Anti-Hypertensive Drug A/B test condition replicated (r = .15), as did the absence of any similar order effect for the other conditions.

Table S7

Ratings of A/B test in Clinician Sample

Exploratory Sample (N = 601)	**Best Corticosteroid Drug A/B Rating (SD)**	**Intubation Safety Checklist A/B Rating (SD)**	**Masking Rules A/B Rating (SD)**
Target Scenario First	2.95 (1.57)	2.79 (1.49)	2.63 (1.43)
Target Scenario Second	3.48 (1.39)	2.53 (1.35)	2.66 (1.44)
Target Scenario Last	3.78 (1.41)	2.78 (1.38)	2.57 (1.29)

Confirmatory Sample (N=294)	**Best Corticosteroid Drug A/B Rating (SD)**	**Intubation Safety Checklist A/B Rating (SD)**	**Masking Rules A/B Rating (SD)**
Target Scenario First	3.22 (1.54)	2.63 (1.50)	2.58 (1.38)
Target Scenario Second	3.49 (1.51)	2.76 (1.39)	2.38 (1.42)
Target Scenario Last	3.77 (1.33)	2.69 (1.15)	2.51 (1.38)

Heterogeneity in experiment aversion

In both the lay participant sample and the clinician sample, associations between demographic variables, including educational attainment, having a degree in a STEM field, years of experience in the medical field, and role in the healthcare system, and sentiment about pRCTs (e.g., A/B effect, experiment aversion, experiment appreciation) are consistently small (r < |.13|, therefore explaining less than 2% of the variance; Tables S8–11).

In the lay sample, women show larger AB and experiment aversion effects (e.g., larger difference between mean intervention rating/lowest-rated intervention rating and AB test rating; r = .067–.068, p < .001) and a smaller experiment appreciation effect (e.g., smaller difference between AB test and highest-rated intervention rating; r = –.064, p < .001). Lay participants who are more conservative (in general and with respect to social and economic issues) or more likely to be strong Republicans show lower levels of an AB effect and experiment aversion (i.e., smaller difference between mean intervention rating/lowest-rated intervention rating and AB test rating; all rs < –.094, ps < .0001). These participants also show significantly more experiment appreciation, though the strength of the association is weaker (rs = .037–.046, p < .0001).
Finally, we find that people who are non-religious show a larger degree of experiment aversion (r = .061, p < .001; they also show a larger AB effect, r = .051, but p = .007 which is greater than p < .005, the standard proposed in Benjamin et al. (2018)[17] for exploratory analyses without a priori hypotheses). For all other variables, we find no significant associations between the individual difference measures and experiment sentiments (all rs < |.051|, all ps > .005).

In the clinician sample, the strongest association was between self-reported comfort with research methods and statistics and experiment aversion—clinicians who report being more comfortable with research methods and statistics are more likely to appreciate the A/B test (r = .070, p = .001).

Table S8

Correlations between lay participant characteristics and sentiments about experiments

	Size of A/B effect		A/B effect		Size of experiment aversion		Experiment aversion		Experiment rejection		Size of experiment appreciation		Experiment appreciation		Experiment endorsement	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Age	-0.008	0.662	-0.020	0.286	-0.020	0.270	-0.038	0.043	-0.046	0.012	-0.004	0.809	-0.016	0.389	-0.033	0.073
Sex (1 = male, 2 = female)	0.068	<.001	0.048	0.010	0.067	<.001	0.039	0.035	0.059	0.002	-0.064	<.001	-0.071	<.001	-0.036	0.053
Race (0 = all other, 1 = Nonhispanic White)	-0.004	0.814	-0.017	0.360	-0.001	0.945	-0.016	0.388	0.003	0.867	0.007	0.706	0.001	0.937	-0.012	0.533
Education	0.047	0.011	0.033	0.075	0.049	0.008	0.051	0.006	0.029	0.114	-0.042	0.024	-0.023	0.216	-0.019	0.298
Income	0.020	0.293	0.005	0.787	0.020	0.273	0.011	0.571	0.005	0.777	-0.017	0.353	-0.025	0.184	-0.026	0.158
Political Ideology (1 = Very Liberal, 5 = Very Conservative)	-0.114	< .0001	-0.087	< .0001	-0.118	< .0001	-0.101	< .0001	-0.091	< .0001	0.101	< .0001	0.043	0.022	0.045	0.015
Political Ideology (Social) (1 = Very Liberal, 5 = Very Conservative)	-0.123	< .0001	-0.099	< .0001	-0.128	< .0001	-0.118	< .0001	-0.106	< .0001	0.109	< .0001	0.039	0.036	0.052	0.005
Political Ideology (Economic) (1 = Very Liberal, 5 = Very Conservative)	-0.094	< .0001	-0.065	<.001	-0.095	< .0001	-0.082	< .0001	-0.073	< .0001	0.085	< .0001	0.046	0.013	0.040	0.031
Political Party (1 = Strong Democrat, 7 = Strong Republican)	-0.096	< .0001	-0.073	< .0001	-0.098	< .0001	-0.075	< .0001	-0.075	< .0001	0.087	< .0001	0.037	0.050	0.035	0.063
Conservatism (mean of z-scored Political Ideology, Political Ideology (Social), Political Ideology (Economic), and Political Party)	-0.117	<.0001	-0.089	< .0001	-0.121	< .0001	-0.103	< .0001	-0.095	< .0001	0.105	< .0001	0.045	0.015	0.047	0.012
Non-religious (0 = Religious (any religion), 1 = non-religious)	0.051	0.007	0.027	0.150	0.061	<.001	0.049	0.009	0.046	0.015	-0.036	0.053	-0.013	0.496	-0.021	0.266
STEM degree (0 = no, 1 = yes)	0.023	0.208	0.016	0.399	0.027	0.154	0.026	0.157	0.027	0.142	-0.019	0.318	0.016	0.403	0.024	0.205

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S9

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Sex											
Male	0.479	1.620	45.6	0.183	1.650	35.7	23.2	-0.775	1.730	25.0	9.8
Female	0.703	1.630	50.4	0.408	1.680	39.5	28.4	-0.998	1.710	19.1	7.8
Other	0.571	1.880	28.6	0.429	1.810	28.6	28.6	-0.714	1.980	28.6	0.0
Prefer not to answer	0.900	1.880	60.0	0.800	1.920	40.0	20.0	-1.000	1.870	20.0	0.0
Race											
Black/African-American	0.504	1.597	49.8	0.149	1.647	37.2	21.8	-0.858	1.681	21.5	9.6
Hispanic or Latino	0.692	1.646	50.2	0.429	1.675	38.8	28.8	-0.954	1.726	20.1	7.8
White	0.601	1.631	47.7	0.309	1.671	37.2	26.2	-0.893	1.724	21.7	8.4
Asian	0.594	1.634	47.1	0.296	1.645	39.2	26.1	-0.892	1.757	23.2	10.5
Other	0.679	1.730	48.7	0.256	1.831	38.5	23.1	-1.103	1.818	25.6	5.1
Prefer not to answer	1.200	1.623	60.0	0.933	1.624	40.0	33.3	-1.467	1.767	13.3	6.7
Education											
Less than high school	1.580	1.440	75.0	1.330	1.610	58.3	41.7	-1.830	1.400	0.0	0.0
High school degree	0.403	1.550	42.2	0.093	1.650	30.6	22.0	-0.713	1.610	20.9	9.0
Some college	0.524	1.690	47.5	0.216	1.720	36.3	25.2	-0.831	1.790	24.2	10.2
Four-year college degree	0.643	1.620	48.7	0.361	1.650	38.4	26.7	-0.925	1.710	21.4	8.0
Some graduate school	0.673	1.600	50.0	0.379	1.640	37.9	28.2	-0.968	1.700	20.2	6.5
Graduate degree	0.713	1.590	50.6	0.419	1.620	41.7	27.8	-1.010	1.690	19.8	8.2
Prefer not to answer	0.750	1.720	50.0	0.667	1.750	33.3	16.7	-0.833	1.720	16.7	0.0
Income											
< $20,000	0.672	1.570	47.8	0.380	1.650	37.7	26.8	-0.964	1.640	17.4	6.9
$20,000-$40,000	0.480	1.700	46.6	0.215	1.730	37.1	25.0	-0.745	1.790	21.8	10.8
$40,000-$60,000	0.592	1.630	49.4	0.220	1.670	36.9	25.4	-0.930	1.750	20.5	8.9
$60,000-$80,000	0.629	1.620	49.5	0.376	1.640	38.0	27.4	-0.883	1.710	20.9	10.5
$80,000-$100,000	0.741	1.520	50.0	0.488	1.530	41.3	27.2	-0.994	1.640	18.9	6.0
> $100,000	0.608	1.620	47.2	0.302	1.680	37.5	25.7	-0.914	1.700	21.0	7.4
Prefer not to answer	0.861	1.940	47.2	0.556	2.080	38.9	36.1	-1.170	1.930	19.4	2.8
No response	-0.250	0.866	25.0	-0.500	1.000	0.0	0.0	0.000	0.816	25.0	0.0

Table S9, continued

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Political Ideology											
Very liberal	0.888	1.740	54.3	0.590	1.780	44.1	31.1	-1.190	1.830	19.8	6.1
Liberal	0.753	1.650	51.6	0.491	1.680	42.3	29.8	-1.010	1.740	20.2	8.2
Moderate	0.557	1.570	47.5	0.247	1.600	36.2	25.4	-0.867	1.670	21.1	8.1
Conservative	0.380	1.600	43.8	0.058	1.650	33.1	21.4	-0.703	1.700	25.0	11.2
Very conservative	0.307	1.520	39.0	0.026	1.570	27.7	18.6	-0.589	1.500	24.2	9.5
Prefer not to answer	0.684	1.680	57.9	0.263	1.560	31.6	21.1	-1.110	1.940	21.1	15.8
No response	0.625	0.750	50.0	0.250	0.957	50.0	50.0	-1.000	0.816	0.0	0.0
Political Ideology (Social)											
Very liberal	0.927	1.720	55.7	0.628	1.760	46.3	33.3	-1.230	1.810	19.1	5.5
Liberal	0.714	1.610	51.2	0.445	1.640	41.1	28.5	-0.983	1.710	20.9	8.2
Moderate	0.498	1.600	45.2	0.205	1.660	35.2	25.0	-0.791	1.680	22.1	9.4
Conservative	0.321	1.590	42.5	-0.016	1.630	30.6	19.8	-0.658	1.710	25.1	12.1
Very conservative	0.362	1.500	40.6	0.059	1.550	28.9	18.8	-0.665	1.590	22.6	8.0
Prefer not to answer	0.528	1.540	55.6	0.222	1.560	33.3	11.1	-0.833	1.650	16.7	11.1
No response	-1.000	NA	0.0	-2.000	NA	0.0	0.0	0.000	NA	0.0	0.0
Political Ideology (Economic)											
Very liberal	0.795	1.760	49.4	0.514	1.770	40.5	28.6	-1.080	1.870	19.9	6.7
Liberal	0.800	1.630	53.8	0.512	1.670	43.7	31.5	-1.090	1.730	18.9	7.8
Moderate	0.594	1.600	48.2	0.307	1.650	38.0	25.5	-0.882	1.670	21.4	8.4
Conservative	0.401	1.580	44.2	0.076	1.620	33.5	22.4	-0.726	1.710	25.5	10.4
Very conservative	0.435	1.600	42.9	0.165	1.650	30.7	21.7	-0.705	1.660	22.7	9.6
Prefer not to answer	0.783	1.540	65.2	0.435	1.530	39.1	21.7	-1.130	1.660	13.0	8.7
No response	-1.000	0.000	0.0	-1.500	0.707	0.0	0.0	0.500	0.707	50.0	0.0
Political Party											
Strong Democrat	0.869	1.710	54.6	0.582	1.720	43.9	28.7	-1.160	1.820	19.6	7.6
Democrat	0.701	1.630	50.7	0.411	1.690	39.7	29.9	-0.990	1.700	19.9	6.7
Independent (but lean Democrat)	0.755	1.620	51.9	0.470	1.640	42.0	29.6	-1.040	1.730	21.0	8.6
Independent	0.468	1.590	43.7	0.173	1.630	34.0	23.3	-0.762	1.670	22.1	9.2
Independent (but lean Republican)	0.437	1.720	42.4	0.144	1.730	33.9	24.7	-0.731	1.830	28.8	14.8
Republican	0.387	1.550	44.8	0.076	1.610	33.4	20.9	-0.699	1.640	22.5	8.8
Strong Republican	0.432	1.500	44.0	0.130	1.570	32.6	20.7	-0.734	1.580	21.7	7.6
Prefer not to answer	0.615	1.580	56.4	0.282	1.490	41.0	23.1	-0.949	1.790	20.5	10.3
No response	-1.000	NA	0.0	-2.000	NA	0.0	0.0	0.000	NA	0.0	0.0

Table S9, continued

Means and percentages of sentiments about experiments by demographic variable in lay participants

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Religion											
Christian - Protestant	0.515	1.620	45.9	0.212	1.680	34.9	24.3	-0.818	1.700	22.5	10.0
Christian - Catholic	0.483	1.510	46.7	0.176	1.550	34.4	21.6	-0.790	1.610	20.7	6.4
Christian - Other	0.589	1.650	48.3	0.298	1.690	37.3	25.4	-0.881	1.740	22.9	9.7
Jewish	0.868	1.720	54.7	0.453	1.840	43.4	32.1	-1.280	1.770	13.2	7.6
Muslim	0.357	1.700	45.7	-0.057	1.800	28.6	20.0	-0.771	1.780	31.4	17.1
Buddhist	0.840	1.690	54.0	0.520	1.570	48.0	32.0	-1.160	1.940	24.0	14.0
Hindu	-0.129	1.550	38.7	-0.452	1.570	29.0	16.1	-0.194	1.620	35.5	19.4
Non-religious	0.704	1.650	49.9	0.435	1.680	40.7	28.5	-0.973	1.750	21.1	8.0
Other	0.673	1.780	49.0	0.337	1.810	40.4	31.7	-1.010	1.880	22.1	8.7
Prefer not to answer	1.090	1.570	58.8	0.794	1.650	41.2	38.2	-1.380	1.600	11.8	0.0
No response	1.250	1.770	50.0	1.000	1.410	50.0	50.0	-1.500	2.120	0.0	0.0
STEM degree											
No	0.587	1.620	47.9	0.289	1.650	37.2	25.6	-0.885	1.720	21.3	8.4
Yes	0.680	1.680	49.8	0.397	1.740	40.3	28.5	-0.963	1.750	22.9	10.0
Prefer not to answer	0.400	1.510	40.0	0.200	1.510	30.0	15.0	-0.600	1.570	25.0	0.0
No response	0.250	1.060	50.0	-0.500	0.707	0.0	0.0	-1.000	1.410	0.0	0.0

Note. If there is an NA in the SD column, that indicates that there was only 1 respondent in that group so there is no variability in responses to report.

Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S10

Correlations between clinician characteristics and sentiments about experiments

	Size of A/B effect		A/B effect		Size of experiment aversion		Experiment aversion		Experiment rejection		Size of experiment appreciation		Experiment appreciation		Experiment endorsement	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Sex (1 = male, 2 = female)	0.016	0.453	0.016	0.457	0.000	0.991	-0.011	0.619	-0.021	0.326	-0.030	0.165	-0.026	0.226	-0.032	0.134
Number of research methods/statistics training units	-0.005	0.812	0.000	0.992	0.000	0.999	0.016	0.471	0.017	0.428	0.010	0.659	0.019	0.382	0.010	0.643
Comfort with research methods/statistics	-0.036	0.100	-0.018	0.410	-0.039	0.071	-0.021	0.335	-0.016	0.446	0.030	0.165	0.070	0.001	0.045	0.035
Number of research methods/statistics activities	-0.019	0.375	-0.022	0.301	-0.006	0.796	0.006	0.778	0.020	0.360	0.031	0.157	0.041	0.056	0.023	0.279
Currently involved in research	-0.002	0.912	-0.012	0.570	-0.009	0.691	-0.016	0.470	-0.022	0.309	-0.004	0.870	-0.024	0.267	0.009	0.693
Position (0 = non-prescriber, 1 = prescriber)	0.033	0.121	0.029	0.176	0.040	0.061	0.042	0.050	0.052	0.016	-0.025	0.250	-0.020	0.347	-0.021	0.338
Years in medicine	0.016	0.452	-0.004	0.865	0.011	0.599	-0.007	0.734	0.006	0.792	-0.020	0.362	0.029	0.185	-0.003	0.879

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

Table S11

Means and percentages of sentiments about experiments by demographic variable in clinician sample

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Sex											
Male	0.456	1.800	43.9	0.270	1.800	38.5	28.2	-0.642	1.890	26.5	17.2
Female	0.529	1.750	45.9	0.271	1.750	37.2	25.8	-0.786	1.890	23.6	14.2
Other	0.000	1.870	40.0	0.000	1.870	40.0	20.0	0.000	1.870	20.0	20.0
Source of research methods/statistics training											
Undergraduate coursework	0.483	1.755	44.2	0.258	1.753	37.7	26.5	-0.707	1.870	25.0	14.1
Professional school instruction	0.571	1.767	46.0	0.314	1.756	38.2	27.1	-0.828	1.916	22.8	14.7
Postgraduate coursework	0.624	1.818	49.4	0.402	1.809	41.5	29.4	-0.847	1.936	24.5	14.5
CME/CEU courses	0.463	1.788	47.1	0.217	1.767	38.6	26.6	-0.708	1.925	25.7	16.7
Self-instruction via peer-reviewed literature	0.333	1.820	41.2	0.097	1.798	32.9	23.2	-0.569	1.949	27.3	16.6
Other	0.722	1.902	46.7	0.478	1.915	41.1	32.2	-0.967	1.986	22.2	14.4
Comfort with research methods/statistics											
Not at all	0.682	1.760	45.8	0.432	1.780	37.7	26.3	-0.932	1.870	18.2	12.7
Somewhat	0.516	1.710	45.7	0.282	1.690	37.8	26.8	-0.750	1.840	22.5	14.0
Moderately	0.482	1.770	46.5	0.237	1.770	38.3	26.6	-0.727	1.880	26.8	15.1
Very	0.491	1.910	43.9	0.203	1.900	34.0	23.1	-0.778	2.070	29.2	17.9
Extremely	0.105	2.020	31.6	-0.079	2.050	28.9	23.7	-0.289	2.100	26.3	23.7
Research methods/statistics activities											
Read results of RCT in peer-reviewed journal article	0.521	1.772	45.5	0.284	1.762	38.0	27.2	-0.718	1.898	24.7	15.0
Changed typical prescription/recommendation after personally reading results of RCT in peer-reviewed journal article	0.430	1.813	43.3	0.217	1.814	36.8	26.3	-0.643	1.921	26.6	16.7
Published scientific paper in peer-reviewed journal	0.530	1.692	43.3	0.339	1.681	38.2	29.9	-0.720	1.802	22.8	13.4
Conducted or worked on a team conducting an RCT	0.371	1.745	42.9	0.114	1.725	35.1	20.9	-0.628	1.902	25.8	16.3
Took a course/class in statistics, biostatistics, research methods	0.505	1.775	45.0	0.277	1.770	37.8	27.3	-0.732	1.892	25.4	15.2
Analyzed data for statistical significance outside of course requirement	0.470	1.781	43.7	0.251	1.766	36.7	26.2	-0.690	1.912	26.2	15.4
Used statistical software	0.588	1.803	49.3	0.389	1.795	42.5	31.7	-0.787	1.915	26.7	14.9

Table S11, continued

Means and percentages of sentiments about experiments by demographic variable in clinician sample

	Size of A/B effect		A/B effect	Size of experiment aversion		Experiment aversion	Experiment rejection	Size of experiment appreciation		Experiment appreciation	Experiment endorsement
	mean	SD	%	mean	SD	%	%	mean	SD	%	%
Currently involved in research											
Yes	0.526	1.740	47.4	0.316	1.720	39.7	29.2	-0.767	1.860	27.3	13.9
No	0.512	1.760	45.3	0.265	1.760	37.2	25.9	-0.769	1.890	23.8	14.9
Position											
Doctor	0.556	1.730	45.5	0.374	1.720	39.9	28.7	-0.768	1.840	23.1	13.7
Physician Assistant	0.757	1.780	53.0	0.508	1.780	44.3	34.4	-1.070	1.890	21.9	13.1
Nurse Practitioner	0.500	1.910	45.9	0.184	1.970	36.7	25.5	-0.816	2.030	23.5	14.3
Nurse (RN)	0.436	1.720	43.8	0.181	1.720	35.2	23.9	-0.630	1.850	25.3	15.1
Nurse (LPN)	0.410	1.790	42.1	0.150	1.760	33.5	22.6	-0.669	1.960	24.8	17.3
Nurse (Other)	1.180	1.910	65.0	0.800	1.910	55.0	35.0	-1.550	2.060	10.0	10.0
Genetic Counselor	---	---	---	---	---	---	---	---	---	---	---
Non-prescribing clinician or staff without clinical credential	---	---	---	---	---	---	---	---	---	---	---
Medical student	1.170	1.770	65.2	0.935	1.790	56.5	45.7	-1.430	1.830	15.2	8.7
Faculty or Professor	1.120	2.050	62.5	0.875	2.030	50.0	37.5	-1.380	2.200	25.0	12.5
Other	0.727	2.000	45.5	0.618	1.980	41.8	32.7	-0.836	2.060	25.5	16.4
Years in medical field											
< 1 year	0.582	1.540	47.5	0.377	1.540	39.3	32.8	-0.787	1.660	24.6	8.2
1-2 years	0.560	1.720	48.4	0.333	1.710	41.3	29.4	-0.786	1.840	23.8	14.3
3-5 years	0.392	1.570	44.8	0.140	1.570	36.0	21.3	-0.643	1.690	23.4	13.6
6-10 years	0.423	1.730	43.3	0.205	1.760	36.5	24.6	-0.621	1.830	26.4	15.1
> 10 years	0.555	1.820	45.9	0.303	1.810	37.5	27.1	-0.807	1.950	23.7	15.3

Note. Size of the A/B effect refers to the magnitude of the difference between the mean intervention rating and the A/B test rating. A/B effect refers to the presence or absence of an A/B effect -- people who have a positive difference between their mean intervention rating and their A/B test rating show the A/B effect, people who have no difference or a negative difference between their mean intervention rating and their A/B test rating do not show an A/B effect. Size of experiment aversion refers to the magnitude of the difference between the worst intervention rating and the A/B test rating. Experiment aversion refers to the presence or absence of experiment aversion -- people who have a positive difference between their rating of their least-preferred intervention and their A/B test rating are experiment averse, people who have no difference or a negative difference are not experiment averse. Experiment rejection refers to the presence or absence of experiment rejection -- people who rate interventions A and B as "neither inappropriate nor appropriate" or more appropriate while rating the A/B test as "very" or "somewhat" inappropriate reject the experiment. Size of experiment appreciation refers to the magnitude of the difference between the A/B test rating and the best intervention. Experiment appreciation refers to the presence or absence of experiment appreciation -- people who have a positive difference between their rating of the A/B test and their rating of their most-preferred intervention are experiment appreciative. Experiment endorsement refers to the presence or absence of experiment endorsement -- people who rate the A/B test as "very" or "somewhat" appropriate while rating interventions A and B as "neither inappropriate nor appropriate" or less appropriate endorse the experiment.

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Aversion to pragmatic randomized controlled trials: Three survey experiments with clinicians and laypeople

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	6-8
Objectives	3	State specific objectives, including any prespecified hypotheses	9
Methods			
Study design	4	Present key elements of study design early in the paper	9-14
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	9, 13-14
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	9, 13-14
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	13
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9-14
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	SM 3-4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	13
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	SM 7
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	N/A

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9, 13-14
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	SM 14-18, SM 28-35
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	14-18 SM 21-25
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	SM 26-35
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20-22
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18-20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20-22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	27

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at

http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.