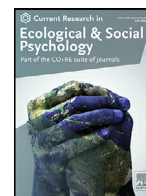




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A moth to a flame? Fulfilling connectedness needs through romantic relationships protects conspiracy theorists against COVID-19 misinformation

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ABSTRACT

Conspiracy theorists' unpopular opinions likely make them more apprehensive about interactions with others, frustrating their need to belong. Therefore, they may be susceptible to believing misinformation because evidence that others share their beliefs provides "social proof" that they can expect interactions with others to be positive and rewarding. The present research examined whether *alternatively* fulfilling the need for social connection through romantic relationships could protect conspiracy theorists against COVID-19 misinformation. In a 3-week daily diary study ($N = 555$), experimental participants implicitly learned to associate their romantic partners with positive experiences (by repeatedly pairing their partner with highly positive and approachable stimuli, McNulty et al., 2017). We then assessed how much participants trusted individuals they might normally distrust, as a manipulation check, and how much participants tuned their daily personal beliefs and behavior to match the U.S. public's daily susceptibility to COVID-19 misinformation. Participants *high* on conspiratorial thinking trusted fellow community members *more* in the experimental than control condition. Participants *high* on conspiratorial thinking in the experimental condition were also *less* likely to treat the U.S. public's greater daily susceptibility to COVID-19 misinformation as proof that they could discount the virus. The present findings suggest that rewarding romantic connections might be leveraged to limit conspiracy theorists' susceptibility to believing public skepticism about COVID-19.

1. Introduction

Social proof is a flame to the human mind moth...

Will Jelbert

Living socially connected to others, people often rely on consensual validation or "social proof" to verify the versions of reality they personally favor (Higgins et al., 2021; Prislín and Wood, 2005). For instance, discovering that another person, group, or community shares one's own passion for Marvel blockbusters, exasperation with the federal government, or skepticism about the COVID-19 pandemic confirms the veracity of the reality one perceives to be true.

But more than validating our favored perceptions, believing other individuals perceive the same reality also provides greater reason to trust and reach out to them, helping to fulfill the need to be immersed in

rewarding social connections (Baumeister and Leary, 1995; Cialdini and Goldstein, 2004; Higgins et al., 2021; Lin et al., in press; Rossignac-Milon et al., 2021). Therefore, when people have reason to think that their preferred beliefs are unpopular or disreputable, it creates more than an epistemic quandary (Heine et al., 2006)—it gives them reason to distrust and avoid others. By frustrating the need to be immersed in rewarding social connections in this way, personally holding unpopular or disreputable beliefs should motivate people to embrace any evidence that suggests others might actually perceive the same reality they do (Biddlestone et al., 2021; Prislín and Wood, 2005; Williams et al., 2000).

While fulfilling the need for social connection through "social proof" may be benign or even adaptive when unpopular beliefs are inconsequential or factually correct, being motivated to find "social proof" for unpopular, disreputable beliefs about a global health pandemic may put

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the health of oneself and others in jeopardy. Therefore, the current paper examines whether fulfilling the need for social connection through romantic relationships can protect people who typically hold unpopular beliefs against publicly-circulating COVID-19 misinformation.

1.1. The need for social connection

Conspiracy theories have captured the imaginations of sizable proportions of the public across time and cultures (Douglas et al., 2017, 2019; van Prooijen et al., 2108). Conspiracy theories are defined by the belief that powerful cabals are secretly working together toward some malevolent end (e.g., the C.I.A. aided the 9/11 hijackers, scientists fabricated climate change).

People who endorse one conspiracy tend to endorse others, even logically inconsistent ones (Douglas et al., 2017; Goertzel, 1994). This tendency suggests that conspiratorial thinking is not rooted in the inherent appeal of any specific belief. Instead, one perspective suggests the modern proclivity to embrace conspiracy theories is evolutionarily rooted in the human need to protect oneself and one's group against harm or exploitation by individuals or social groups aligned to obstruct one's interests, whether by stealing mates, pillaging fields, or waging war (van Prooijen and Douglas, 2018). In human ancestral history, those individuals who were quicker to detect whispers of actively unfolding plots would be better positioned to form the alliances needed to thwart such competitors, helping to ensure their offspring survived to reproduce.

Although conspiratorial thinking may have lost some of its utility in modern times (Douglas et al., 2019; Lantian et al., 2018), there is reason to suspect that the proclivity to engage in conspiratorial thinking today may still be associated with underlying anxieties about social connection (Baumeister and Leary, 1995; Murray et al., 2021a). Specifically, compared to people less prone to conspiratorial thinking, people who are highly prone to conspiratorial thinking are less likely to trust the members of their broader community – whether they be random passersby on the street, neighbors, the mainstream press, or government officials and institutions (Balta et al., 2021; Banai et al., 2020; Bruder and Kunert, 2021; Goertzel, 1994; Phadeke et al., 2021; Silva et al., 2017; van der Linden et al., 2021). People highly prone to conspiratorial thinking also tend to belong to stigmatized minority groups that have good reason to be wary about depending on their broader community to treat them well (Crocker et al., 1999; Davis and Reyna, 2015; Davis et al., 2018). Even people who are not normally prone to conspiratorial thinking gravitate to such beliefs when other individuals reject or ostracize them (Graepner and Coman, 2017; Poon et al., 2020).

The onset of the COVID-19 pandemic thrust people into a reality where virtually anyone they met could expose them to a life-threatening virus, generally threatening the safety of social connection (Bai et al., 2020). This stressor thus provided further fodder for conspiracy theorists to question their broader communities' acceptance of them. Not surprisingly, people who are prone to conspiratorial thinking also tend to hold unpopular beliefs about COVID-19, such as believing that the government turned a simple flu into a crisis for its own personal gain (Banai et al., 2020; Bertin et al., 2020; Bruder and Kunert, 2021; Pummerer et al., 2022). People generally expect to be rejected by others when they hold non-mainstream or otherwise unpopular beliefs (Douglas et al., 2019; Lantian et al., 2018). Therefore, holding non-mainstream beliefs about COVID-19 has likely given people prone to conspiratorial thinking even less reason to feel validated, accepted and included in their connection to their broader communities as they go about their daily lives.

Such feelings of disconnection represent a potential point of both vulnerability and leverage. Feeling disconnected, distrusting, or otherwise rejected by others generally attunes people to cues that signal rewarding opportunities for social connection (DeWall et al., 2009; Gardner et al., 2000; Pitts et al., 2014; Sacco et al., 2014; Young et al., 2015).

Therefore, feeling disconnected from others, people prone to conspiratorial thinking should be similarly primed to identify rewarding opportunities for connection. For anyone facing an uncertain reality, other individuals sharing the same reality as oneself clearly signals the availability of rewarding social connections (Higgins et al., 2021). Accordingly, in the uncertain context of a global pandemic, people prone to conspiratorial thinking might be especially attuned to finding “social proof” that others share their beliefs about the pandemic. Seeing their personal skepticism mirrored in the behavior of others could signal the social acceptability of their beliefs to this broader community, helping to fill frustrated needs for social connection (Biddlestone et al., 2021; Higgins et al., 2021; Prislín and Wood, 2005; Williams et al., 2000). However, if people prone to conspiratorial thinking are motivated toward finding “social proof” for their beliefs in order to fulfill their need to connect others, such a need also provides a point of leverage. Namely, providing conspiracy theorists an *alternate* means to fill their need for social connection could help reduce their susceptibility to any publicly circulating “social proof” for COVID-19 skepticism.

1.2. The power of romantic connection

The connection to a romantic partner is arguably the most important social connection made in adult life. In the past decades, people have come to rely more on their romantic relationships to fill the large majority of their needs as broader friendship networks have shrunk (Finkel et al., 2014). The restrictions imposed by pandemic living made social networks even more limited (Kovaks et al., 2021), further leveraging the unique power romantic relationship bonds have to fill daily needs to be immersed in rewarding social connections.

Nevertheless, the specific romantic partners that individuals possess may leave such connectedness needs more or less fulfilled. In ongoing relationships, spontaneous evaluative associations to romantic partners (e.g., good/bad, approach/avoid) reflect actual experiences of being more or less valued and protected in these relationships. Such evaluations capture lessons one has learned about the partner's trustworthiness and willingness to behave responsively (Faure et al., 2018; Hicks et al., 2016, 2018, 2021; LeBel and Campbell, 2009; McNulty et al., 2013; Murray et al., 2010, 2011, 2013). Consequently, these attitudes vary substantially in positivity (McNulty et al., 2019; Zayas and Shoda, 2015) and effectively capture the degree to which interactions with the partner have satisfied as opposed to frustrated the human need for safe and rewarding social connections (Murray et al., 2006, 2011, 2013). Indeed, automatic partner attitudes often better predict romantic relationship outcomes than consciously held attitudes toward the partner (McNulty et al., 2013; Righetti et al., 2022).

Building on such research, as well as more than 60 years of research on evaluative conditioning (see Hofmann et al., 2010), we designed the intervention to *simulate* the associations people who are involved in safe and rewarding romantic relationships typically make to their romantic partner. Specifically, we repeatedly conditioned *experimental* participants to associate their romantic partner with highly positive words and images. In so doing, we hoped to help fulfill needs for rewarding social connections by subtly nudging experimental participants to *consistently* make highly positive associations to their romantic partner (above and beyond whatever associations they would normally make). Prior research suggests that conditioning participants in this way enhances positive evaluative associations to that same partner over time (McNulty et al., 2017). In fact, this intervention is so effective in fulfilling connectedness needs that its implementation can inoculate vulnerable people against the perceived social and physical risks of social connection (Murray et al., *In press*) and reduce the general sense of social disconnection and isolation underlying suicidal ideation (McNulty et al., 2019).

1.3. Study aims

On the strength of this prior research, we reasoned that intervening to evaluatively condition participants to associate their romantic partner with highly positive, approachable stimuli would help fulfill needs for social connection. Consistent with this logic, feelings of security readily transfer across contexts (Chen et al., 2015; Fay and Maner, 2012; Forest et al., 2015; Mikulincer & Shaver, 2003; Murray et al., 2018; Murray et al., 2021a; Williams and Bargh, 2008). Specifically, we expected participants conditioned to associate their partner with highly positive stimuli to see strangers they might normally distrust as more *approachable* and *trustworthy*, helping them to feel more connected.

Existing research suggests that fulfilling the need for social connection in one way lessens the immediate need to fill it in an alternative way (Leary and Gabriel, 2021). Such satiability implies that filling the need for social connection through romantic relationships could conceivably quench the need to fill it alternatively, such as by internalizing “social proof” for one’s unpopular beliefs. Consequently, we reasoned that evaluatively conditioning conspiracy theorists to associate their romantic partners with highly positive and approachable stimuli would help fulfill the need for social connection and thus lessen the need for “social proof,” reducing their susceptibility to publicly-circulating misinformation about COVID-19.

The present research is the first to examine how people in general, and conspiracy theorists in particular, dynamically adjust their *daily* beliefs and behavior surrounding COVID-19 to the real-life misinformation about the virus circulating in the broader community. It is also the first to examine whether repeatedly conditioning conspiracy theorists to associate their romantic partner with highly positive stimuli can increase trust in the safety of collective ties to fellow community members. And finally, this research is the first to test whether conditioning conspiracy theorists to associate their romantic partner with highly positive stimuli can actually protect them against internalizing collectively-circulating misinformation about COVID-19.

1.4. Hypotheses

Evaluatively conditioning participants to associate their partner with highly positive and approachable stimuli should help fill the daily need to feel immersed in rewarding social connections, lessening the need to fill it in other ways (Leary and Gabriel, 2021). Because people *high* in conspiratorial thinking should be especially in need of connection, we expected the intervention to have the most impact on people *high* in the proclivity for conspiratorial thinking.¹

In the *control* condition, we expected participants *high* on conspiratorial thinking to report *less* daily trust of their fellow community members than those *low* on conspiratorial thinking, evidencing the hypothesized frustration of *highs*’ need for rewarding social connections. However, we expected the experimental intervention to fill this need, helping to disabuse conspiracy theorists of their distrust of fellow community members.

In the *control* condition, we also expected participants *high* on conspiratorial thinking to fill their need for social connection through “social proof” – tuning their personal beliefs about COVID-19 to match the broader community’s daily susceptibility to COVID-19 misinformation. That is, we expected control *highs* to be more *disbelieving* of the public-health-reality of COVID-19 on days when the broader community evidenced *greater* susceptibility to COVID-19 misinformation, as compared to days it evidenced *less* susceptibility. However, we expected evaluatively conditioning *highs* to associate their romantic partner with highly positive, approachable stimuli to reduce their need to rely on “social

proof” – effectively inoculating them against the broader community’s daily susceptibility to COVID-19 misinformation.

Unlike for participants *high* in conspiratorial thinking, we did not expect the intervention to substantively change how people *low* in conspiratorial thinking responded to the broader community’s daily susceptibility to COVID-19 misinformation. Instead, we reasoned participants *low* in conspiratorial thinking might be driven solely by epistemic concerns, using the “social proof” provided by the community to help inform their perceptions and behavior.

2. Method

This research was approved by the Institutional Review Board. We based the sample size we stipulated with Qualtrics, the company contracted to recruit and manage participants, on the results of Monte Carlo power simulations to detect at least 2-way cross-level interactions (Mathieu et al., 2012), using input parameters derived from tests of conceptually-related questions in our prior diary research. These simulations suggested power to detect 2-way interactions should approximate 0.90. Sensitivity power analyses conducted in G*Power (Faul et al., 2009) revealed that our effective sample size of 634 offered 80% power to detect an effect as small as $f^2=0.012$, which translates to an effect size r of 0.10.² We discuss procedures and measures not relevant to the current study in the Supplementary Online Material (SOM). Although the study was not pre-registered, we predicted that evaluative conditioning would increase trust in others, including strangers and government bodies, in the NSF grant that supported this research. The data are on OSF, https://osf.io/h2nqz/?view_only=aef58fce1df1496e995ec4243a5623f4. Study data were utilized in four prior publications (see SOM point 2). The SOM includes all measures; all manipulations and exclusions are disclosed, and data collection was concluded prior to analysis.

2.1. Participants

We contracted Qualtrics to recruit 400 participants with 11 complete assessments; they oversampled, soliciting 716 participants. Eligible participants had to be U.S. citizens in monogamous, heterosexual live-in romantic relationships, native English speakers, and pass a research integrity check. Qualtrics did not recontact 161 participants who did not attempt the second assessment, leaving 555 participants completing 2–11 assessments (9.6/11 assessments on average), with 348 (63%) completing all 11. Participants (268 men) averaged 42.6 years old ($SD=11.7$) and 363 had children ($M = 2.1$, $SD=1.1$). Relationships averaged 13.3 ($SD=10.2$) years in length (130 dating, 36 engaged, 389 married). Of the 392 employed participants, 25.3% were essential workers; 79.8% were working at home. U.S. participants lived across 41 states, with the largest subsets in California (15.3%), North Carolina (11.9%), Indiana (10.5%), Vermont (5.9%) and Hawaii (5.4%). Participants were recruited in two cohorts in May and June 2020. At this point in the pandemic, Republicans under President Donald Trump were leading the U.S. government response, scientists were still debating the primary means of COVID-19 transmission, and lockdowns were still imposed throughout much of the U.S.

2.2. Procedure

Participants first completed a 3-week long intervention, where they provided reports every-other-day for a total of 11 assessments. Qualtrics issued the first survey link to participants at 5 p.m. local time, with

¹ We identified participants high versus low on conspiratorial thinking in relative terms – that is, as participants scoring one standard deviation above the mean, and one standard deviation below the mean, respectively, on the generic conspiracist ideation scale (Brotherton et al., 2013).

² The current hypotheses include both 2-way and 3-way cross-level interactions (in particular, we expect the 3-way to consist of non-significant 2-ways contrasted with significant 2-ways), so the power to find significant 2-ways is highly related to the power of the hypothesized 3-way. However, specific power analyses for a 3-way cross-level interaction are not yet developed.

subsequent surveys issued every other day for 20 days (11 assessments). They were asked to complete the survey before bed, but the link remained accessible until 6 a.m. the next day. Two months after the 11th assessment, interested participants completed a short single-administration follow-up survey.

2.2.1. Assessing conspiratorial thinking

In the first of the 11 assessments, we assessed general susceptibility to believing in conspiracy theories to capture the general disposition to be distrusting and suspicious of society as a whole (Douglas et al., 2017) that is thought to frustrate the need for rewarding social connection. Specifically, participants responded to only the government malfeasance (e.g., “A small, secret group of people is responsible for making all major world decisions, such as going to war”), personal well-being (e.g., “The spread of certain viruses and/or diseases is the result of the deliberate, concealed efforts of some organization”), and control of information subscales (e.g., “Groups of scientists manipulate, fabricate, or suppress evidence in order to deceive the public”) of the general conspiracist beliefs scale ($\alpha = 0.91$, Brotherton et al., 2013), $-2 = \text{definitely not true}$, $2 = \text{definitely true}$. This scale was included among demographic questions and other personality measures (see SOM).

2.2.2. Implementing the evaluative conditioning intervention

In the next 10 assessments (every-other-day over 3 weeks), participants underwent the *condition-specific* evaluative conditioning protocol before completing self-report surveys assessing the focal daily dependent measures embedded in unrelated measures (see SOM point 1). In the *experimental* condition, participants were exposed to 310 stimuli over 6–7 min to condition more positive evaluative associations to their romantic partner, with the 25 critical stimuli pairing their romantic partner’s first name or role with highly positive, approachable unconditioned stimuli, such as pictures of puppies or sunsets or words like “wonderful” and “fabulous” (McNulty et al., 2017). In the *control* condition, participants were exposed to 310 stimuli that included 25 critical pairings of their partner’s first name or role with neutral unconditioned stimuli. As in McNulty et al. (2017), we randomly distributed a set of 75 unconditioned stimuli across the 10 conditioning sessions to ensure participants did not habituate to the unconditioned stimuli.

2.2.3. Assessing the daily predictor variable – daily observed U.S. public susceptibility to COVID-19 misinformation

Given the myriad ways public susceptibility to COVID-19 misinformation can be observed, we created a broad, formative daily index of susceptibility by *z*-scoring and averaging 3 theoretically relevant indicators that we decided upon in advance of data collection. Specifically, we reasoned that more people (1) posting negative comments about the White House Coronavirus Task force on social media, (2) conducting Google searches for information that suggested COVID-19 was not to be taken seriously, and/or (3) being out in the community rather than locked down at home would reflect greater daily public susceptibility to COVID-19 misinformation. We also reasoned that the skepticism captured by these daily markers would be evident in public behavior participants could see in their daily lives (e.g., the number of cars out on the street in violation of lockdown protocols, the number of people wearing a mask or crowding queues, the level of criticism of the task force on cable news). As intended (Epstein, 1984), the 3 components of this formative index, described next, captured independent aspects of daily public susceptibility to COVID-19 misinformation (average $r = 0.07$).³

³ In a reflective measurement model, the construct (e.g., self-esteem) causes the indicators (e.g., responses to self-esteem items). Therefore, indicators are expected to inter-correlate (i.e., people who score relatively highly on one indicator should also score highly on all the other indicators). In a formative measurement model (Diamantopoulos et al., 2008; Diamantopoulos & Winklhofer, 2001; Edwards & Bagozzi, 2000), the indicators (e.g., ways of behaviorally demonstrating the U.S. public’s susceptibility to COVID-19 misinformation) instead define

Importantly, as we later discuss, parallel interaction effects emerged in analyses using the individual indicators of this composite, which suggests that all of its components do indeed similarly capture public susceptibility to COVID-19 misinformation.

2.2.3.1. Negative sentiment about the white house coronavirus task force.

We used the social-media monitoring tool Digimind to retrieve and analyze social media posts mentioning the “White House Coronavirus Task Force” on each assessment day. Digimind uses machine learning to classify posts by valence (see SOM), allowing us to identify the percent of U.S. social media posts mentioning the task force that were negative on a given day.

2.2.3.2. Google searches for COVID-19 myth/hoax and Chinese virus.

Google Trends data indexes how frequently a particular term is searched on a given day relative to the total search volume. We separately tracked how often U.S. residents searched for the terms “COVID-19 myth or COVID-19 hoax” and “Chinese virus” each day and averaged the *z*-scored results.

2.2.3.3. Percent of residents that stayed home state-wide.

We tracked the percentage of residents in participants’ state that moved less than 330 feet from their personal residence each assessment day (*z*-scored, multiplied by -1 to reverse the results) using the website: https://www.cuebiq.com/visitation-insights-covid19/?utm_source=nyt&utm_medium=article&utm_campaign=organic.

2.2.4. Assessing the daily manipulation check – trust in fellow community members

On each of the 10 assessment days, we assessed participants’ trust in their “fellow community members” by averaging two independent daily indicators (within-person $r = 0.05$): Trust in (1) fellow citizens and (2) potential acquaintances.

2.2.4.1. *Trust in fellow citizens.* Participants rated their personal level of trust/confidence in “the U.S. population/my fellow citizens” each day, $0 = \text{no trust at all}$, $4 = \text{a great deal}$.

2.2.4.2. *Trust in potential acquaintances.* We serially presented 8 headshots of strangers (varying daily), and for each image, participants rated how much they would trust the person pictured “right from the start”. We selected the headshots from the Chicago Face Database (CFD, Ma et al., 2021), constraining the 8 images presented each day so that participants saw new male and female faces representing four races (i.e., Black, White, Asian, Latino), with the images roughly matched in age, attractiveness, threateningness, trustworthiness, and unusualness. We indexed participants’ trust in potential new acquaintances each day by averaging responses to the 8 new images presented each day, $0 = \text{not at all}$, $8 = \text{very much so}$.

2.2.5. Assessing the daily dependent variable – daily endorsed personal belief in the public-health reality of COVID-19

To broadly capture the breadth of the beliefs likely contributing to greater daily *personal* dis/belief in the public-health-reality of COVID-19, we created a formative index by averaging three equally-weighted component indices (average within-person $r = 0.20$): (1) trust in the government and public-health officials communicating the gravity of COVID-19, *z*-scored, (2) immersion in the mainstream media touting the dangers of the virus, captured through (a) trust in the media/press and (b) time spent reading/listening to the mainstream news, *z*-scoring each

the construct. Therefore, people/days that score relatively highly on one indicator are not necessarily expected to score highly on the others because any one indicator is sufficient to index the construct (e.g., as is the case for indicators of socioeconomic status).

scale before averaging, and (3) personal vigilance to COVID-19, captured through (a) concern about COVID-19, (b) trust in the efficacy of social distancing, and (c) engaging in public-health recommended self-protective behavior, z-scoring each scale before averaging.⁴ Higher scores on this index captured greater daily belief in the scientific reality of COVID-19 advocated by government and public health officials, whereas lower scores captured greater relative disbelief.

2.2.5.1. Daily trust in government and public health. Participants rated their trust/confidence in 10 government and public health agents/institutions ($\alpha=0.83$) each day (i.e., “The President”, “The United States Congress”, “White House Coronavirus Task force”, “The Centers for Disease Control”, “Dr. Anthony Fauci, The Director of the National Institute of Allergies and Infectious Disease”, “my state governor”, “public health officials”, “epidemiologists (researchers who study disease)”, “the legal system”, and “the police force”), 0=no trust at all, 4 = a great deal.

2.2.5.2. Daily trust in the mainstream media. Participants rated their personal level of trust/confidence in “the media/press” each day, 0=no trust at all, 4 = a great deal.

2.2.5.3. Daily time spent with the mainstream media. Participants rated how much time they spent “reading/listening to the mainstream news” each day, 0=no time, 4=>7 h.

2.2.5.4. Concern about COVID-19. Participants rated their concern about “COVID-19/Coronavirus” each day, 0=not at all concerned, 4=extremely concerned.

2.2.5.5. Trust in social distancing. Participants rated their trust/confidence in the efficacy of social-distancing policies each day, 0=no trust at all, 4 = a great deal.

2.2.5.6. Public-health recommended behavior. Participants rated how much effort/energy they spent “washing my hands for at least 20 s”, “using hand sanitizer”, “keeping physical distance (at least 6 feet/2 m) between myself and another person when in public”, “covering my coughs/sneezes”, “trying not to touch my face” and “wearing a face mask” each day ($\alpha=0.88$), 0=no effort/energy at all, 4=an extreme amount of effort/energy.

3. Results

Table 1 presents descriptive information and Table 2 presents the intercorrelations for the primary variables. In Table 2, *within-person* variables vary daily, and they are centered around the participant’s mean across the daily assessments. *Between-person* variables vary by person and included experimental condition (which was randomly assigned), conspiratorial thinking (an individual difference variable), and participants’ *average* daily experiences/responses. The *within-person* correlations (below the Table 2 diagonal) were negligible, which we expected because the daily-level hypotheses involve interactions, not main effects. The *between-person* correlation (above the Table 2 diagonal) between conspiratorial thinking and participants’ *average* daily belief in the public health reality of COVID-19 was negative, as we expected.

The data had a multilevel structure, with each of the 10 repeated assessments at Level 1 nested within person at Level 2. Therefore, we used the multilevel modeling program MLwiN to test the interaction

⁴ We also measured daily time spent “self-isolating/social distancing.” We did not combine this item in measure of trust in the efficacy of social distancing because people who trust social distancing may be compelled to spend time with others due to the work or family obligations. Nevertheless, when we did include this item, the 3-way interaction we later reported was still significant, $b=.034$, $SE=.013$, $z = 2.62$, $p=.00879$, $95\%CI(.009, .059)$.

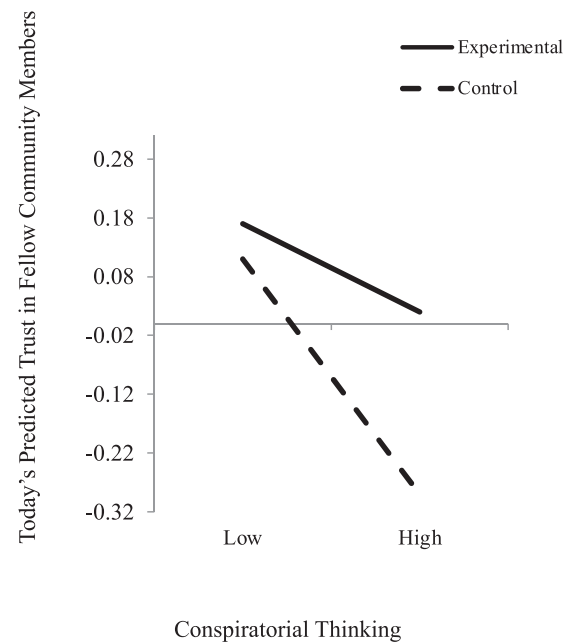


Fig. 1. Today's predicted trust in fellow community members from condition and conspiratorial thinking.

hypotheses (Goldstein et al., 1998). We predicted the daily outcome variable (whether trust in fellow community members or belief in the public health reality of COVID-19) from the *main* effects of (1) public susceptibility to COVID-19 misinformation on that day, centered around the person's daily mean, (2) experimental condition (1=experimental, 0=control), (3) conspiratorial thinking, a between-person variable centered around the sample mean, and (4) their 2-way and 3-way interactions. We also included the (5) value of the outcome variable on the prior day to isolate change and (6) the main effect of the participant's *mean* daily exposure to COVID-19 misinformation and its interactions with condition and conspiratorial thinking to separate daily-level and between-person effects (Bolger and Laurenceau, 2013).

Table 3 presents the terms and coefficients in the multilevel model predicting each of the two composite dependent variables. We focus on the highest order effects in describing the results.

3.1. The manipulation check, daily trust in fellow community members

We generally expected participants in the *experimental* condition to report greater trust in their fellow community members than participants in the *control* condition, but we expected this main effect to be more pronounced for those *high* on conspiratorial thinking.

As expected, the main effect of experimental condition predicting the composite index of daily trust in fellow community members was significant, but it was qualified by a marginal 2-way condition by conspiratorial thinking interaction ($p=.055$). Fig. 1 presents the predicted scores (which vary from negative to positive because the components of the daily trust in fellow community members were z-scored). Participants *high* on conspiratorial thinking (1 *SD* above the mean) reported significantly greater daily trust in their fellow community members in the experimental than control condition, $b = 0.303$, $SE=0.088$, $z = 3.44$, $p=.00058$, $95\%CI(0.131, 0.475)$. However, the simple effect of experimental condition was not significant for participants *low* on conspiratorial thinking (1 *SD* below the mean), $b = 0.064$, $SE=0.083$, $z = 0.77$, $p=.44$, $95\%CI(-0.099, 0.227)$. In the *control* condition, participants *high* on conspiratorial thinking reported markedly less trust in fellow community members than those *low*, $b=-4.43$, $p<.00001$, $95\%CI(-0.294, -0.114)$. However, the greater distrust of highs relative to lows was reduced in the experimental

Table 1
Descriptive information.

Variable	Mean	SD
Conspiratorial thinking	-0.01	.96
Daily%negative social media posts about White House Coronavirus Task Force	26.0	9.46
Daily Google searches for COVID-19 myth	87.4	12.05
Daily Google searches for Chinese virus	85.0	18.6
Daily%residents that stayed home statewide	32.5	4.88
Daily public-health-recommended behavior	4.05	2.12
Daily trust in U.S. populace/fellow citizens	1.73	0.94
Daily trust in potential acquaintances	3.87	1.68
Daily recommended self-protective behavior	4.05	2.12
Daily concern about COVID-19	2.48	1.25
Daily trust in social distancing policies	2.42	1.20
Daily trust in media	1.65	1.10
Daily time spent on mainstream news	0.97	0.81
Daily trust in government institutions	1.97	0.75

Table 2
Intercorrelations among the primary variables.

Variable	1	2	3	4	5
1. Conspiratorial thinking	–	.03	.02	-0.30	-0.04
2. Daily observed public susceptibility to COVID-19 misinformation	.00	–	.02	-0.18	.01
3. Daily trust in fellow community members	-0.13	.02	–	.01	.02
4. Daily personal belief in public-health-reality of COVID-19	-0.00	-0.09	.05	–	.09
5. Experimental condition	-0.04	.00	.06	.00	–

Note. Intercorrelations among the daily within-person (centered) variables are below the diagonal and intercorrelations among the daily between-person means are above the diagonal.

condition, $b = -0.081$, $SE = 0.044$, $z = -1.84$, $p = .066$, $95\%CI(-0.167, 0.005)$. In sum, the intervention especially helped participants high in conspiratorial thinking to be more trusting of their fellow community members. Further analyses predicting the components of the composite index of daily trust in fellow community members revealed similar patterns (see SOM point 3).

3.2. Daily belief in the public-health reality of COVID-19

In the *control* condition, we expected participants *high* on conspiratorial thinking to follow social proof and be more *disbelieving* of the public-health-reality of COVID-19 on days when the broader community evidenced *greater* susceptibility to COVID-19 misinformation, as compared to days it evidenced *less* susceptibility. However, we expected the intervention to reduce conspiracy theorists' need to find "social proof" for their beliefs, resulting in their personal belief in the public-health-reality of COVID-19 being less affected by daily variations in the community's susceptibility to misinformation about the virus.

As expected, the 3-way interaction between conspiratorial thinking, experimental condition, and the current day's U.S. public susceptibility to COVID-19 misinformation significantly predicted daily personal belief in the public-health-reality of COVID-19. Fig. 2 presents the predicted scores (which vary from negative to positive because the components of the daily belief in the public-health-reality of COVID-19 were z -scored). The slopes capture the daily effects of "social proof"—that is, the attunement between participants' own daily beliefs and behavior and the U.S. public's daily susceptibility to COVID-19 misinformation. More negative slopes capture greater attunement to misinformation, with *greater* daily public susceptibility to COVID-19 misinformation predicting *decreased* personal belief (or greater relative *disbelief*) in the public-health-reality of COVID-19. The 3-way interaction depicted in Fig. 2 was also largely robust in further analyses examining the components of composite daily independent variable and dependent variable indices (see SOM point 4).

As expected, participants *high* in conspiratorial thinking (1 *SD* above the mean) followed "social proof" in the *control* condition, where their needs for social connection were relatively unfulfilled. In the

control condition, that is, participants *high* on conspiratorial thinking significantly attuned their personal beliefs to daily "social proof" for COVID-19 skepticism. *Control highs* were significantly *less* believing of the public-health-reality of COVID-19 on days when the U.S. public evidenced *greater* susceptibility to COVID-19 misinformation, as compared to days it evidenced *less* susceptibility, $b = -0.062$, $SE = 0.014$, $z = -4.43$, $p < .0001$, $95\%CI(-0.089, -0.035)$. In contrast, participants *high* in conspiratorial thinking ignored "social proof" in the *experimental* condition, where their needs for social connection were relatively fulfilled. The simple effect of daily public susceptibility to COVID-19 misinformation predicting daily personal belief in the public-health-reality of COVID-19 was essentially zero and not significant for experimental highs, $b = 0.004$, $SE = 0.014$, $z = 0.29$, $p = .772$, $95\%CI(-0.023, 0.031)$.

Also as expected, participants *low* in conspiratorial thinking followed "social proof" regardless of experimental condition. That is, participants *low* in conspiratorial thinking (i.e., those 1 *SD* below the mean) were *less* believing in the public-health-reality of COVID-19 on days when the U.S. public evidenced *greater* susceptibility to COVID-19 misinformation, as compared to days the U.S. public evidenced *less* susceptibility. The simple effect of today's public susceptibility to COVID-19 misinformation was significant for participants *low* on conspiratorial thinking, $b = -0.028$, $SE = 0.019$, $z = -3.11$, $p = .0019$, $95\%CI(-0.046, -0.010)$.

Decomposing the 3-way interaction into its component 2-way interactions revealed the expected differences between the simple slopes depicted in Fig. 2. First, participants *high* in conspiratorial thinking were significantly *less* attuned to "social proof" for COVID-19 skepticism in the experimental than control condition. That is, the conditional 2-way daily public susceptibility to COVID-19 misinformation by condition interaction was significant for participants *high* in conspiratorial thinking, $b = 0.066$, $SE = 0.019$, $z = 3.47$, $p = .00052$, $95\%CI(0.029, 0.103)$, but not for participants *low* in conspiratorial thinking, $b = -0.013$, $SE = 0.018$, $z = -0.72$, $p = .472$, $95\%CI(-0.048, 0.022)$. Second, in the *control* condition, participants *high* in conspiratorial thinking were significantly *more* attuned to "social proof" than participants *low* in conspiratorial thinking, but in the *experimental* condition, participants *high* in conspiratorial thinking were significantly *less* attuned to "social proof" than participants *low* in conspiratorial thinking. That is, opposite

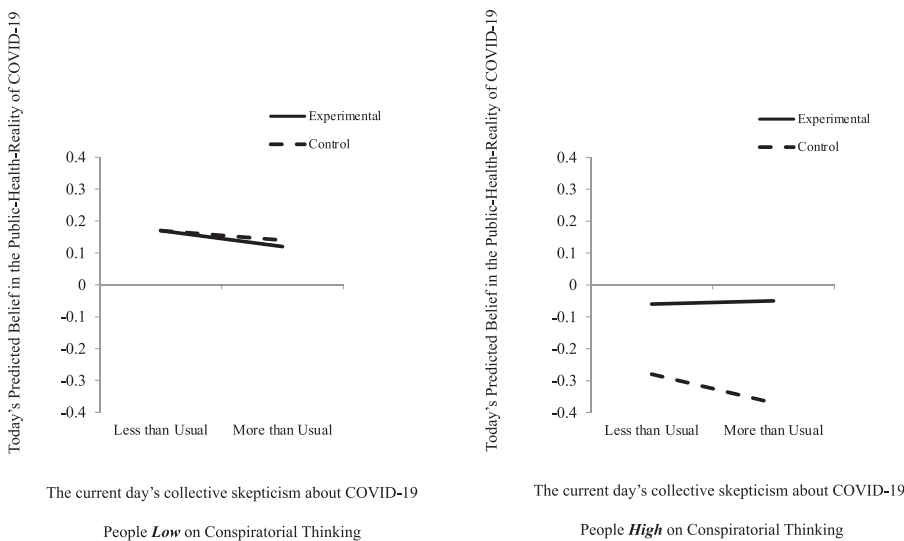


Fig. 2. Today's predicted belief in the public-health-reality of COVID-19 from the current day's collective skepticism about COVID-19, experimental condition, and conspiratorial thinking.

and significant conditional 2-way daily public susceptibility to COVID-19 misinformation by conspiratorial beliefs interactions emerged in the control, $b = -0.021$, $SE = 0.010$, $z = -2.10$, $p = .0357$, $95\%CI(-0.041, -0.001)$, and experimental conditions, $b = 0.020$, $SE = 0.009$, $z = 2.22$, $p = .0264$, $95\%CI(0.002, 0.038)$. Third, on days when the U.S. public evidenced *greater* than usual skepticism about COVID-19, the intervention's protective effects were even more evident for participants *high* in conspiratorial thinking. That is, the 2-way condition by conspiratorial thinking interaction was stronger on days when the U.S. public evidenced *greater* susceptibility to COVID-19 misinformation (1 *SD* above the daily mean), $b = 0.170$, $SE = 0.055$, $z = 3.09$, $p = .002$, $95\%CI(0.062, 0.278)$, than days when it evidenced *less* susceptibility to COVID-19 misinformation (1 *SD* below the daily mean), $b = 0.123$, $SE = 0.055$, $z = 2.24$, $p = .025$, $95\%CI(0.015, 0.231)$. In sum, intervening to fulfill the need for rewarding social connections through romantic relationships appeared to protect those *high* in conspiratorial thinking against internalizing COVID-19 misinformation.

3.3. Further considerations

At least two points bear further consideration. First, the conditions contrast the effects of pairing the romantic partner with highly desirable as opposed to neutral words. Because the partner is primed in both conditions, partner priming cannot account for the effects of evaluative conditioning. However, this procedure does leave open the possibility that the effects of evaluative conditioning emerged due to mood effects resulting from priming positive versus neutral words on a daily basis. Fortunately, further analyses (detailed in the SOM, point 5) revealed that daily mood cannot account for the effects of the intervention.

Second, it is important to note that the intervention generally made people who were prone to conspiratorial thinking more believing of the public-health-reality of COVID-19. As Table 3 reveals, the 2-way condition by conspiratorial thinking interaction predicting daily personal belief in the public-health-reality of COVID-19 was significant in the context of the 3-way interaction. It was also significant when we omitted daily public susceptibility to COVID-19 misinformation and its interactions from the model, $b = 0.167$, $SE = 0.055$, $z = 3.04$, $p = .0024$, $95\%CI(0.059, 0.275)$. In the control condition, participants *high* on conspiratorial thinking were much *less* believing of the public-health-reality of COVID-19, as compared to participants *low* in conspiratorial thinking, $b = -0.267$, $SE = 0.040$, $z = -6.48$, $p < .00001$, $95\%CI(-0.345, -0.189)$. While the greater skepticism of highs was still evident in the experimental condition, it was significantly reduced, $b = -0.100$, $SE = 0.038$, $z = -2.63$, $p = .0085$, $95\%CI(-0.174, -0.026)$. While it may be

advantageous to be distrustful of the government when it is behaving badly, popular resistance to public health recommendations has directly increased deaths due to the pandemic (Robertson, 2021; VoPham et al., 2020). Therefore, it is crucial to understand and redress the motivations that dispose conspiracy theorists to be distrustful of public health advice; the current findings suggest that fulfilling the human need for rewarding social connection may increase such trust.

4. Discussion

People low and high on conspiratorial thinking share the same strong need to be immersed in rewarding social interactions, not just with friends and family, but with the broader collective community (Gabriel et al., 2020). However, the latter need is especially likely to be frustrated for people prone to conspiratorial thought because they espouse unpopular opinions. Indeed, in the *control* condition, people *high* in conspiratorial thinking were markedly less trusting of their fellow community members than those *low*. However, evaluatively conditioning participants to associate their romantic partner with highly positive and approachable words and images helped fulfill the need to be immersed in rewarding social connections and lessened conspiracy theorists' distrust of fellow community members.

As expected, fulfilling the need for rewarding social connections by evaluatively conditioning people *high* on conspiratorial thinking to associate their romantic partner with high positive and approachable stimuli reduced the need to internalize "social proof" for unpopular beliefs. In the *control* condition, participants *high* on conspiracy thinking were significantly and markedly *less* likely to think and behave in line with the public-health reality of COVID-19 on days when the U.S. public evidenced *greater* susceptibility to COVID-19 misinformation, as compared to days it evidenced *less* susceptibility. However, in the experimental condition, the U.S. public's daily susceptibility to COVID-19 misinformation had no significant effect on the daily credibility participants *high* in conspiratorial thinking personally granted to COVID-19.

Moreover, the 2-way experimental condition by conspiratorial thinking interaction that also emerged revealed that the intervention helped convince conspiracy theorists to treat COVID-19 as a public health emergency. Namely, in the context of an indisputable global health pandemic, conditioning conspiracy theorists to associate their romantic partner with highly positive and approachable stimuli helped disabuse them of their distrust of the public health, governmental, and media institutions. These effects are impressive for at least two reasons. First, we did not assess whether participants thought their romantic partners shared their conspiratorial beliefs. Nevertheless, evaluative

Table 3
Predicting today's trust in fellow community members and personal belief in the public-health-reality of COVID-19 from daily community susceptibility to COVID-19 misinformation, experimental condition, and conspiratorial thinking.

Predictor	Daily Trust in Fellow Community Members		Daily Belief in the Public-Health-Reality of COVID-19	
	b (SE)	z	b (SE)	z
Intercept	-0.089 (0.043)	-2.07*	-0.081(0.037)	-2.19*
Prior's day outcome variable	-0.004 (0.016)	-0.25	.117 (0.015)	7.80***
Current day's community susceptibility to COVID-19 misinformation	-0.005 (0.013)	-0.38	-0.042 (0.010)	-4.20***
Condition	.185 (0.061)	3.03**	.124 (0.052)	2.38*
Conspiratorial thinking	-0.204 (0.046)	-4.43***	-0.250 (0.039)	-6.41***
Current day's community susceptibility by condition	-0.024 (0.019)	-1.26	.027 (0.013)	2.08*
Current day's community susceptibility by conspiratorial thinking	.007 (0.014)	0.50	-0.021 (0.010)	-2.10*
Condition by conspiratorial thinking	.123 (0.064)	1.92+	.147 (0.054)	2.72**
Current day's community susceptibility by condition by conspiratorial thinking	-0.030 (0.019)	-1.58	.041 (0.014)	2.93**
Mean daily community susceptibility	-0.309 (0.100)	-3.09***	-0.322 (0.085)	-3.79***
Mean daily community susceptibility by condition	.181 (0.139)	1.30	.176 (0.118)	1.49
Mean daily community susceptibility by conspiratorial thinking	-0.096 (0.110)	-0.87	-0.041 (0.093)	-0.44
Mean daily community susceptibility by condition by conspiratorial thinking	.147 (0.149)	0.99	-0.013 (0.127)	-0.10

+ $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$ Coefficients set to be random are italicized. Bolded terms capture the expected effects.

conditioning had a robust enough effect to transcend any differences in the support participants may (or may not) have perceived from their romantic partner for their beliefs. Second, people are usually highly resistant to any information that directly challenges their beliefs (Hornsey, 2020; Kunda, 1990). Indeed, confronting people with opposing views often hardens their commitment to their own position (Bail et al., 2018; Lord et al., 1979). However, people want to believe their family relationships are secure when depending on one's community or government seems risky (Murray et al., 2021a). The present findings thus suggest interventions that capitalize on the need to be immersed in rewarding family connections could lessen conspiratorial thought without directly confronting such beliefs.

The current findings have strengths and limitations. On the side of strengths, this research is the first to examine how conspiracy theorists tune their personal beliefs about a pressing national crisis to the behavior of the U.S. public. It is the first to leverage romantic relationship bonds as a means of inoculating conspiracy theorists against publicly-circulating misinformation about COVID-19. Indeed, the inoculating effect of evaluative conditioning was significantly stronger on days when the behavior of the broader community communicated *greater* than usual susceptibility to COVID-19 misinformation. On the side of empirical strengths, we used multiple, convergent indices of daily community COVID-19 susceptibility to COVID-19 misinformation that we decided on a-priori and diverse indicators of the daily belief in the public-health reality of COVID-19. The effects were also robust when we added time to the multilevel models (see SOM point 7), suggesting they were not an artifact of unrelated historical events on a given day or maturational changes in the participants.

On the side of limitations, the predicted interactions were not significant for every single indicator constituting the composite daily measures of trust in fellow community members and belief in the public-health reality of COVID-19, as we noted in the results. Nevertheless, the effects were robust enough to transcend the imprecision of specific measures. The effects were also small, which is to be expected given the subtlety of the daily objective measures of the U.S. public's susceptibility to COVID-19 misinformation (Götz et al., 2021) and the implicit nature of the evaluative conditioning intervention (see SOM point 8).

Finally, evaluative conditioning increased trust in those they would normally treat with some suspicion, namely strangers in the community, as predicted a-priori in the grant proposal that supported this research. Nevertheless, it did not have the straightforward effect on trust in one's romantic partner. Participants in the experimental condition did *not* report significantly greater trust in their romantic partner, as compared to control participants, likely because participants were already, unsurprisingly, highly trusting of their romantic partners. Nonetheless, participants in the intervention condition did report significantly greater daily trust in their fellow community members and marginally greater trust in their friends (see SOM point 9). Moreover, this conditioning procedure also significantly increased relationship satisfaction in newlyweds in prior research (McNulty et al., 2017), speaking to its effectiveness in fostering stronger romantic relationship bonds. But importantly, these effects on satisfaction only emerged over the course of several months, making it unlikely we would detect same-day effects on partner perceptions in the current research. Indeed, people's motivations to view their relationships positively appear to minimize their willingness or ability to report the automatic gut-level responses that the conditioning procedure targets (Hicks et al., 2021), though such feelings do immediately affect other processes (Faure et al., 2018) and eventually shape self-reported evaluations over time (McNulty et al., 2013). Moreover, a two-month follow-up revealed that evaluative conditioning had lasting effects on collective trust for *highs* (see SOM point 9). By the 2-month follow-up, *control* participants *high* on conspiratorial thinking reported even less trust in people in general and in government as compared to controls *low* on conspiratorial thinking. However, in the experimental condition, this relative distrust disappeared.

5. Conclusion

Like moths to flames, conspiracy theorists gravitate to any whisper of information that fuels their suspicions and distrust. While such inclinations might be advantageous when the government is actually behaving duplicitously, they are less advantageous in the context of a global health pandemic where resistance to public health advice directly compounds death rates (Robertson, 2021; VoPham et al., 2020). The present findings provide the first evidence that giving conspiracy theorists experiential reason to associate their romantic partner with safe and rewarding experiences can help protect them against believing misinformation about COVID-19. These findings provide novel support for evolutionary models that emphasize the role that conspiratorial thought can play in making social connection safer (van Prooijen and Douglas, 2018). Going beyond this prior literature, the present findings also suggest that the need for social connection can be effectively leveraged to reduce susceptibility to misinformation.

Misinformation spreads in part because it imposes order on uncertain or threatening situations – making the world itself seem safer and less capricious (Douglas et al., 2017, 2019; van Prooijen et al., 2018). However, social connections do more than just make the world feel safer, (Murray et al., 2017, 2021b). They also provide real protection against physical and psychological stressors (Slatcher and Selcuk, 2017). For this reason, interventions that build and broaden social connection could give people *real*, rather than imagined, reasons to feel safe in the world, and in so doing, lessen collective vulnerability to misinformation. In the present study, evaluative conditioning provided an easily implementable means for fulfilling the need for connection in the early months of a global health pandemic that had constrained social activities outside the home. However, romantic bonds are not the only ones that can satisfy needs for social connection, nor is evaluative conditioning the only way to satiate such needs. Therefore, future research might examine whether other interventions, such as focusing on the meaning of a romantic partner's compliment (Marigold et al., 2007), engaging in self-expanding activities with a romantic partner (Aron et al., 2013), or even filling social voids with happy childhood memories or Netflix binges with friends (Gabriel et al., 2016) could also help lessen conspiracy theorists' susceptibility to misinformation. Just as finding social proof for one's beliefs can inflame conspiratorial thought, finding proof of social connection could help quell it.

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Ethics

This research received approval from the Institutional Review Board at the University of Buffalo, State University of New York.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data are on OSF, https://osf.io/h2nqz/?view_only=aef58fce1df1496e995ec4243a5623f4.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.cresp.2023.100111](https://doi.org/10.1016/j.cresp.2023.100111).

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