STAYING HEALTHY HAPPY & VACCINATED

Duke UNIVERSITY | CENTER FOR ADVANCED HINDSIGHT

2022 HEALTH REPORT

ABOUT THIS REPORT

Everybody is tired of the pandemic. At the start of the pandemic, everybody was sick with COVID-19; now, everybody is sick of COVID-19. We all wish it were over. But it isn't.

So we need to keep fighting. In 2021, we published a report titled Staying Healthy and Happy in Tough Times: Lessons from the Coronavirus Pandemic. It's still tough times. So we're calling our 2022 report "Staying Happy, Healthy, and Vaccinated," to reflect that many challenges related to the pandemic are still with us.

Please cite the report as follows

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Terminology

When talking about people from historically marginalized populations, the language that we use matters.

Several of our studies focus in particular on individuals from the Hispanic/Latine community. There's considerable disagreement on the appropriate terminology to use to describe this group, with Hispanic, Latino, Latinx, and Latine all being suggested options. We have chosen Hispanic/Latine to aim for maximum inclusivity.

Hispanic tends to be the term most preferred by the community overall, while Latine is a gender-neutral form of Latino popular among LGBTQ+ groups that avoids some of the issues with the alternative gender-neutral term Latinx. By using both terms, we hope to take an intersectional lens that respects a community's right to self-label but also the diversity of experiences and perspectives within that group.

Online survey platforms

Some of the studies in the report were conducted with people who signed up to take studies online via two platforms: MTurk or Prolific. Throughout the report, we refer to these platforms as "online survey platforms."

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INTRODUCTION

There's nowhere else quite like the Center for Advanced Hindsight.

Our approach to research represents a unique intersection between the methods of academia and industry.

Behavioral science practitioners typically use established rules about how human beings think and act to swiftly develop solutions that work across as many different situations and behaviors as possible. On the other hand, academic research labs usually invest years to gain world-class expertise in a single phenomenon.

At the Center, we believe that making an impact on health requires combining the rigor of academic research with the real-world impact of practice. That means we study decision-making in the laboratory to test research-based theories under controlled conditions. We then use our findings to design interventions that are specific to the behaviors we wish to change, and deploy them in the field for real-world change.

In this report, we'll be sharing some of our work to demonstrate exactly how we combine high-quality, novel scientific research with agile, tailored interventions. We'll also be sharing some of the lessons we've learned along the way, including these three principles that lie at the heart of our work:

Principle #1: The barriers that prevent healthy choices and the facilitators that encourage them don't look the same for everyone.

Principle #2: The difference in people's individual journeys to our desired behaviors means we have to use research—both others' and our own—to ensure we're targeting the right levers.

Principle #3: Details always matter—there's no one-size-fits-all approach to behavior change.

Principle #1: Barriers and facilitators differ

When people don't engage in a behavior even though it's good for them, it's usually due to **barriers**. For example, exercise takes time, often feels physically unpleasant, might require specialized equipment, and has few immediate benefits. When people do manage to work out, they're likely motivated by **facilitators**: the long-term health impacts of exercise, feelings of wellbeing or triumph that arise afterward, or even the simple existence of a long-term habit.

> **What people often miss, however, is that that trade-off can look very different from person to person.**

For just about any health behavior, there's a complicated trade-off between barriers and facilitators that ultimately determines what choice someone will make. What people often miss, however, is that that trade-off can look very different from person to person. In our research on COVID-19 booster shots, we identified many reasons why people might not have received their boosters. Some of our participants held intense anti-vaccination beliefs to the point of considering the COVID-19 vaccine a scam—a strong barrier that would be very difficult to overcome. Others were actually pro-vaccination

but simply hadn't prioritized getting a booster shot yet—a lack of strong facilitators. To lump these two groups together just because neither had received their boosters would be to miss critically important differences that could drive intervention design.

What people often miss, however, is that that trade-off can look very different from person to person. Barriers and facilitators can also differ at the level of sociodemographic factors, when subgroups of the population experience the same behavior in radically different ways. Our work investigating attitudes toward the COVID-19 and flu vaccines over time found considerable differences between Black, White, and Hispanic/Latine Americans. Even when vaccination rates were similar, factors like racial discrimination in healthcare and perceived personal risk from COVID-19 showed that different ethnic groups had to make very different trade-offs in their health decisions. On the facilitator side, we're also looking at how health messages that are based on faith might be a great way to reach people we don't often see in online samples or doctors' offices. Reframing health behaviors as a way to uphold cherished values like religion can provide some much-needed emotional motivation for people to change their lives.

Reframing health behaviors as a way to uphold cherished values like religion can provide some much-needed emotional motivation for people to change their lives.

Principle #2: Interventions require behavioral thinking and research

One common issue we face is the assumption that unhealthy behaviors are just a problem of information. It's easy to assume that if people knew how important exercise was for health, they'd never miss a day in the gym. Time and again, however, just providing basic information or education fails to change behavior.

This is a direct function of how complex people's barriers and facilitators can be. We can't assume we know why people make the choices they do. Instead, we need to design interventions that are based on scientifically established theories and best practices and test them with rigor and care before deploying them in the field.

Our work on daily habit-building with paired incentives is a great example of how that process unfolds. Making people's payment contingent on a partner's behavior combines pre-existing research on

social and financial incentives to create something both theory-backed and genuinely new. Before this intervention went to the field, we ran multiple lab studies, refining its design to target as many facilitators as possible.

In practice, many people are reluctant to deploy interventions like this because of the concern they'll feel overly heavy-handed. Common sense would dictate that people don't really like being told what to do. Yet when we investigated that possibility directly in our work on sedentary behavior, we found the opposite. It didn't matter whether we gave people a choice between interventions or enforced which one they received—in both cases, they took more breaks at work. Interestingly enough, the people who weren't given a choice took even longer breaks!

> **Common sense would dictate that people don't really like being told what to do.**

Another thing we've learned from past research is how hard it is to make a behavior change that sticks. Most interventions will work for at least a little while, but lasting change can be tougher without repeating the intervention again and again. Our study on healthcare provider training offers an alternative: If you can give people the skills they need to spot misinformation, they'll be better equipped to deal with any conspiracy theory they encounter down the line.

Principle #3: Details always matter

Even when an intervention is directly based on prior research, it still needs to be tested carefully. The slightest change in context, userbase, or behavior can have extensive repercussions.

A wealth of research has suggested that letting people customize chatbots makes the chatbots more likable. When we looked into the impact of customization on responses to a chatbot, we did find that people made their chatbots more similar to themselves—but that didn't mean they liked them more! Does this mean that the existing research is wrong? Probably not—it just means the story is more complicated than we know.

> **The slightest change in context, userbase, or behavior can have extensive repercussions.**

Our work on medication adherence similarly suggests that, while scientists have some good ideas on how to encourage people to take their pills, there's room to improve. Specifically, interventions shouldn't rely on single concepts like reminders or incentives in isolation. Yet when we built a

behaviorally informed medication adherence program incorporating multiple strategies into a single platform, we found that people reacted poorly to it. It turned out the specifics of the messages were critical; some participants even had issues with the light-hearted jokes we mixed in!

Lessons learned

The studies we've discussed so far demonstrate just how wide-ranging our work is—in settings from the lab to the field, and on outcomes from vaccination uptake to sedentary behavior. Providing solutions to these kinds of complex issues in real time isn't easy. To make it work, we've had to figure out how to combine academia's devotion to truly understanding the roots of behavior with industry's need for swift, practical solution design.

The lessons we've learned along the way have become the foundation of that fusion. Here at the Center, we believe that people take many different journeys to health, with their own barriers and facilitators; the complexity of their motivation requires stronger, smarter solutions; and every little detail of intervention design matters.

As you read this report and learn more about the research we've conducted recently, we hope you'll come to agree.

1 GETTING VACCINATED

GETTING VACCINATED

Most problems don't have a "silver bullet" solution. In the case of COVID-19, however, vaccines can have a tremendous impact. There's just the question of getting people to actually get the vaccine. This challenge was a call to arms for the health team at the Center, given our long history of research on vaccine hesitancy before COVID-19.

Much of our pre-COVID-19 vaccine research focused on people who generally supported vaccination but hadn't translated their positive attitudes into behavior. For example, one set of studies used cognitive dissonance[1]—the tension between one's actions and beliefs—to increase vaccination uptake. Another intervention focused on using public accountability[2] to increase vaccination intentions.

But the COVID-19 vaccine presented unique challenges: Misinformation, politicization, and the very novelty of the vaccine have all contributed to unprecedented levels of vaccine hesitancy. Additionally, in this situation we're not dealing with pre-existing attitudes toward long-established vaccines like the flu shot. Instead, we're witnessing the creation of new beliefs about vaccines in real time—and working to shape them as well.

With this shift, we've adjusted our approach to study how people form beliefs about vaccination and the importance of early intervention to change them.

On the following page, we've outlined some of the questions and issues we explore in each of the studies in this section.

Do targeted messages increase COVID-19 and flu vaccine uptake?

There are many different reasons why people might hesitate to get vaccinated. Some reasons, like conspiracy theories and misinformation, apply across wide swaths of society. Others, however, are group-specific. For example, Black Americans have faced a long history of medical discrimination—making it difficult to trust that doctors always have their best interest in mind. Messages to encourage vaccination will only succeed if they can address all of the different barriers to vaccination. In this study, we created tailored messages to increase flu vaccination for Black Americans, people who were vaccine hesitant, and people who had already gotten a COVID-19 vaccine. Does tailored messaging focusing on fairness, risk, and consistent behavior, respectively, increase intentions to vaccinate? Read more on page 12.

What do people think about COVID-19 booster shots?

Most vaccines require a booster shot every five years or so at most. The COVID-19 vaccine's requirement for multiple boosters in a much shorter time period might have serious implications for people's perception of its usefulness and value. To understand how the existence of COVID-19 booster shots might impact their uptake, we tested different persuasive messages such as comparing booster shots to the flu, providing basic information about boosters, and encouraging vaccinated people to be consistent by getting boosted. Our initial findings surprised us, leading to a second study trying out some very different approaches. Read more on page 17.

What type of training makes it easier for healthcare providers to talk to patients about misinformation and vaccines?

Physician recommendations are one of the best ways to increase vaccination; however, providers might not always feel confident in their ability to convince patients who have been exposed to vaccine misinformation. This study explores different methods of teaching healthcare providers about misinformation so they can better address patient concerns. What type of training will work best? Traditional training? Gamified training? Read more on page 26.

Creating targeted messaging to increase COVID-19 and flu vaccine uptake

BACKGROUND

The COVID-19 vaccines represent a triumph of medical science. But the vaccines' unprecedented speed of development and testing have generated considerable vaccine hesitancy, despite continued assurance by various public health authorities that they are safe and effective.

Reasons for COVID-19 vaccine hesitancy differ substantially across ethnicity. Several studies[3,4,5] have shown that COVID-19 vaccine hesitancy rates were higher among Black and Hispanic/Latine Americans during early vaccine rollout, citing reasons such as lack of trust, lack of health insurance, and financial concerns. These differences pose considerable challenges for the uptake of COVID-19 vaccines as well as others, such as the flu vaccine.

We partnered with the Centene Center for Health Transformation to create messaging strategies that addressed vaccine hesitancy concerns specific to different populations. The messaging strategies were based on learnings from a survey we ran that looked at the relationship between COVID-19 and flu vaccine beliefs and behaviors.

> **...the vaccines' unprecedented speed of development and testing have generated considerable vaccine hesitancy, despite continued assurance by various public health authorities that they are safe and effective.**

KEY INSIGHTS

Across our two surveys, we asked participants about the perceived risk of COVID-19, questions about flu vaccination status, intention, and trust, as well as the impact of racial discrimination on healthcare services. The surveys led to the following insights:

- **People who aren't vaccinated perceive the viruses as less risky and don't feel that the vaccines will reduce their risk of infection.** Our surveys found that people who aren't vaccinated perceive both the COVID-19 and flu viruses as less risky, with no benefit from either of the vaccines.
- **Medical discrimination partially explains lower vaccine uptake among Black Americans.** Our surveys indicated that low vaccine uptake seen in Black Americans was partially explained by higher perceived frequency of medical discrimination and the perception that their race negatively impacts their ability to access good health-care services.

- **COVID-19 and flu vaccine attitudes and behaviors are positively related.** Our surveys showed that greater COVID-19 vaccination intentions, being vaccinated for COVID-19, and having favorable attitudes toward the COVID-19 vaccine had a significant positive influence on flu shot intentions and uptake.

- **A higher perceived risk of COVID-19 partly explains why Hispanic/Latine Americans are more likely to be vaccinated against COVID-19.** Our surveys found that Hispanic/Latine Americans perceive the COVID-19 virus as most risky compared to the other racial groups. These differences explained the reason for high vaccine uptake among Hispanic/Latine Americans.

EXPERIMENT

Based on these key insights, we created messaging strategies to increase COVID-19 vaccine uptake. The messages were sent in January 2022 to approximately 3,400 Marketplace health insurance members who were randomly assigned to read a message or a no-message control condition.

Condition name	Target	Message theme
Risk & Regret	Americans who are hesitant about the COVID-19 vaccine	Risk perception and anticipated regret
Fairness & Norms	Black Americans who are hesitant about the COVID-19 vaccine	Racial discrimination, fairness, and social norms
COVID-Flu Connection	Americans who have received the COVID-19 vaccine	Leveraging the COVID-flu connection

Please refer to the message examples on the following page.

Risk & Regret

Every decision we make in life has its own risks and rewards—especially when we're talking about health. Some people worry about the COVID-19 vaccine because, like any medical treatment, it has a small chance of side effects. People who aren't vaccinated yet tend to think they're choosing between the risks of vaccination and the safety of doing nothing at all.

But that's not true. Doing nothing means taking on the risks of COVID-19—and that's a lot scarier. Even young, healthy people have ended up so sick from COVID that they have to fight for every breath. Even those that make it through don't always recover. A year or more after catching COVID-19, some "long haulers" have to fight just to get out of bed.

So which risk would you choose to take? Take the vaccine... and you might end up with symptoms like a minor cold or fever. Skip the vaccine… and you might end up in the ICU—or in a coffin.

Don't spend your last words begging others not to make the same mistake you did. Choose the safer path and get vaccinated today.

Fairness & Norms

It's easy to see why some Black Americans might distrust the medical system. Looking back at history, there are many terrible stories where Black Americans paid the cost for medical breakthroughs without getting the benefits in return.

But the COVID-19 vaccine is different. The team that designed it was led by Dr. Kizzmekia Corbett, a Black scientist. It was tested by a diverse group of people to make sure it was safe and effective for everybody. And Black Americans, who are dying from COVID-19 at twice the rate of White Americans, need its protection as much as anybody.

More than 12 million Black Americans have already gotten the COVID-19 vaccine, and more are doing so every day. It's time to join them in moving toward a new chapter where medical breakthroughs are shared equally with everyone.

Covid-Flu Connection

How worried are you about the flu season this year?

Probably not very, huh? People think the flu just isn't a serious disease. But some people said the same thing about COVID-19—before it killed over 700,000 Americans.

Now, the flu isn't as deadly as COVID-19. But it can still put healthy people in the hospital, or even kill them. And getting protected against it is even easier than getting protected against COVID-19. A single shot gives you much better odds of getting through this flu season without getting sick.

You've already shown you're a person who makes the right choices about your health. Reaffirm your commitment to protecting yourself and others by getting your flu shot today.

After reading the passage, participants were asked to rate the passage for its accuracy, helpfulness, clarity, offensiveness, relevance to them, believability, trustworthiness, and previous consideration of the message of the passage.

RESULTS

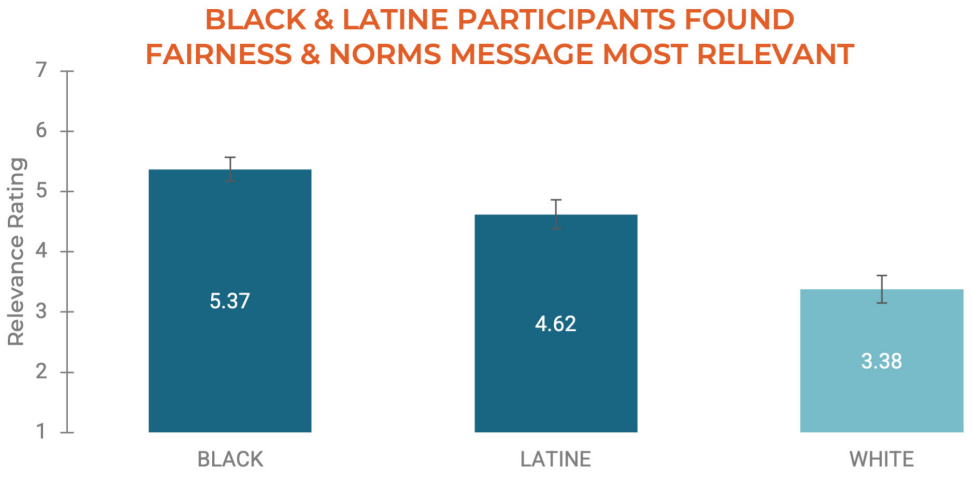
The different messages had no significant effects on COVID-19 vaccine intentions. Looking closer revealed that the participants had strong feelings about the content of the messages, as indicated by how much participants agreed with the following statements:

"This passage was accurate."
The "Fairness & Norms" messaging was rated as being less accurate than the "Risk & Regret" messaging.

"This passage was offensive."
The "COVID-Flu Connection" message was rated as less offensive than the other two messages.

"This passage was relevant to me."
The "COVID-Flu Connection" message was rated the most "relevant to me," while the "Fairness & Norms" was rated least relevant.

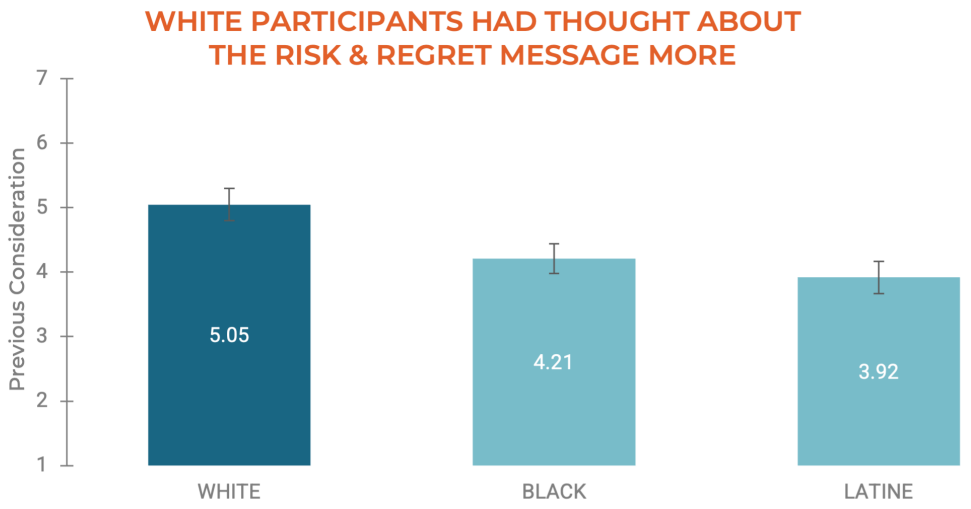
However, racial differences were found, with Black and Hispanic/Latine participants rating the "Fairness & Norms" message as being more relevant to them compared to relevance ratings from White participants.



"This passage was not something I had thought about before."

Participants had given the least previous consideration to the "Fairness & Norms" message compared to the other messages. However, there was no racial difference in the rating.

White participants had given more previous consideration to the "Risk & Regret" message than Black and Hispanic/Latine participants.



No significant differences were found in the message ratings concerning helpfulness, clarity, believability, and trustworthiness.

IMPLICATIONS

Given that the messages did not increase intentions to get vaccinated for COVID-19, this messaging approach may not be sufficient on its own. Perhaps these messages would work when paired with structural changes; increasing access to the vaccines may enable people to be more receptive when encountering messages to get vaccinated.

Additionally, the difference in message ratings across racial groups was substantial. This suggests that these messages are resonating more with certain groups than others. There's a need to understand the target audience in order to craft messages before disseminating them more widely.

Understanding how people view COVID-19 boosters to increase their uptake

BACKGROUND

While most vaccines come with boosters, they're rarely needed more often than once every five years. In contrast, the COVID-19 vaccines may require twice-yearly booster shots to maintain maximum efficacy. For a vaccine that's already mired in hesitancy and misinformation, this could be a problem.

> **The COVID-19 vaccines may require twice-yearly booster shots. For a vaccine that's already mired in hesitancy and misinformation, this could be a problem.**

But the actual scope of this problem was unclear. To find out, we ran a study to investigate people's attitudes toward the COVID-19 vaccine and its booster shots, as well as trial messaging to increase booster shot uptake.

Study 1

KEY INSIGHTS

For our intervention, we focused on three possible approaches that might increase people's intention to get boosted:

- **Encouraging consistency:** Our previous work on cognitive dissonance and vaccination[6] suggests that asking people to stay consistent with their past actions can be helpful in encouraging vaccine uptake.
- **Providing information:** Since the COVID-19 booster is so new, it's very possible people simply don't know what it is or what it's for. This could be one circumstance where information might actually change behavior.
- **Increasing familiarity:** The idea of booster shots might seem odd and unfamiliar to people, but there's one precedent—even people who don't get yearly flu shots are familiar with the concept. By framing the boosters as similar to the flu shot, we might help people understand their purpose and value.

In February 2022, we assigned 4,139 US adults recruited from online survey platforms to one of four conditions: Information, Consistency, Flu-Framing, or a no-message Control condition. The message content follows:

Consistency

If everyone in the US had been like you and gotten vaccinated against COVID-19 the first time around, the pandemic might be over by now. Instead, we're facing new and dangerous strains of the disease like Omicron.

It isn't fair that you should be put at risk by others' bad decisions, but don't worry – there is an answer. A booster shot taken 5 to 8 months after your last vaccine dose can give you extra protection.

Reaffirm your commitment to keep yourself and others safe from COVID-19. Talk to your doctor or visit your local pharmacy to schedule a COVID-19 booster shot.

Information

Have five months passed since your COVID-19 vaccination? Time to get a touch-up on your immunity! Getting a booster shot 5 to 8 months after your last vaccination can ensure your protection against COVID-19 lasts longer and stays stronger.

Talk to your doctor or visit your local pharmacy to schedule a COVID-19 booster shot.

Flu-Framing

Every year, a flu shot helps protect you against the version of the flu that's going around. With new variants like Omicron, COVID-19 works the same way. Get your new flu shot every year and your new COVID-19 shot every 5 to 8 months to make sure you've got the best protection medical science can offer.

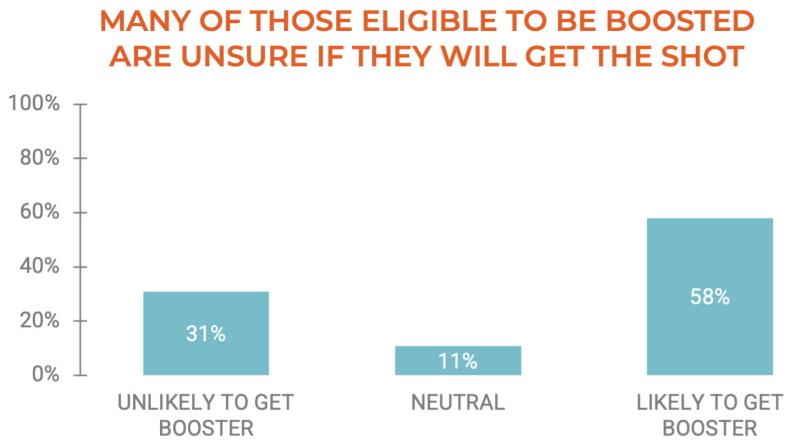
Talk to your doctor or visit your local pharmacy to schedule a COVID-19 booster shot.

We then asked participants about their perceptions of the COVID-19 vaccine, its booster, and the Omicron variant, which was the majority variant at the time of the study. Lastly, we gave them a chance to share their overall feelings and thoughts about the COVID-19 booster in an open-ended format.

RESULTS

About 80% of our sample had been fully vaccinated against COVID-19, and 60% of vaccinated individuals had received a booster. This meant there was a large population of people eligible for boosters who hadn't received one yet.

The unboosted people in our sample generally viewed the COVID-19 vaccine positively but felt some real hesitation around the booster.

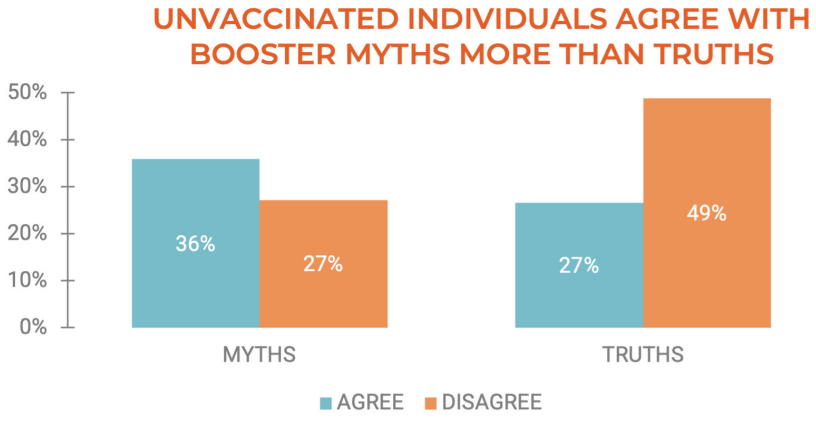


As you might expect, our vaccinated participants generally held more positive views toward the COVID-19 vaccine than our unvaccinated participants.

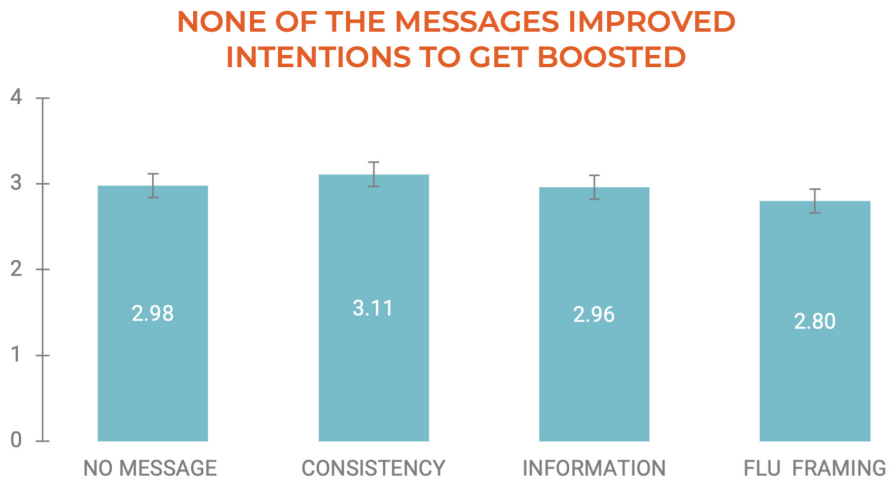
In fact, our unvaccinated participants were more likely to believe negative myths about the booster shot than positive truths:

Example booster myth:
Each booster shot gets more dangerous than the last.

Example booster truth:
Booster shots protect against variants.



Our messages didn't succeed in moving the needle on booster intentions. Our consistency message was almost better than no message at all, but the flu-framing message came close to backfiring.



Looking at the open-ended responses participants gave us, some common themes emerged. Ultimately, people just weren't motivated to get boosted. Many people thought they didn't need a booster if they'd already gotten COVID-19, or that young, healthy people wouldn't benefit from boosters. Even people who viewed the booster shot positively often didn't see it as a high priority. Those who held anti-booster beliefs typically were concerned about needing more and more boosters and the sense the boosters just weren't effective or safe.

The most common reasons for not getting the booster appeared to be simply a lack of motivation or information, but some people also held concerns about the supposed inefficacy of the booster shot.

IMPLICATIONS

Many people who were eligible for a COVID-19 booster shot hadn't received one as of February 2022. The most common reasons appeared to be simply a lack of motivation or information, but some people also held concerns about the supposed inefficacy of the booster shot. Our first attempts at persuading people to get boosted seemed to miss the mark in terms of creating motivation or addressing people's concerns.

Study 2

KEY INSIGHTS

Struck by the size of the booster gap, we decided to take the results of this study and try again.

Study 2 did a few things differently from Study 1:

- We recruited only individuals who had been fully vaccinated but not boosted, to increase our chance of finding an effect.
- We added a scheduling prompt as a behavioral outcome. Instead of just asking about intentions to be vaccinated, we shared a link to Vaccines.gov, a CDC website that helps people find nearby places to be vaccinated. This way, we could measure if they clicked the link and also ask if they'd made an appointment—behaviors much more closely linked to our real outcome of interest than just intentions.
- We tried out five different theoretical approaches:
    1. **Encouraging consistency:** Our consistency message was the most successful in Study 1, so we revamped it to make it stronger.
    2. **Providing information:** Since information was a barrier, we added more content to our information message, e.g., an analogy to sunscreen to help people understand that protective measures can wear off.
    3. **Maintaining identity:** We implied the unvaccinated were responsible for the duration of the pandemic and that getting boosted was a way to maintain one's identity as someone outside of that group.
    4. **Highlighting risk:** Many people indicated they didn't feel COVID-19 was risky, so we wrote a narrative of a healthy young person ending up with long COVID to illustrate that the danger of COVID-19 was still real.
    5. **Prompting scheduling:** People in this condition were required to remain on the page with the link to the scheduling site for a full minute, encouraging them to check it out. If they didn't report making an appointment, they had to pledge to at least consider doing so at a specific time and date in the future.

EXPERIMENT

In August 2022, 2,486 fully vaccinated US adults answered questions about their vaccination attitudes and beliefs before being assigned to one of the messages (Consistency, Information, Identity, Risk, Scheduling) or a control condition with no message.

Consistency

Over the last two years, you've worn a mask, practiced social distancing, and gotten the COVID-19 vaccine. You've sacrificed a lot to protect yourself and those close to you. Now, the time has come to see if you're the type of person who follows through with their commitments. Getting your booster shot is the best way to show that you're a person who does the right thing, from start to finish.

Don't let your sacrifices be for nothing. Do what's right by scheduling an appointment for your booster shot today.

Information

Booster shots aren't optional: they're a critical part of staying safe from COVID-19. Why?
Your immunity from COVID-19 wears off over time — whether you got it from a vaccine or from catching COVID. Booster shots give your protection a quick, safe, effective update. You wouldn't expect one dose of sunscreen to get you through a whole day at the beach, would you?

So refresh your protection: schedule an appointment for your booster shot today.

Identity

This pandemic has gone on for far too long. The truth is, there's only one group to blame — the unvaccinated.
By refusing to get the vaccine, they've allowed COVID to spread through the United States, disrupting our daily lives and leading to the deaths of thousands of Americans. The unvaccinated care about no one except themselves, and we're all suffering as a result.

Scheduling*

We'd like you to consider the options around you for receiving a COVID-19 booster shot.

Please click on the link https://www.vaccines.gov/search/ (it will open in a new window) and input your zip code to see where you might be able to find a vaccine near you.

Take a few minutes to look over this site. If you want to make an appointment while you're doing so, please feel free. Take as much time as you need.

Risk

Marcella was a healthy, 28-year-old woman when she caught COVID earlier this year. Her symptoms were mild, with just a light cough and some fatigue. But a few weeks later, she started feeling way worse — having trouble sleeping, pain in her chest, and a constant feeling of fogginess, like she had just woken up from a deep sleep.

Being young and healthy, Marcella didn't think she needed to get her COVID-19 booster shot. Now, she's stuck with long COVID, with symptoms that still affect her today, almost 6 months after she was first infected.

Even if you are young and healthy, a COVID-19 booster shot can protect you from the dangers of this disease, like long COVID. Renew your protection by scheduling an appointment for your booster shot today.

*People in the scheduling condition were required to wait one full minute on this page

After reading the messages, people were given the opportunity to click on a link to vaccines.gov/search to find the nearest location for getting a booster shot, based on their zip code.

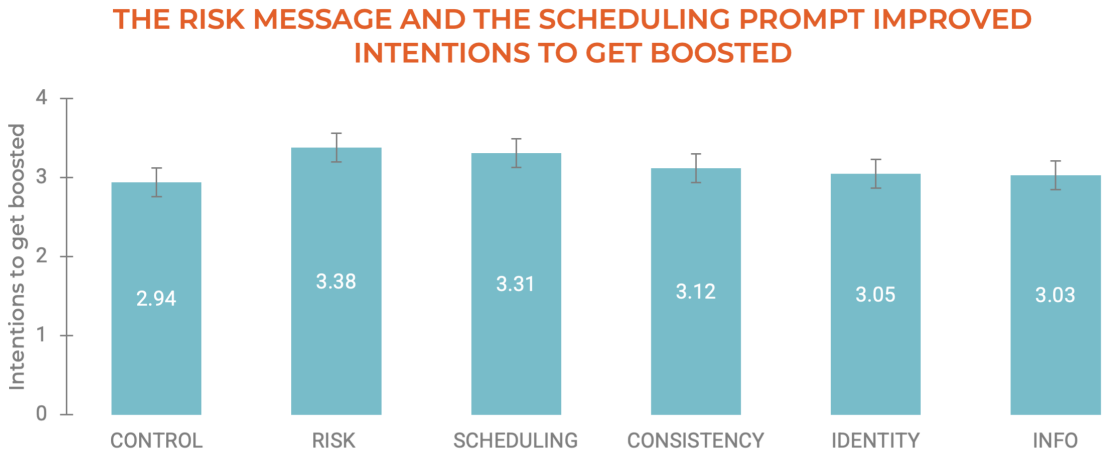
People reported if they made a vaccine appointment and told us if they intended to get a booster shot.

We also measured other variables that we thought might explain why our conditions changed people's intentions:

- Booster self-efficacy—i.e., people's confidence that they knew how to get the shot
- Identification with the vaccinated and unvaccinated
- Perceived dangers of COVID-19
- Message ratings—i.e., how persuasive, effective, etc. the message was
- Manipulativeness of the message

RESULTS

This time around, our messaging worked. People who read the Risk message or experienced the Scheduling prompt reported higher intentions to get a COVID-19 booster.



But it wasn't for the reasons we thought. We didn't see higher booster self-efficacy in the Scheduling condition, higher identification with the vaccinated in the Identity condition, or higher perceived danger from COVID-19 in the Perceived Risk condition. Instead, it appeared that the Scheduling and Perceived Risk conditions worked better to improve intentions because they were seen as more persuasive and less manipulative overall than the other messages.

In our open-ended comments, we mostly saw similar themes as in Study 1. However, some new ideas emerged. Participants spoke about the inevitability of getting COVID-19 and how society's return to normal made boosters seem less important. It was also increasingly more common to say that boosters weren't effective, given that many more people (and high-profile individuals such as President Biden and Dr. Fauci) had gotten COVID-19 despite being boosted.

Participants spoke about the inevitability of getting COVID-19 and how society's return to normal made boosters seem less important.

IMPLICATIONS

Getting people to receive booster shots for COVID-19 has been a difficult task, thanks to misinformation, lack of motivation, and large shifts in social norms and behaviors. By beginning with exploratory work, however, we were able to develop two different strategies that show promise for increasing booster uptake.

The Perceived Risk and Scheduling conditions might seem very different at first glance, but they act on two central principles of behavioral science: fuel and friction. Increasing people's perceived risk makes them more motivated to be vaccinated, and putting them in a situation where it's easier to click the vaccine finder link than to ignore it gets them one practical step closer to vaccination.

There are still many issues to face in increasing COVID-19 booster uptake, especially given the need for more boosters as time moves on and the introduction of the new bivalent booster in Fall 2022. But this work suggests focusing on fuel and friction may be useful tactics to consider in the ongoing effort to keep society safe from COVID-19.

This work suggests focusing on fuel and friction may be useful tactics to consider in the ongoing effort to keep society safe from COVID-19.

Training healthcare providers to talk to patients about misinformation and vaccines

Study after study demonstrates that physician recommendations are the best way to increase vaccine uptake.[7] That said, healthcare providers don't always recommend vaccines to their patients in part due to concerns about patient hesitancy—hesitancy that is often rooted in misinformation.

Addressing misinformation in a clinical setting is challenging. Unless executed extremely well, attempting to debunk incorrect information can actually make things worse[8] because efforts to correct it increase exposure to it—a phenomenon called the mere exposure effect.

Pre-bunking is an approach to dealing with misinformation that has gotten considerable attention in the era of fake news and conspiracy theories. Pre-bunking refers to teaching citizens the techniques used to spread misinformation before the actual misinformation enters the public sphere. Pre-bunking has been likened to a vaccine: It aims to inoculate people against false information by exposing them to it, much like a vaccine inoculates the immune system from the virus by antibody exposure.

In partnership with The Centene Center for Health Transformation, we aimed to teach Centene employees in healthcare provider (HCP) roles about misinformation techniques. We wanted to help HCPs spot misinformation and feel better equipped to have conversations with patients who may hold incorrect beliefs.

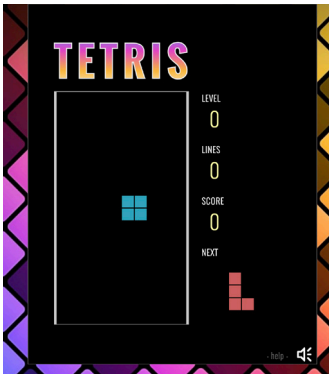
KEY INSIGHTS

- **Teaching people about misinformation techniques will improve their ability to discern and discuss misinformation.** In a series of prior studies, people were shown short YouTube videos explaining misinformation techniques such as using emotionally manipulative language and scapegoating.[9] Exposure to the videos increased people's ability to discern the trustworthiness of content.
- **Research shows that online games are an effective way to help people discern and discuss misinformation.** Online games have been successful at teaching people about pre-bunking.[10] In these games, people are put in a simulated social media environment and are shown how to craft and spread misinformation.
- **Different misinformation training approaches will yield different learning outcomes.** A gamified learning platform will be enjoyable and enable HCPs to learn a range of misinformation techniques, while a traditional training video will enable HCPs to learn about one specific misinformation technique.

EXPERIMENT

900 Centene employees will be assigned to partake in one of the three following tasks:

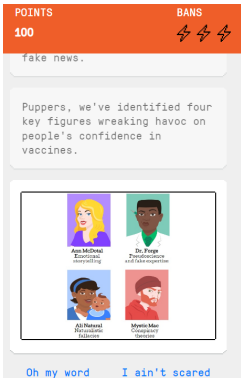
Play Tetris



Play a game that has nothing to do with misinformation.

https://rakoen.maertens.international/research-tetris/

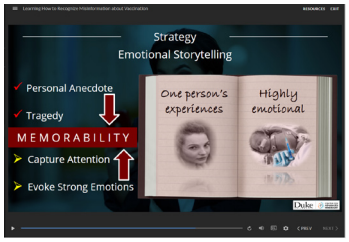
Play the "Bad Vaxx" game



Play a game where you learn how villains use different misinformation strategies and then try to defeat them in a simulated social media environment.

https://badvaxx.aboutbadnews.com/book/test/#/play

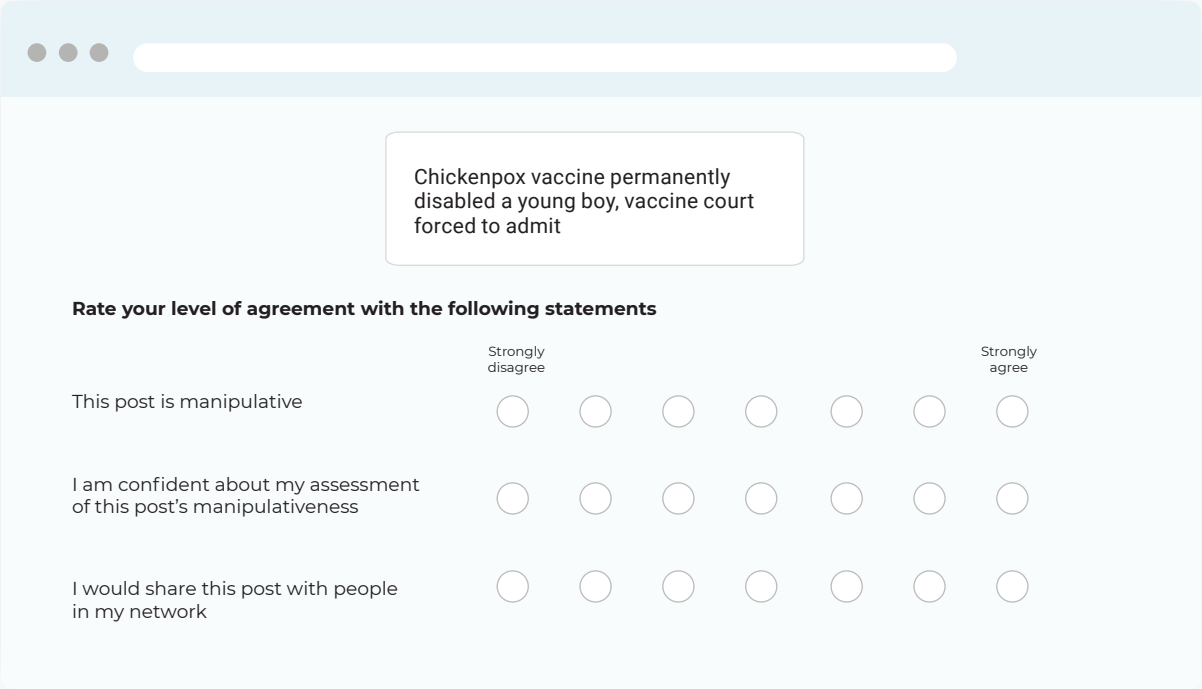
Do online training



Watch an instructional video online to learn about emotional storytelling, a common misinformation strategy.

After completing the tasks, employees will be asked to rate a series of news headlines on how manipulative they seem, as well as the likelihood that the employee would share the headline on social media.

The headline rating activity, shown below, will serve as the main measure of how effective the interventions are at teaching misinformation strategies.



HYPOTHESES

- Employees in the experimental conditions will be better at discerning misleading headlines and will be less likely to share misleading headlines.
- Employees who get the online training will be very good at discerning news headlines that use the emotional storytelling strategy they learned about during online training.
- Employees who get the online training might perform the same as those who played Tetris when presented with headlines that use misinformation strategies other than the emotional storytelling approach.

RESULTS

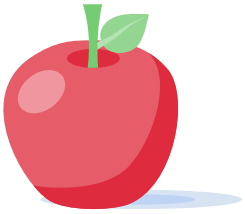
The study will be launched in the first quarter of 2023.

IMPLICATIONS

Healthcare providers are consistently ranked as the most trusted sources of vaccine information. Giving providers tools like pre-bunking to increase their ability to spot vaccine-based misinformation could have enormous downstream benefits for tackling vaccine hesitancy. As providers become more confident in learning about misinformation tactics, they will be more likely to discuss these issues with their patients, which could lead to increased vaccine uptake. The results of this study will shed light on the best way to teach HCPs about misinformation.

Giving providers tools like pre-bunking to increase their ability to spot vaccine-based misinformation could have enormous downstream benefits for tackling vaccine hesitancy.

2 TAKING CARE OF OUR EVERYDAY HEALTH



TAKING CARE OF OUR EVERYDAY HEALTH

For better or worse, the pandemic disrupted the way we go about taking care of ourselves on a daily basis.

When the pandemic started, people started cooking more at home, which is generally healthier than eating out, and the trend doesn't seem to have abated. On a less positive note, physical activity also plummeted at the outset of the pandemic and hasn't yet returned to pre-pandemic levels.[11]

Getting vaccinated has a huge impact on our everyday lives, but the way in which we go about our days also has a significant bearing on health. This section will focus on those everyday health behaviors and behaviorally based approaches to improving them.

The studies in this section of the report focus on behaviors such as medication adherence, taking breaks from sitting, and daily mental brain training. The learning about these behaviors, however, can apply to a number of health activities. For example, the social support that encourages people to spend 10 minutes a day taking a language lesson might also be effective in encouraging them to do 10 minutes of stretching or meal planning every day.

On the following page, we've outlined some of the questions and issues we explore in each of the studies in this section.

Do people like to be told what to do when it comes to their health, or is choice important?

There are many different strategies for reducing sedentary behavior, ranging from going to the bathroom a lot to setting alarms as reminders to move around. This study explores how people respond to tips and strategies for taking more breaks based on how involved they were in selecting those tips and strategies. Read more on page 33.

What are acceptable times and places for delivering health guidance?

What do people make of getting a health message from a faith leader in a place of worship? How does that compare to the same advice from an expert or a friend? This study explores how people react to getting health guidance in different contexts. Read more on page 36.

What traits are important in a health coach?

Are people more likely to follow advice from a health coach when they have a hand in picking what type of health coach they want to work with? What if the coach is a chatbot? This study explores how people react to the opportunity to customize a digital coach, ranging from giving the coach a name to deciding how extroverted the coach is. Read more on page 38.

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What happens to motivation when you're accountable to someone else?

Does performance change based on the extent to which your own actions impact someone else's? This study looks specifically at what happens when financial incentives are based on the performance of two people. Read more on page 44.

What types of messages will motivate people to take their medications?

Does pairing taking medication with positive moments help people establish a routine? What about messages that cheer people on? In this study, people were sent different types of prompts to take medication and then asked how they felt about the reminder. Read more on page 48.

How can we make the most of behavioral science to improve medication adherence?

According to the literature, what are the best practices for medication adherence? What are possible new and different approaches to medication adherence that aren't yet fully tested? This entry recommends running studies using novel behaviorally based approaches. Read more on page 52.

Reducing sedentary behavior for home-based office workers

BACKGROUND

Sitting for too long is a growing concern for public health. Doing it on a regular basis—and without sufficient breaks—increases the risk of developing serious illnesses, like heart disease, diabetes, and certain cancers.[12] Office-working adults are particularly at risk, as they spend the majority of their workday sitting down.[13]

As the hybrid world of office and home-based work has become the new "normal," traditional ways of reaching employees, such as through workplace wellness programs, are no longer appropriate. Thus, we need new strategies to help employees optimize their health.

Home-based office workers living in Ontario, Canada were recruited to participate in our study. The objective was to impact workers' sitting patterns, particularly the frequency (e.g., every 30–45 min.) and duration (e.g., 1–3 min.) of breaks from sitting at work.

KEY INSIGHTS

- **Providing people with strategies will help reduce sedentary behavior.** People don't take breaks from sitting for a number of reasons, including forgetting to stand, not knowing when or how often to stand, and not understanding the benefits of standing (and the detriments of sitting). Offering clear directives on exactly how to break up sedentary behavior might help.
- **People might like being told what to do. Or not.** In fact, our strategies could backfire because sometimes people do the opposite of what they're told to do. This resistance is referred to as psychological reactance. Conversely, when people are unfamiliar with a topic, they might be more receptive to being told what to do.
- **People might like to have a say.** Being able to have a say in the matter—by having the opportunity to choose among options—can increase commitment and reduce psychological reactance.

EXPERIMENT

In this experiment, we tested whether choosing your own strategies or a more paternalistic approach—having strategies chosen on one's behalf—is more effective in helping people reduce sedentary behavior while working from home. To do so, 148 full-time, home-based office workers living in Ontario, Canada were recruited to participate in our four-week study between September and December 2020. In the study, all the workers were sent weekly "Move More" strategies.

Examples of "Move More" strategies
Drink lots of water throughout your workday. Filling up your water bottle and taking more washroom breaks will hopefully allow you to break up your sitting every 45 minutes.
Leave your phone on the other side of the room, and get up at least once every 45 minutes to check in throughout your workday.

Participants were assigned to one of two conditions:

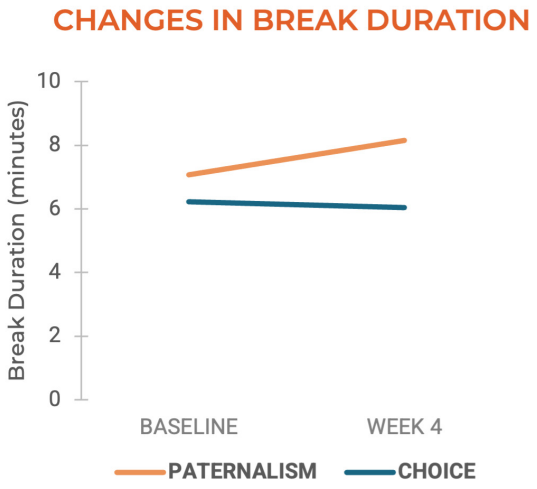
Choice condition	Paternalistic condition
Participants **decide** between one of the two delivery methods: » Select your own strategies » Expert-recommended strategies "Please choose your 2 MOVE MORE strategies for this week."	Participants are **assigned** to one of the two delivery methods: » Select your own strategies » Expert-recommended strategies "These will be your 2 MOVE MORE strategies this week."

Note that in both conditions, there were participants who were selecting their own weekly strategies. The difference between conditions was whether or not the participant had decided to make their own selection (Choice condition) or had been assigned to make their own selection (Paternalistic condition).

At the end of each week, participants self-reported their sitting patterns. In addition, objective measures of time spent sitting, standing, and moving as well as frequency and duration of breaks from those activities (sitting, standing, moving) were obtained via a device. Participants wore the device during a baseline week as well as during the last week of the study.

RESULTS

Regardless of condition, all participants increased their frequency of breaks over the course of the four-week program. Comparing those participants in the Choice condition to those in the Paternalistic condition, we found that people in the Paternalistic condition increased their break duration, while there was no change for those in the Choice condition.



IMPLICATIONS

As predicted, providing people with strategies to stand up more frequently during work hours is effective. We saw that the delivery method of those strategies didn't matter—participants in both the Choice condition and the Paternalistic condition took breaks more frequently at the end of the four-week period compared to the beginning of the study period.

The increase in break frequency translates to about five more breaks from a sedentary work culture per eight-hour workday.

While those participants in the Choice condition didn't increase the duration of their breaks from sitting, those in the Paternalistic condition increased the duration by two minutes on average.

These results suggest that participants in our study were receptive to being told what to do. Having the option to choose the delivery method of those strategies (select your own strategies or receive expert-recommended strategies) didn't improve workers' sitting patterns over and above those who weren't able to choose the delivery method of those strategies.

Providing home-based office workers with strategies to break up their sedentary behavior is, therefore, an effective method for increasing the number of breaks taken during a workday.

Understanding how people respond to faith-based guidance

BACKGROUND

Many religions provide believers with guidance on how to live. But religious beliefs aren't only about big moral decisions—they can impact health behaviors such as physical activity and diet. For example, many religions include periods of fasting, and some religions are practiced via physical movements such as yoga in Hinduism or Buddhism.

Religion can play a more active role in health by using physical places of worship as a space for delivering health services. Faith-placed health programs have been particularly important for reaching underserved and hard-to-reach populations.[14] For example, churches have been an important part of health promotion in many African American communities.

Religion and faith-based messaging can also be used to promote health. For example, many religions consider the body to be a gift from a higher power, and keeping the body healthy is how one honors that gift. Health guidance of this sort often comes straight from religious texts; however, research shows that faith leaders can also have an impact on health behaviors.[15] The trust and authority they have in their communities allows them to serve as powerful messengers to encourage healthy behaviors.

But integrating religion and health is an opportunity that must be pursued cautiously. It's possible faith leaders might be seen as overstepping when they talk about health, and faith-based messages could even backfire for individuals who aren't religious. In order to further explore the connection between religion and health, we are planning on running a study to gauge reactions to faith-framed health guidance.

KEY INSIGHTS

- **Using religion to promote health is promising.** Religious values lend themselves to healthy behaviors. Since people trust their churches and faith leaders more so than other institutions, places of worship can reach the unreachable.
- **Using religion to promote health can be problematic.** Using faith to promote healthy behaviors can backfire due to things like politicization, reactance, and differing interpretations of religious texts.

EXPERIMENT

In order to explore how people react to faith-based health guidance, we will describe three different hypothetical scenarios where a speaker tells an audience to eat less sugar. Those scenarios will vary the messenger, the reason behind the advice, and the context in which it's given.

Participants will be randomly assigned to imagine they are in one of the following three situations:

Situation	Messenger/Context	Why follow this advice?
Faith	You're in a church listening to a sermon and the faith leader is talking about decreasing sugar consumption.	Religious duty
Expert	You're watching a news show and there's a segment with a physician who is talking about decreasing sugar consumption	Scientific evidence
Friend	You're scrolling through social media and you see a video post from a friend about decreasing sugar consumption	Personal experience

After reading a scenario, people will answer questions about topics like the trust they have in the messenger and their perceptions of the messenger's credibility. We will then ask people if they intend to eat less sugar in the future.

HYPOTHESIS

We expect to find that people who are highly religious will be most likely to change their behavior after reading the religious message, while people who believe strongly in science will be most likely to change their behavior after reading the scientific message. Which message will be the best overall, however, is an open question.

RESULTS

We plan to launch this study by the first quarter of 2023.

IMPLICATIONS

As a proof of concept, our initial experiment asks people to react to uncontroversial health guidance such as steering clear of eating excessive amounts of sugary food during the holidays. Understanding how people react to straightforward faith-based health guidance is a good starting point for understanding how (or whether) to use religious messaging for more loaded topics such as vaccination.

Increasing engagement in a health program by having users customize their digital health coach

BACKGROUND

Conversational agents—that is, programs designed to interact with their users in a naturalistic, conversational way—are increasingly a part of interventions to improve health behavior. For example, someone training for a 5K run can download an app where they can be cheered on by a friendly coach or yelled at by a drill sergeant.

Agents have several advantages over human coaches. For instance, an agent can be customized to match a user, either in superficial traits like appearance or more fundamental traits like personality. Research suggests this kind of customization may be beneficial in terms of increasing people's engagement with agents,[16] but we don't yet know if that will translate to improved success in encouraging health behavior.

To test this idea, we created a conversational agent to function as a health coach. Our agent asks its users about their current health behaviors—exercise, diet, water consumption, and sleep—and provides recommendations based on their responses. It then asks users to complete an optional brain-training task, our main outcome of interest.

KEY INSIGHTS

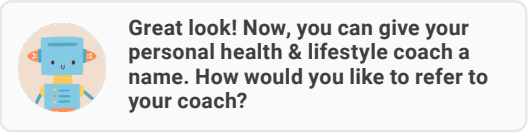
- **People like others who are similar to them.** With both agents and people, we find those like us to be more likable and trustworthy.
- **People return favors.** By changing to suit user preferences, the agent could be seen as doing the user a favor. If that's true, strong social norms of reciprocity should encourage the user to follow the agent's instructions in turn.
- **Customization increases user engagement.** Users are more likely to follow the advice of an online coach when the user has had a hand in customizing the personality traits of the online coach.

EXPERIMENT

1,643 US adults were recruited from an online survey platform.

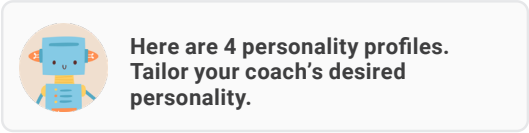
Users could customize their coach in one of two ways:

Surface-level customization



Users can change the coach's gender, name, and avatar image.

Deep-level customization



Users can choose one of four personality profiles with varying levels of agent extroversion and openness.

Users were assigned to one of four conditions with varying levels of customization:

1. Surface-level customization only
2. Deep-level customization only
3. Surface and deep-level customization
4. No customization

Deep-level customization was largely an illusion. Participants in all of the conditions still interacted with the same agent in order to make sure actual differences in the agent's behavior didn't explain the results.

Our participants began the study by answering their coach's questions about their everyday health behaviors. At the end of the coaching script, the coach recommended participation in a brain-training task.

Brain-training task

The brain-training task for this study was inspired by a famous paradigm in social science research called the Stroop Task.

In this version, participants completed three 60-second rounds of a task asking them to choose the right word from a list. The correct answer depended on the specific instructions participants were given, requiring them to pay close attention.

When the prompt says COLOR, as shown below...

COLOR: BLACK

BLACK | GREEN | RED | BLUE

...then you need to select ***the same ink color***

When the prompt says WORD, as shown below...

WORD: BLUE

BLACK | GREEN | RED | BLUE

...then you need to select ***the same word***

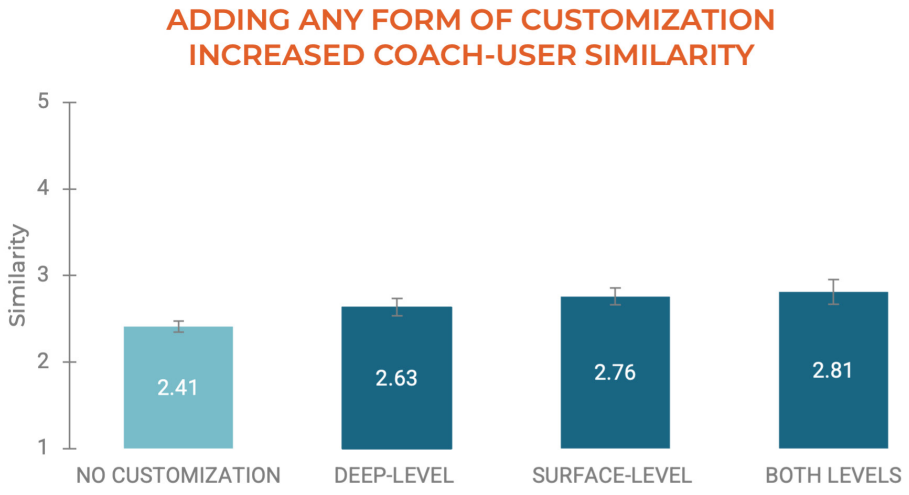
HYPOTHESES

- Customizability will lead to increases in motivation to engage with the agent in the future.
- Customizability will improve the experience of interacting with the online coach.
- Customizability will make people more likely to try out the brain-training task.

RESULTS

Across both deep-level and surface-level customization, our participants felt that their coach was definitely customizable. Our attempts to convey personality worked as well, with participants agreeing that their coach matched its description.

We also saw that customizability did increase perceptions of similarity between the coach and the user.

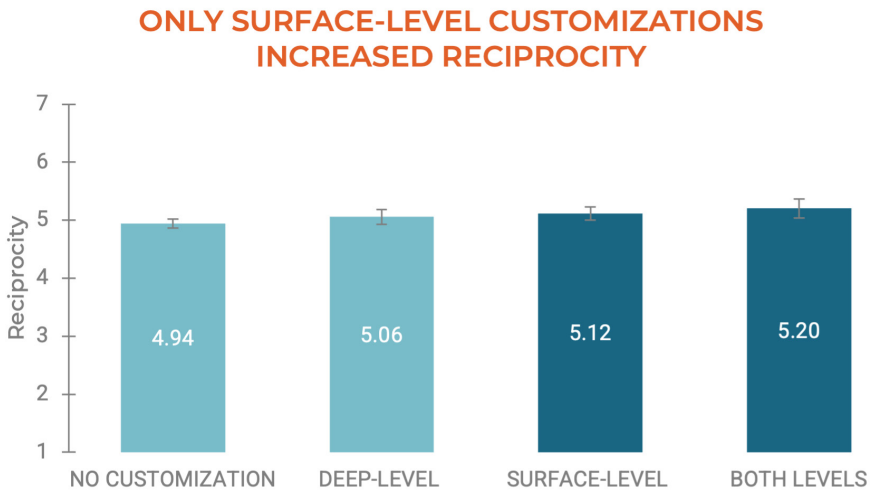


Interestingly, those who could change their coach's name were particularly likely to change it to a name having the same first letter as theirs!

When people could customize, 12.8% of coach names matched users' first-name letter.

When people couldn't customize, 4.7% of coach names matched users' first-name letter.

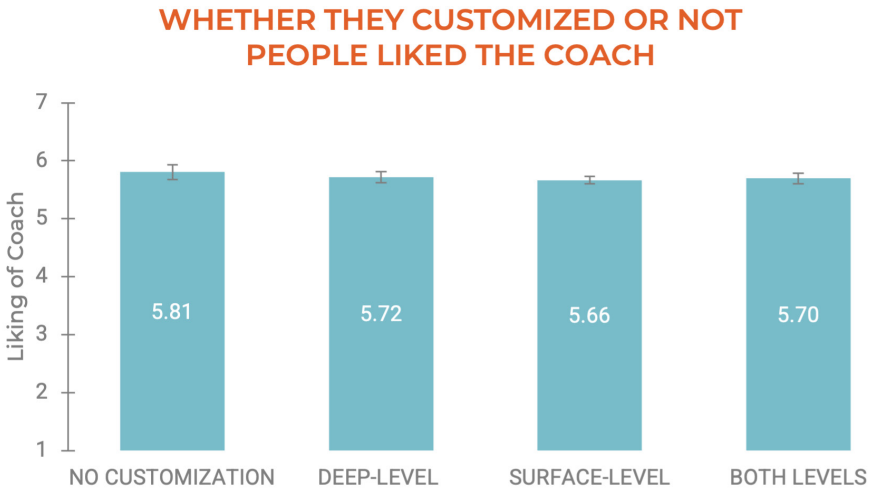
Surface-level customizability increased reciprocity as well, but deep-level customizability didn't.



However, customizability didn't translate to an improved experience or behavior change. Participants didn't like their customized coaches more, indicate any extra willingness to engage with them in the future, or take their advice and complete the brain-training task more often.

31% of participants chose to play the game.

35% of participants wanted to be notified if we released the coach as an app.



IMPLICATIONS

While we succeeded in creating a customizable agent, we found that customizability ultimately didn't affect people's experience at all. This might have happened for two reasons:

- **Our version of customization was too weak**. We didn't truly change the user experience based on the choices that people made—everyone saw the same text. We might have needed to genuinely alter the agent to have a more extroverted or open personality to see the full benefits of the deep-level customizability.
- **Customization doesn't actually matter.** Previous studies on this subject have often used small samples and less-rigorous designs. It might be that customizability just isn't that important for the user experience—for example, maybe everyone prefers an extroverted agent.

Either way, our results suggest that people seeking to design effective health coaches may not want to focus on customization. Instead, better gains might be made by focusing on improving the coach's friendliness, warmth, and naturalistic responses—all concepts that have been strongly linked to positive experiences in the past.

Combining social and financial incentives to establish daily habits

BACKGROUND

There are many things people are advised to do at least once a day, like stretching, taking medication, expressing gratitude, or practicing a new skill such as speaking a foreign language. While most people would agree that doing these things daily is a good idea, actually getting them to maintain daily health behaviors can be challenging.

Incentives have been widely used to promote healthy behaviors. Financial incentives have been shown to improve adherence to health behaviors ranging from getting routine screenings to smoking cessation.[17] Individual financial incentives, however, aren't perfect and can be costly. Integrating social incentives into financial rewards might be a more effective—and less expensive—way to motivate individuals.

To learn more about different incentive structures, we ran a pilot where individual financial rewards were tied to the performance of a dyad (two people). During the study, both people were asked to play 10 rounds of an online brain-training game and were made aware of each other's performance. The study found a boost in motivation when financial incentives depended on the performance of both members of the dyad rather than an individual.

Based on the results of the study, we decided to test different incentive structures in a real-world context by providing financial and social incentives for people to complete daily language lessons on the Duolingo language platform.

KEY INSIGHTS

- **The structure of a dyadic incentives program impacts motivation.** There are a number of ways to structure a rewards program, including adding social features (someone else is aware of your performance) and interdependence (the performance of one player impacts the performance of the group). The specifics of how these features impact rewards will impact motivation.
- **Autonomy and guilt are key players in motivation.** A person's motivation varies based on the extent to which a social incentives program creates a sense of autonomy (your actions impact your rewards) and guilt (your actions impact the rewards of another person).

EXPERIMENT

3,878 study participants were recruited from a survey platform and asked to enroll in a Duolingo language program. Those enrolled were tasked with the goal of taking a daily language lesson every day for the following two weeks. In most conditions, participants were assigned a partner for the duration of the program.

During these two weeks, financial incentives were offered for completing a daily lesson. The terms of the financial incentive varied based on random assignment into one of the following five rewards program conditions.

Rewards reported and linked to partner performance

Strict

- Full reward if participant and partner both complete daily lesson

> You reached 10 XP on Monday, July 18.
>
> However, your teammate did not reach 10 XP.
>
> As a result, your team did not earn a bonus.

Hybrid

- Half reward to one participant if they complete daily lesson but their partner doesn't
- Full reward if participant and partner both complete daily lesson

> You did not reach 10 XP on Monday, July 18.
>
> As a result, you did not earn a bonus.
>
> However, your teammate did reach 10 XP.
>
> If you had also reached 10 XP, you would have earned 30 cents.

Loose

- Half reward for both participant and partner if either participant or partner completes daily lesson
- Full reward if participant and partner both complete daily lesson

> You did not reach 10 XP on Monday, July 18.
>
> However, your teammate did reach 10 XP.
>
> As a result, both members of your team earned 15 cents.
>
> If you had also reached 10 XP, both members of your team would have earned 30 cents.

Rewards reported to partner

Comparison

- Full reward if participant completes daily lesson
- Partner performance doesn't impact participant reward

You reached 10 XP on Thursday, July 21.

As a result, you earned 30 cents.

Your teammate also reached 10 XP.

No partner

Individual

- Participant not assigned a partner
- Full reward if participant completes daily lesson

You reached 10 XP on Saturday, July 23.

As a result, you earned 30 cents.

HYPOTHESES

» **A strict dyadic incentive might increase participants' motivation** to meet their daily goal so as to avoid feeling guilty for depriving their compliant teammate of a reward.

» **A hybrid dyadic incentive might create a higher sense of agency** because you still get some reward for your efforts. However, this structure diminishes guilt since your teammate will still get a half reward even if you do nothing.

» **A loose dyadic incentive may create reciprocity between teammates**, as they can earn rewards for each other. However, it might also result in a "free-rider" situation where the non-compliant player continues to earn a reward because their teammate complied, but doesn't put in any effort themselves.

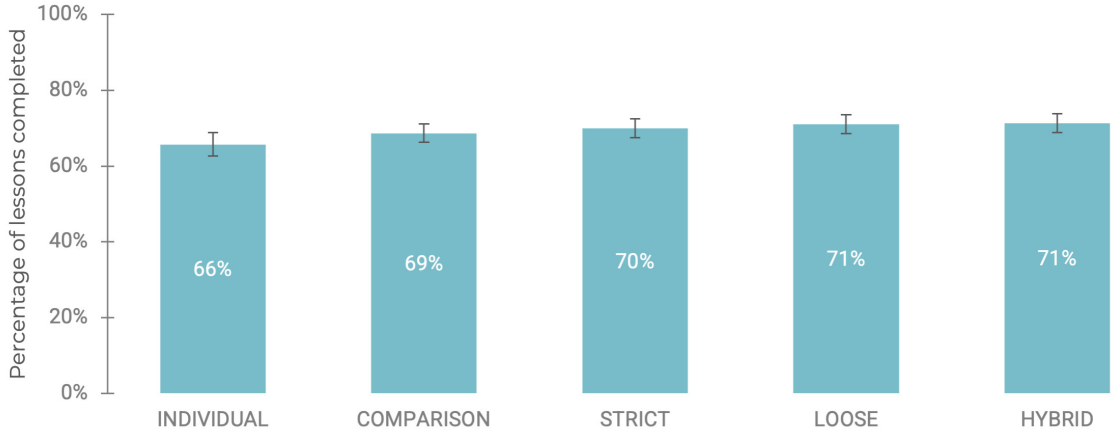
RESULTS

Preliminary analyses have found the following:

» Dyadic incentives are effective at motivating people to complete daily language lessons.

» Hybrid and loose incentives provided the highest levels of adherence.

HYBRID AND LOOSE INCENTIVES WORKED BEST



IMPLICATIONS

This study shows increased motivation to complete daily language lessons when there are social incentives to do so. The rewards programs that included a partner (comparison, strict, loose, and hybrid) outperformed the individual program.

Of the social programs, the hybrid and loose programs were most effective at increasing adherence to daily lessons. Notably, these are the programs that only partially penalize team members for partner non-compliance. In both the hybrid and loose conditions someone could still get some type of reward, even if their partner did nothing.

In the strict program, both teammates need to meet their goal in order for anyone to get a reward. Our results showed that people in the strict program were much less likely to complete their goal if their teammate hadn't done so on the previous day. Presumably, people lost motivation to do their lessons when they got nothing for it.

These results have practical implications for scaled-up health incentive programs where the goal is cost effectiveness—i.e., get the most improvement in behavior for the lowest cost (smallest reward). The strict and hybrid programs were the most cost effective, whereas the loose program was the least cost effective.

Our findings suggest that a hybrid rewards program will produce the best results for the cost. For this reason, we are currently taking forward research on hybrid rewards programs and medication adherence.

Using behaviorally informed reminders to increase medication adherence

BACKGROUND

Seventy-five percent of Americans struggle with taking their prescribed medication on time—a problem that contributes to 125,000 deaths per year.[18] Researchers and insurers have tested multiple methods to increase adherence, which have offered modest benefits at best. That's likely because many factors can get in the way of adherence: from cost to transportation to unpleasant side effects.

Drawing from our report on The Behavioral Science of Medication Adherence, in partnership with the Centene Corporation, we created the PillPal program, a month-long series of behaviorally informed text messages designed to address the many causes of medication adherence.

KEY INSIGHTS

Our design for PillPal is informed by the best practices established in the medical adherence literature:

- **Multi-component interventions work better.** The more strategies an intervention uses, the more likely it is to move the needle. While the heart of PillPal is a reminder system, it also includes goal setting, progress tracking, and other tried-and-tested behavioral strategies.
- **Habit-based interventions are key.** One of the most successful methods for improving adherence is to help people make it habitual—either through creating a new habit (e.g., "Commit to taking your medication at the same time every day") or tying medication to an existing habit.

We've also identified three specific barriers to medication adherence:

- **Lack of motivation.** Many medications improve people's long-term health without making them feel better in the moment. It's difficult to feel motivated to take your medication when the benefits of doing so aren't clear.
- **Social isolation.** Many people with chronic illnesses suffer from social isolation. Emotional support is critical for dealing with the day-to-day difficulties of chronic illness.
- **Structural issues.** To take your medication on time every day requires some level of routine in your everyday life. Adding the burdens of disease management to other stressors like work and family obligations can make it even harder to remain adherent.

PillPal's unique approach to medication adherence programs involved three message themes designed to tackle the barriers listed above.

Before launching PillPal, we decided to test how people felt about its content. Striking the right balance to make sure our messages are helpful and well-received is a critical part of ensuring PillPal's success.

EXPERIMENT

To see how users might react to PillPal's messaging, we recruited 1,158 people who take at least one medication once daily, via an online survey platform. They were assigned to one of four messaging conditions:

Condition	Messaging
Control	Simple reminder messaging: "It's time to take your medication."
Positivity	This condition targets a lack of motivation by pairing moments of happiness or relaxation with medication. Tying a reward to taking their pills helps users build a routine they'll actually want to follow. Users see three different types of messaging: **Behavioral tips:** "Make a plan to do one small thing for yourself today that brings you joy." **Positive emotions:** "Think about a time when someone special in your life did something that you felt grateful for." **Jokes:** "Why couldn't the bicycle stand up by itself? It was too tired."
Support	This condition targets social isolation by making PillPal act like a friend, including cheering users on and offering them an opportunity to share their highs and lows with a friendly ear. Users see three different types of messaging: **Sharing sadness:** "Do you want to talk about something that's bugging you? I'm all ears." **Sharing joy:** "Anything exciting coming up? What are you looking forward to?" **General support:** "It's important to take care of your health. You've been doing a great job!"
Self-Efficacy	This condition targets structural issues by asking users to diagnose their own biggest issues with medication adherence, then providing specialized advice about how to overcome those barriers. Users first choose a barrier from a list, then receive different tips to address it, such as: "Sometimes people benefit from having a specific checklist of steps to start their day. Try making a list of things you can't leave your house without, and put your meds at the top!"

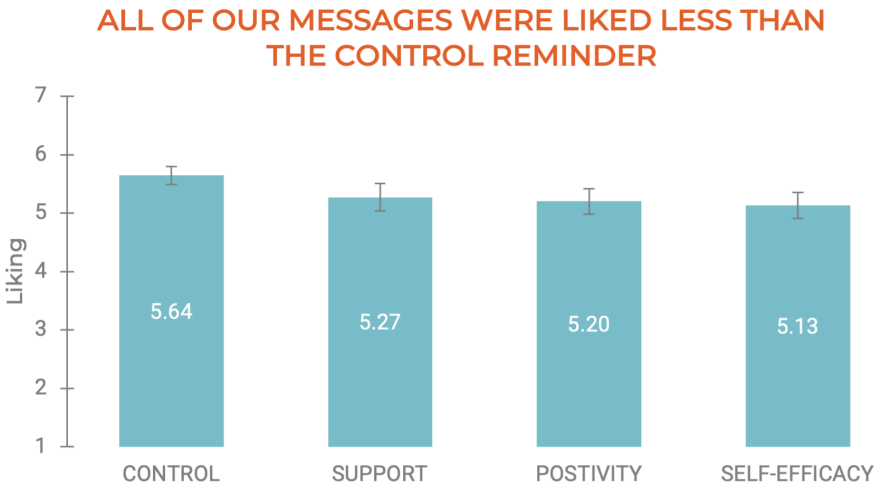
Participants rated their responses to each message on multiple scales (e.g., how helpful, meaningful, and useful the messages were), which were collapsed into a single scale of message liking.

HYPOTHESIS

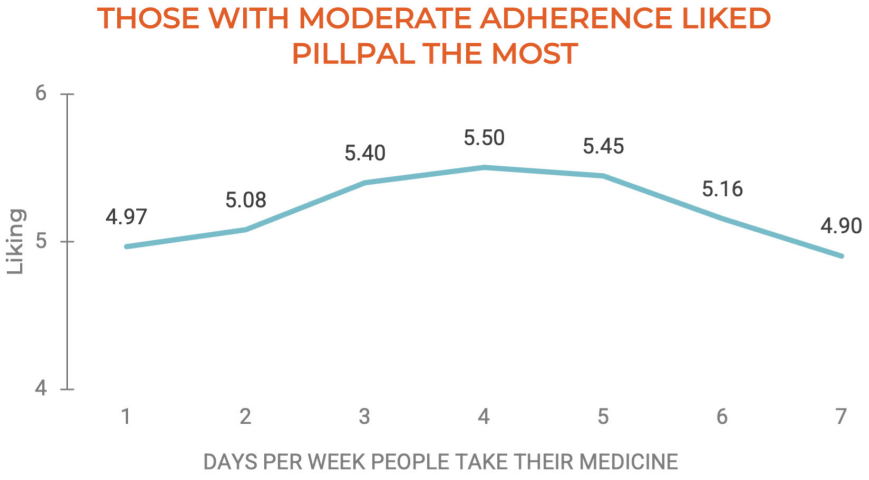
We expected to find that our messaging conditions (Positivity, Support, and Self-efficacy) would be better liked than the control.

RESULTS

Surprisingly, we found that our participants preferred the control condition to our experimental conditions, even when we excluded participants who already had perfect adherence.



However, it was our participants who were moderately adherent (i.e., taking their pills three to five days a week, on average) who rated PillPal's messages the highest.



In addition, our participants found some types of messages much more likable than others—within message type, participants preferred some messages over others. For example, the individual jokes from the Positivity condition received vastly different likability ratings.

Worst joke: "How do you make an octopus laugh? With ten tickles."	**Joke Rating**: 2.63
Best joke: "Why do melons get married in church? Because they cantaloupe."	**Joke Rating:** 4.25

IMPLICATIONS

These results make one thing clear: Details matter. The open-ended feedback participants provided helped us to understand why certain messages performed badly. For example, behavioral tips that asked participants to invest too much time and effort (e.g., "Write for five minutes about how you're feeling right now") were roundly rejected. Participants also disliked the idea of sharing their negative thoughts and feelings with an automated service, considering PillPal's attempts to serve as a source of support fake and unhelpful.

But this study is limited in one important way: we're essentially asking our participants to guess how a message might affect them. For example, one of our outcome variables asks people to agree with the statement, "I think this message would help me take my medication." People often don't know how interventions would change their behavior.

Moving forward, we'll continue to tweak our messages and methods to make sure PillPal is as effective as possible before we launch it in the field. Medication adherence is a serious problem—it deserves nothing less than our best efforts.

This study is limited in one important way: we're essentially asking our participants to guess how a message might affect them.

Using behavioral science to address medication adherence

BACKGROUND

When taken as intended, prescription medications can keep chronic conditions in check and reduce healthcare expenses. Unfortunately, research suggests that up to 50% of medication for chronic diseases are not taken as prescribed even when people are given information and education about the importance of doing so.[19]

That means we need to consider other approaches to behavior change if we want to move the needle. In partnership with the Centene Center for Health Transformation, we investigated what the research literature has to say about medication adherence. We then applied our knowledge of behavioral science to the findings, creating a list of recommendations for stronger interventions in the future. A full report on our work can be found here. What follows are highlights from the report.

KEY INSIGHTS

Reviewing the existing literature, we determined four central insights:

- **Medication adherence needs to be as easy as possible.** Strategies that simplify medication regimens and leverage habits are perhaps the two most promising strategies for improving adherence.
- **Medication reminders may represent the lowest-hanging fruit.** While the effects of reminders can be modest, the cost of reminders is generally very low, so there's no reason not to include them.
- **People should be made aware of their own adherence behavior.** People who have a way of monitoring their adherence are better at maintaining it. Pillboxes, blister packs, and other reminder packaging also help people see when they've missed a dose.
- **Adherence interventions work best when they include multiple strategies.** For example, a program that uses reminders and incentives will likely perform better than a program that uses reminders or incentives.

EXPERIMENTS

While our review of the literature did produce important insights, it also highlighted several areas for improvement. Behavioral science suggests many new and different approaches to medication adherence that have yet to be fully tested.

Some ideas for future studies are as follows:

1. **Use social incentives:** Integrate social relationships into any financial incentives used to encourage medication adherence.

   Example: *Paying people for taking their medication as a group can activate social ties and make medication adherence a communally rewarding experience.*

2. **Provide accountability:** People have a strong desire to adhere to society's norms, especially when they know other people are watching. This insight can be leveraged by health insurers, whose access to claims data provides a natural way to hold people accountable.

   Example: *Remind members that their insurance company is able to observe their pharmacy refills as a way to improve refill pickups. Pairing a similar reminder with the provision of an electronic pill bottle could increase the number of pills taken each month.*

3. **Teach people to identify friction:** Decisions are impacted by things that might seem small. Minor frictions and subtle cues from defaults have a surprising effect on behavior. Helping people analyze their own behavior and environment might let them develop their own routines to address individual barriers.

   Example: *If someone struggles specifically with taking their medications on weekends, a medication adherence program could provide advice like leaving your pills beside your toothbrush to be part of your morning routine.*

4. **Leverage emotional decision-making:** Health decisions are often ruled by emotion rather than rationality. We can harness this fact by a) reducing negative emotions that might get in the way of medication adherence, and/or b) connecting positive emotions to staying adherent.

   Example: *Messaging can help people reinterpret the side effects of their medication as a sign that it's working. Alternatively, we can remind people how taking their medication can help them achieve their most important life goals.*

5. **Leverage loss aversion**: People are more sensitive to losses than similarly sized gains. The losses associated with skipping a dose of medication, however, are not immediately apparent or routinely communicated.

   Example: *Focus on the costs and losses of not adhering to medication, including costs to health and finances.*

IMPLICATIONS

Integrating behavioral science into the design of medication adherence programs has the potential to improve health at a lower cost. However, improving medication adherence is no walk in the park, in part because the problem of non-adherence has no single cause. Factors related to the medication, condition, provider, healthcare system, member, and member's environment all interact to make medication non-adherence a pressing challenge.

It's no surprise, then, that standard educational and information-based approaches don't do much to improve medication adherence. Fortunately, the discipline of applied behavioral science offers a new lens through which to view and address this issue, bridging fundamental insights about human psychology with a broader view of the medication adherence ecosystem to address one of the most pressing problems in healthcare.

EPILOGUE : EQUITY IN BEHAVIOR CHANGE

When there's a problem that needs to be fixed, many people immediately start trying to think of a solution. Behavioral scientists are no different. "People need to save more money—let's default them into savings plans!" "People need to exercise more—let's add walking to their daily routines!"

A good behavioral scientist knows that they must slow down and back up. Still, we often get it wrong. Or, if not wrong, at least incomplete. Do all people need to save more? Exercise more? Is the context for all people to save the same? What about the barriers to exercise? Do all people think that saving and exercising are as important as we do? Even if they do, can they prioritize these activities over others? In order to be successful, we need to think about the context, the barriers, and the people we are hoping to help.

Our field has often treated "people" as a homogeneous lump of WEIRD (western, educated, industrialized, rich, democratic) individuals with no variations in history, culture, structural supports, social conventions, etc. Obviously, this is incorrect. Not only is it incorrect, but it can have profound, negative consequences when interventions designed to help "people" end up hurting certain individuals instead. To be good behavioral scientists, we must understand the multiple, diverse contexts of the various groups within the population our interventions will affect. We also need to know how these groups think about behavior change and the methods used to implement it, as well as how equitable behavior change and its implementation methods are when considering if and how to intervene.

To be good behavioral scientists, we must understand the multiple, diverse contexts of the various groups within the population our interventions will affect.

We at the Center still struggle with how to do this effectively, but we are making strides through some of our internal and external work. Internally, we have created a team that focuses on different ways our Center can become more equitable, including in our hiring practices and research methodologies and processes. Externally, we have worked with our partners to start creating more nuanced interventions that focus on specific groups of people, such as messages that address the medical profession's historical abuse of Black Americans.

We've also created a publicly available online tool to help decision makers focus on the moral and equitable implications of behavior change. The tool guides decision makers to think through a behavior change they are considering, including the potentially varied impacts of that change between specific groups of people and the reasons behind those differing impacts. The research behind the tool and the tool itself were funded by the Robert Wood Johnson Foundation.

We believe (and hope) that customized solutions based more directly on the specific groups of people who will be affected by a behavior change are the future of behavioral science.

Building the tool inspired a new way of thinking, creating a new behavioral lens focused on equity when we approach behaviors we would like to address in our work. People and context both took on new meaning and nuance—no longer do we have general, homogeneous "people" in mind when we think through our behavior change of interest, its barriers, and potential solutions. We now think about the various groups of people within our larger population of interest, their contexts and histories, and how their barriers and solutions might differ. We believe (and hope) that customized solutions based more directly on the specific groups of people who will be affected by a behavior change are the future of behavioral science. We think that a behavioral science lens focused on equity will be used to create the most effective—and moral—interventions. Perhaps, one day soon, WEIRD might just become weird.

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Dan Ariely is the James B. Duke Professor of Psychology and Behavioral Economics at Duke University and a founding member of the Center for Advanced Hindsight. He does research in behavioral economics on the irrational ways people behave, described in plain language. Irrationally Yours, Predictably Irrational, The Upside of Irrationality, The (Honest) Truth About Dishonesty, the movie Dishonesty and the card game Irrational Game are his attempt to describe his research findings in non-academic terms so that more people will discover the excitement of behavioral economics and use some of the insights to enrich their own lives.

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Nina Bartmann focuses on applied behavioral economics research in the field of health and finance. She received her MA in international and development economics from Yale University and her MSc in behavioral economics from Tilburg University in the Netherlands. Nina's work focuses on applied behavioral economics research with the aim of driving measurable change in the domains of health and finance.

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Judson Bonick has a background in public policy and social work but decided to move to experimental and applied behavioral science after becoming frustrated with policies not based on evidence or the way humans actually act. His work focuses on the perceived morality of paternalistic policies, purpose-in-life, and international development, among other topics. He is passionate about creating real, measurable change in the world, and also about his pups, Huckleberry and Sprout.

Jenna Clark, Senior Behavioral Researcher

Jenna Clark has a PhD in social psychology from the University of North Carolina at Chapel Hill. Her research background focuses on how we use technology to create, strengthen, and maintain our social relationships. At the Center, she focuses on helping people live happier and healthier lives with behavioral science.

Jonathan Cloughesy, Behavioral Researcher

Jon specializes in designing incentive structures that leverage social connections to improve health. He is passionate about behavioral science and aspires to help build a healthier, happier world for us all. Currently, Jon is a doctoral student in health economics at the University of Southern California.

Jamie Foehl, Senior Behavioral Researcher

Jamie Foehl is a ten-year veteran of the lab and brings her expertise to a variety of lab endeavors, including working with The Common Cents Lab, a sub-lab committed to financial health. In March of 2020 Jamie joined the CAH Health team and focused on applying behavioral science to address challenges related to the pandemic, such as vaccine hesitancy. Prior to joining the lab Jamie worked in advertising at Fallon in Minneapolis and other top agencies in NYC.

Jan Willem Lindemans, Principal

Jan Willem Lindemans leads the Health team at CAH. His research covers a wide range of health behaviors: from lifestyle to medication adherence and vaccination. He has extensively collaborated with partners in the healthcare industry, global health, and health tech. Before arriving at Duke, he was a postdoctoral researcher and codirector of the Penn Social Norms group at the University of Pennsylvania.

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Becky Reeves received her PhD in experimental psychology from the University of Kentucky in 2011 and completed a two-year post-doctoral fellowship at Tufts University in 2016. Her research interests involve decision-making under uncertainty, social support, and cognitive and emotional barriers to successful behavior change.

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ENDNOTES

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