

Trust in Public Health Sources, COVID-19 Protective Behaviors, and the Attenuating Role of Behavioral Beliefs: A Dual Processing Study with a Longitudinal Representative

Sample of U.S. Adults

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Abstract

Public distrust in official sources of COVID-19 information threatens to undermine engagement in recommended practices. Nonetheless, people with low trust may adhere if they believe recommended behaviors are effective. This set of longitudinal studies examines the interaction between behavioral beliefs and trust in official sources in their effects on recommended COVID-19 prevention behaviors (study 1: facemask wearing and social distancing; study 2: vaccination). Repeated measurement data were collected from a nationally representative sample of U.S. adults in May/June 2020 (T1; $n=1074$), July 2020 (T2; $n=889$), and April/June 2021 (T3; $n=750$). Lagged linear regressions found consistent negative interactions between trust and behavioral beliefs, either significant (T1-T2: facemask wearing $B=-0.10$, $SE=0.04$; T1-T3: social distancing $B=-0.20$, $SE=0.06$; T2-T3 vaccination $B=-0.27$, $SE=0.10$) or close to significant (T1-T3: social distancing $B=-0.13$, $SE=0.08$; T1-T3: facemask wearing $B=-0.11$, $SE=0.06$). These results support dual-processing models; among individuals who strongly believed in behavioral benefits, trust did not influence adherence.

Keywords: covid-19, dual-processing, trust, behavioral beliefs, vaccine

Trust in Public Health Sources, COVID-19 Protective Behavior, and the Attenuating Role of Behavioral Beliefs: A Dual Processing Study with a Longitudinal Representative Sample of U.S. Adults

Since the onset of the SARS-CoV-2 (COVID-19) pandemic, public trust in official sources of health information has decreased in the United States (U.S.) (Flew, 2021; Latkin et al., 2020). Distrust may result from a variety of factors, including misinformation (Pickles et al., 2021), conflicting information (Nagler, 2014; Toney & Ishack, 2020), and political polarization (Latkin et al., 2020). These phenomena threaten public health, as trust in experts can affect willingness to engage in recommended protective behaviors (Bargain & Aminjonov, 2020). Pandemic communication approaches may benefit from identifying and targeting perceptions that motivate recommendation adherence among segments of the public who distrust experts as sources of information. Using longitudinal survey data of U.S. adults, I examine one factor that may interact with the relationship between trust in recommendation sources and recommendation adherence—the extent to which people believe in the protective benefits of recommended behaviors.

Literature Review

Across theories of health behavior change, anticipated outcomes of engaging in a particular behavior are recognized as important predictors of the behavior itself. Anticipated behavioral outcomes may be referred to as *perceived benefits/costs* (health belief model; Rosenstock, 1974), *pros/cons* (transtheoretical model; Prochaska & DiClemente, 1983) *outcome expectancies* (social cognitive theory; Bandura, 2001), or *behavioral beliefs* (the reasoned action approach; Fishbein & Ajzen, 2011). According to the integrative model of behavior prediction (IMBP), which incorporates constructs from prominent behavior change theories, behavior-specific beliefs influence behavioral attitudes, which—along with, self-efficacy, and perceived norms—predict intention to engage in a behavior (Fishbein & Yzer,

2003). Intention, in turn, predicts behavior (Fishbein & Yzer, 2003).

There is strong empirical evidence supporting the theorized relationship between behavioral beliefs, intention, and behavioral outcomes (Ajzen, 2011; Armitage & Conner, 2001; McEachan et al., 2011; Schulze & Wittmann, 2003; Sheeran et al., 1999). Consistent with this broader literature, recent studies have found associations between positive behavioral beliefs and adoption of COVID-19-protective behaviors (Hornik et al., 2021; Metzger et al., 2003), as well as support for contact tracing (Guillon, 2020), and vaccine acceptance (Head et al., 2020; Woko et al., 2020). While the important role of behavioral beliefs is well-documented, few prior studies have examined how such beliefs interact with source trust to affect recommended behaviors.

There are several conceptualizations of trust in the risk communication literature (Siegrist & Zingg, 2014). For example, some studies measure general confidence in the ability of health and government agencies to handle crises. In certain cases, this confidence in institutions can increase public acceptance of risk and recommendation compliance (Alkuwari et al., 2011; Prati et al., 2011), while in other cases over-confidence might lead to lower risk perception and compliance (Guillon, 2020; Wong & Jensen, 2020). I focus on a narrower measure—trust in public health officials as sources of information about COVID-19. In persuasion research, this measure of trust is akin to perceived credibility of a message source. McCroskey (1997) defines source credibility as “the attitude toward a communicator held at a given time by a receiver”. In the context of a health recommendation, the recommendation source would be considered credible to the extent that it is seen by the receiver as knowledgeable enough on the health topic to give accurate advice (perceived expertise) and motivated to convey honest information that will be in the receiver’s best interest (perceived trustworthiness) (Metzger et al., 2003).

Given public health agencies (e.g. the CDC and WHO) are official sources of COVID-19 guidelines, one would expect trust, or perceived credibility, of these agencies to have an overall impact on compliance (Centers for Disease Control (CDC), 2021; World Health Organization (WHO), 2021). It is generally accepted that perceived source credibility can influence persuasive outcomes (e.g. Horai et al., 1974; Hovland & Weiss, 1951; Schulman & Worrall, 1970; Whittaker & Meade, 1968). Trust in a recommendation source has the potential to increase attention to messages (Jones et al., 2003), validate message arguments, and influence behavior-specific beliefs (Chaiken et al., 1989; Heesacker et al., 1983; Hovland & Weiss, 1951). Consistent with this model, a panel study by Kim and Tandoc (2021) found initial trust in the government was associated with pro-facemask wearing beliefs subsequently, which were associated with facemask wearing behavior at a third measurement wave. This prior study highlights the potential for perceived credibility of official guideline sources to influence behavior through behavior-specific beliefs.

However, trust in recommendation sources may not always align with or influence beliefs about the outcomes of recommended behaviors. People encounter health information from a variety of sources—including social media; interpersonal conversations; local, national, and international news outlets; and personal physicians (Ali et al., 2020; Pew Research Center, 2021; Shafiq et al., 2021). Behavioral beliefs may depend on the extent to which these secondary sources endorse public health recommendations. Positive coverage of recommended behaviors may lead to pro-behavioral beliefs, regardless of trust in official recommendation sources. On the flip side, negative or conflicting coverage may lead to anti-behavioral beliefs or uncertainty, despite trust in official sources (Nagler, 2014). As a result, an individual may hold favourable attitudes toward behaviors while distrusting some sources which recommend those behaviors or hold unfavourable, mixed, or weak attitudes towards

behaviors while trusting sources that recommend those behaviors. In these contexts—when two cognitive predictors of behavior conflict—what are the implications for behavior?

According to certain dual-processing theories, believing in the benefits of recommended behaviors may attenuate the effects of distrust in recommendation sources. Specifically, the heuristic systematic model (HSM)'s attenuation hypothesis holds that when heuristics and message arguments conflict, beliefs derived from systematic processing can outweigh the impact of heuristics (Chaiken & Maheswaran, 1994; Todorov et al., 2002). The HSM and other dual-processing models posit that individuals make decisions based on one of two types of processes: automatic (i.e. Type 1, peripheral, or heuristic processing) and deliberate (i.e. Type 2, central, or systematic processing) (Chaiken et al., 1989; Evans, 2012; Petty & Cacioppo, 1986; Todorov et al., 2002). While Type 1 processing usually involves reliance on heuristics and other peripheral cues to inform decisions, Type 2 processing usually involves attention to the quality of message arguments (Petty & Cacioppo, 1984; Todorov et al., 2002). The notion that experts are (or are not) trustworthy may serve as a heuristic, biasing judgements only when one is unable or unmotivated to engage in Type 2 processing (Carpenter, 2015; Petty & Cacioppo, 1984; Todorov et al., 2002). However, if one forms reasoned judgements about the benefits of engaging in a recommended behavior, she may adhere regardless of trust in the recommendation source (Todorov et al., 2002).

Consistent with dual-processing theories, prior work has found deliberative processing of strong arguments can override the influence of perceived source credibility (e.g. Mak et al., 1997; Rosen, 2000; Stephenson et al., 2009). In the COVID-19 context, some studies have examined the association between analytic thinking—and knowledge about COVID-19— and accepting COVID-19 pandemic recommendations (Swami & Barron, 2021; Thoma et al., 2021). However, few studies have investigated the role of

existing behavioral beliefs in attenuating the influence of trust in public health information sources and recommendation compliance using longitudinal survey data.

The Present Study

I build on prior literature by examining the interaction between trust in recommendation sources and beliefs about COVID-19-specific recommended behaviors in their joint influence on subsequent behavior. Most dual processing studies are experimental, either manipulating message features or respondent processing style. Experimental approaches permit strong causal claims but may not allow generalizability to real life contexts. In contrast, the present studies use a representative national sample to measure whether baseline behavior, behavioral beliefs, source trust, and the interaction of beliefs and trust predict subsequent behavior. The use of longitudinal analyses supports stronger claims than a cross-sectional analysis might; it establishes causal order since the predictors precede the outcome behavior. Adjustment for baseline behavior reduces concerns about potential confounding variables (measured or unmeasured). I consider the strengths and weaknesses of this approach in the discussion.

The goal of this set of studies is to assess whether positive behavioral beliefs attenuate the influence of distrust in public health information sources—and thus may be promising targets for pandemic communication campaigns. In the first study, I measure how baseline trust and behavioral beliefs influence engagement in two recommended behaviors, facemask wearing and social distancing, 5-6 weeks and 11-12 months later. Drawing from prior literature and dual processing theories, I expect the following¹:

¹ Registered hypotheses can be found here: https://aspredicted.org/YMF_YL6. Note: The proposed analyses were modified to include a separate T1-T2 and T1-T3 analysis, and to only include T1-measured beliefs (rather than the T1/T2 average). This decision was meant to preserve statistical

Hypothesis 1: There will be a negative interaction between trust in public health information sources and anticipated benefits of facemask wearing in their joint effect on subsequent facemask wearing, such that each will be more strongly associated with facemask wearing when the other is lower.

Hypothesis 2: There will be a negative interaction between trust in public health information sources and anticipated benefits of social distancing in their joint effect on subsequent social distancing, such that each will be more strongly associated with social distancing when the other is lower.

In the second study, I examine the interaction between trust and anticipated benefits on a third outcome: COVID-19 vaccine intentions and behavior. Specifically, I measure how trust in public health sources and beliefs about the safety and efficacy of COVID-19 vaccines in July 2020 influenced willingness to get vaccinated 8-10 months later, in April/June 2021 (after vaccines became available in the U.S.). Parallel to the first study, I propose the following hypothesis:

Hypothesis 3: There will be a negative interaction between trust in public health information sources and anticipated benefits of COVID-19 vaccines in their joint effect on subsequent vaccination intention/behavior, such that each will be more strongly associated with vaccination when the other is lower.

Study 1

Method

Sample

A three-wave nationally representative survey of U.S. residents from each U.S. state

power, as some respondents who participated at T3 did not participate at T2 and would have been excluded from the original proposed analyses.

was conducted between 05/26-6/12/20 (T1; $n=1074$; cooperation rate 54%), 07/15-07/21/20 (T2; $n=889$; follow up response rate 83%), and 04/12/21-04/20/21 or 06/08/21-06/30/21 ($n=750$; follow up response rate 72% from baseline survey) as part of a larger project. Surveys were conducted in English or Spanish online or by phone through the Social Science Research Solutions Opinion Panel [(Social Science Research Solutions (SSRS), 2020)] (recruitment rate for the underlying panel varies from 2-4%). Respondents were asked questions about their COVID-19 related beliefs and behaviors, among other personal characteristics. Survey weights were developed by SSRS to ensure participants matched U.S. population on important demographic variables. The same sample was used for both study 1 and 2. However, because vaccine-related items were not included in the questionnaire at T1, the sample for study 2 included only respondents who participated at both T2 and T3 ($n=659$).

Dependent Variables

In the first study, two protective behaviors (facemask wearing and social distancing) were the primary outcomes of interest. Specifically, I focused on change in these behaviors between T1 and T2 and between T1 and T3. Multi-item scales measured each protective behavior at T1 and T2, with single item measures used to check convergent validity. Due to space limitations, only single items measuring these behaviors were included at T3.

Facemask Wearing. To measure facemask wearing frequency at T1 and T2, respondents were asked in random order whether they had engaged in seven specific activities in the past seven days [*Getting fresh air or exercising outdoors; shopping for groceries or other necessities; walking a dog or other pet; meeting people socially outside; taking children outside to play; meeting people socially indoors; working at a job outside your home*] (Yes/No). If respondents had participated in any of the seven activities, they were asked the frequency with which they had worn a face covering or mask ($1=Never$, $2=Some\ of\ the\ time$,

3=*Most of the time*, 4=*Every time*). A *facemask wearing scale* (1-4) averaged responses to these measures, with high consistency across items (T1 and T2 alphas = .88; .93) and with all items loading on a single dimension in Principal Components Analyses (PCA). In addition, at all three waves, respondents were asked, “When you went outside your home in the past 7 days, how often did you wear a mask or other face covering?” (1= *Rarely or never*, 2=*Sometimes*, 3=*Most of the time*, 4=*Always*). This single item measure was strongly correlated with the facemask wearing scale at both T1 ($r=.73$) and T2 ($r=.61$).

Social Distancing. To measure social distancing frequency at T1 and T2, participants were asked in random order whether they had engaged in five activities in the past seven days that would have violated social distancing guidelines at the time of data collection [*Gone out to a restaurant, bar, or other indoor place where people gather; Gone inside a friend, neighbor, or relative’s residence that is not your own; Had visitors such as friends, neighbors or relatives inside your residence; Had close contact – within about 6 feet – with people who do not live with you; (reverse coded) Remained in your residence at all times, except for essential activities or exercise*] (*Yes=0;No=1*). These items were combined into a single *social distancing scale* and coded so the highest score (5) meant engaging in fewer non-compliant activities. There was moderate consistency across measures (T1 and T2 alphas = .65 and .68) and with all items loading on a single dimension in PCA. In addition, at all three waves, respondents were asked, “Social distancing is staying at least 6 feet away from other people in public places. In the past 7 days, how often have you practiced social distancing?” (1= *Rarely or never*, 2=*Sometimes*, 3=*Most of the time*, 4=*Always*). This single item measure was moderately correlated with the scales (T1 $r=.57$; T2 $r=.49$).

Independent Variables

The independent variables of interest were T1 trust in public health officials as sources of information about COVID-19, T1 belief in the benefits of protective behaviors,

and their interaction.

Trust in Public Health Information Sources. Items measuring trust in sources of COVID-19 information were adapted from Pew Research Center's American News Pathways survey instrument (Pew Research Center, 2021). Participants were asked to rate how much they trust or distrust public health officials or agencies as a source of information about the coronavirus pandemic (*1=Strongly distrust, 2=Distrust, 3=Trust, 4=Strongly trust*). This measure was collected at T1 and T3. Trust in other sources of information was also measured, including President Trump (T1); conservative news sources (T1); progressive or liberal news sources (T1); friends, family, or neighbors (T1); mainstream news media (T1 & T3); state and local elected officials (T1 & T3); and your local doctor or health care provider (T3). To test reliability and discriminant validity, the correlation was measured between trust in public health sources at T1 and trust in each source 11-12 months later at T3. Trust in public health officials was more strongly correlated with the same measure at T3 ($r=.60$) than with trust in other sources at T3 (mainstream news $r=.44$, doctor $r=.49$, state and local elected officials $r=.51$).

Behavioral Beliefs. Six-item batteries were used to measure anticipated benefits of facemask wearing and social distancing at both T1 and T2. Participants were asked "*How much do you disagree or agree if you [wear a mask or other face covering in public places] / [maintain social distancing] every day for the next two weeks...*" For each behavior, one item pertained to benefits for oneself (*you will be less likely to get sick*), and four items pertained to benefits for others (*you will protect more vulnerable people in society, you will help the healthcare system so that people who need urgent medical care will receive it, you will slow the spread of coronavirus, it will prevent you from transmitting the coronavirus to others*). These items were provided to respondents in random order. Response options included *Strongly disagree (1), Disagree (2), Agree (3), Strongly agree (4)*. Responses to all benefit items were averaged

for each behavior to create a *pro-facemask belief* scale (alpha = .93) and a *pro-social distance belief* scale (alpha = .93). The consistency between T1 and T2 (two months later) was high for both scales (facemask $r=.75$; social distancing $r=.73$)

Analyses

All analyses were conducted in Stata15.1 (Stata, 2017). To test H1, the facemask wearing frequency at T2 was regressed on the main effects and the interaction between T1 trust in public health information sources and T1 pro-facemask beliefs, controlling for facemask wearing frequency at T1. Next, a regression was run using the same T1 variables with T3 facemask wearing frequency as the outcome measure. To test H2, parallel regressions were run replacing facemask wearing measures with social distancing measures.

To allow for longitudinal measurements, the T1-T2 analyses included the 83% of T1 respondents who provided information at T2 ($n=889$) and the T1-T3 analyses included the 72% of T1 respondents who provided information at T3 ($n=750$). Subsamples were separately weighted to represent the U.S. population; analyses used the svy Stata command to correct standard errors. To check for potential confounders, all analyses were re-run controlling for demographic variables—including sex, age, education, household size, partner status, marital/partner status, job requirements, home ownership, income, region, race/ethnicity, and political party.

Results

Descriptive Data

Table 1 provides descriptive data comparing samples available at each wave. Overall, the retained samples were similar to the baseline sample across demographic variables. Compared to those who did not participate at T2, retained respondents had slightly lower facemask wearing frequency at T1. Compared to those who did not participate at T3, retained respondents had slightly lower trust in public health sources at T1, as well as lower facemask

wearing frequency at T1 and T2 and social distancing at T2. However, these differences were minor, and weights were applied to ensure the retained samples were equally nationally representative.

At T1, the percentage of respondents who wore facemasks in the past seven days ranged across activities, from 11.5% (while walking a dog or other pet) to 69.1% (while shopping for groceries or other necessities). Past seven-day adherence to social distancing guidelines also varied, from 30.1% (avoided close contact with people they did not live) to 73.6% (did not go out to a restaurant, bar, or other indoor place where people gather). Among respondents retained at all three waves, the frequency of both protective behaviors increased from T1 to T2 and decreased between T2 and T3. The proportion of respondents who reported wearing a face mask every time they left the house was 37% at T1, 47% at T2, and 42% at T3. The proportion of respondents who reported social distancing every time they were in a public place was 34% at T1, 49% at T2, and 46% at T3.

Trust in public health officials as sources of COVID-19 information decreased between T1 and T3. Among respondents retained at all three waves, the proportion who strongly distrusted public health sources increased from 4% to 12% and the proportion who strongly trusted public health sources decreased from 25% to 21%. For both facemask wearing and social distancing, pro-behavioral belief was generally strong—most people agreed or strongly agreed that facemask wearing and social distancing would benefit others and themselves—and was fairly consistent between T1 and T2.

Table 2 reports the correlations and means for each primary variable. There were significant correlations between T1 trust in public health sources and both protective behaviors. This relationship was not significant when controlling for belief in benefits (as shown in Table 3).

Hypothesis Tests

Table 3 reports the results of the lagged linear regressions of facemask wearing and social distancing at T2 and T3 on the main effects and interaction between T1 trust in public health information sources and T1 pro-behavioral beliefs, controlling for T1 behavior. Supporting both hypotheses, there was a negative interaction between trust and pro-behavioral beliefs for both facemask wearing (H1) and social distancing (H2). For facemask wearing, this interaction was significant in the T1-T2 analysis ($B=-0.10$; $SE=0.04$) and marginally significant ($p=0.08$) in the T1-T3 analysis ($B=-0.11$; $SE=0.06$). For social distancing, the interaction was marginally significant ($p=0.09$) in the T1-T2 analysis ($B=-0.13$; $SE=0.08$) and significant in the T1-T3 analysis ($B=-0.20$; $SE=0.06$). Controlling for potential confounders did not influence these results (equations not shown).

Study 2

Method

Sample

The same sample was used for both study 1 and 2. However, because vaccine-related items were not included in the questionnaire at T1, the sample for study 2 included only respondents who participated at both T2 and T3 ($n=659$).

Dependent Variable: Vaccine Intentions and Behavior

In the second study, the outcome of interest was change in COVID-19 vaccination intentions and behavior from T2 to T3. Vaccine intention/behavior was measured from 1 (very low) to 4 (very high). At T2, respondents were asked: "If you were able to get a vaccine for the coronavirus today, what is the likelihood that you would get vaccinated?" ($1=very unlikely$; $2=unlikely$; $3=likely$; $4=very likely$). At T3, COVID-19 vaccines had been approved for all adults in the United States, allowing for behavior measurement. In addition to the T2 intention measure, the T3 questionnaire asked whether respondents had received at

least one dose of a coronavirus vaccine (*Yes/No*). The T3 intention/behavior score combined those who had been vaccinated with those who had the highest level of intention to get vaccinated (*4=very likely/vaccinated*).

Independent Variables

The independent variables of interest were T2 trust in public health officials as sources of information about COVID-19, T2 belief in the safety and efficacy of vaccines, and their interaction.

Trust in Public Health Information Sources. Due to space limitations, the measure of trust in public health officials as sources of information about the coronavirus used at T1 and T3 was not included at T2. A different measure, focusing on trust in public health officials as sources of information about coronavirus *vaccines* was included. In the same battery as the behavioral belief items, respondents were asked their agreement with the statement, “If you were to get vaccinated with the coronavirus, you could trust information you receive from public health officials about the vaccine” (*1=Strongly disagree; 2=Disagree; 3=Agree; 4=Strongly agree*). To generate a broader measure of trust parallel to the one used in study 1, I regressed the T2 vaccine-specific trust measure on the more general T1 and T3 trust measures and saved the predicted values as the estimated T2 general trust score. This score removed variance that might be specific to vaccine-related trust.

Behavioral Beliefs. To measure beliefs about COVID-19 vaccines at T2, three items were adapted from the vaccine hesitancy scale developed by the SAGE Working Group on Vaccine Hesitancy (Larson et al., 2015) and later validated by Shapiro et al. (2018). Respondents were given a battery with the stem, “If you were to receive a potential coronavirus vaccine...”. The following statements were presented in random order: you would suffer bad side effects from the vaccine (reverse coded); you would be well protected from getting infected with the coronavirus; you would be protecting others in your

community from getting infected ($1=Strongly\ disagree; 2=Disagree; 3=Agree; 4=Strongly\ agree$). These three items were combined into a *pro-vaccine beliefs* scale ($\alpha=.80$).

Analyses

To test H3, vaccine intention/behavior at T3 was regressed on the main effects and the interaction between estimated T2 trust in public health sources and T3 pro-vaccine belief, controlling for T2 vaccine intention. To check for potential confounders, all analyses were re-run controlling for demographic variables—including sex, age, education, household size, partner status, marital/partner status, job requirements, home ownership, income, region, race/ethnicity, and political party.

Results

Descriptive Data

Table 4 shows the summary statistics and correlations of primary variables. Overall, vaccine intention increased from T2 to T3. At T2, 42.4% of respondents had strong intentions to get a vaccine (*very likely*) and 21.2% had strong intentions not to get a vaccine (*very unlikely*). At T3, 71.0% of respondents were either vaccinated (65.2%) or had strong intentions to get vaccinated (6.02%) while only 16.6% had low intentions. On average, respondents at T2 had positive beliefs about vaccine safety and efficacy ($M=2.72$; 1 =most anti-vaccine and 4 =most pro-vaccine). There was a significant correlation between trust and vaccine intention/behavior. In contrast to study 1, the relationship between trust and vaccine intention/behavior was significant even when controlling for belief in benefits (as shown in Table 5).

Hypothesis Test

Table 5 reports the results of the lagged linear regressions of vaccine intention/behavior at T3 on the main effects and interaction between T2 trust public health sources and T2 anticipated benefits, controlling for T2 vaccine intention. Supporting H3,

there was a negative interaction and significant between trust and pro-vaccine beliefs ($B = -0.27$; $SE = 0.10$). Controlling for potential confounders did not influence these results (equations not shown).

Predictive Margins Plots

Predictive margins plots (Figures 1-3) illustrate interaction results for T3 outcomes in both study 1 and study 2. To simplify this, a binary measure of trust in public health sources was used (high = >1 standard deviation above the mean; low = <1 standard deviation above the mean). Graphs show the linear prediction of T3 facemask wearing (Figure 1), social distancing (Figure 2), and vaccination (Figure 3) based on pro-behavioral beliefs for those with lower and higher trust in public health sources. All figures show a steeper upward-slanted slope (i.e. stronger association between pro-behavioral belief and behavior) when trust in public health sources is low and a flatter slope when trust is high.

Discussion

As the COVID-19 pandemic continues, adherence to official recommendations is critical to reducing viral transmission. Yet, declining trust in institutions and experts may threaten the ability for public health agencies to communicate guidelines effectively. Understanding the contexts in which source trust influences protective behavior, and which factors motivate behavior when trust is low, can help serve health communication efforts. I use longitudinal survey data and draw from two core theories of behavior change and persuasion to assess how source trust interacts with other cognitive predictors of behavior.

Consistent with the IMBP (Fishbein & Yzer, 2003), and prior COVID-19 survey research (e.g. Fridman et al., 2020; Hornik et al., 2021; Kim & Tandoc, 2021), I found evidence for a main effect of anticipated behavioral benefits at baseline on subsequent behavior for all three outcomes (facemask wearing, social distancing, and vaccination willingness). Extending previous work, I observe a negative interaction between anticipated

benefits and trust. These results support a dual-processing model, suggesting pro-behavioral beliefs (however obtained) may attenuate the effects of distrust on recommendation adherence (Todorov et al., 2002).

Experimental tests of dual-processing theories have found evidence supporting the notion that strong message arguments, and Type 2 processing, decrease the influence of perceived source credibility on persuasive outcomes (e.g. Mak et al., 1997; Rosen, 2000; Stephenson et al., 2009; Petty & Cacioppo, 1986). However, such studies have been most successful in explaining attitude formation, rather than behavior change (Carpenter, 2015), and have been criticized for conflating manipulations of argument quality with processing type (Mongeau & Williams, 1996; O’Keefe, 2013). This study did not manipulate or measure processing style, nor test the effects of specific message features. Rather, I considered the role of existing beliefs, which align with evidence supporting recommended behaviors, in relation to a broader sense of trust in public health sources. To the best of my knowledge, this is the first longitudinal observational survey study to show a negative interaction between behavioral beliefs and source trust in their joint influence on health recommendation adherence. I find parallel results across three recommended behaviors and over three time periods.

Implications and Future Directions

The findings of this study indicate that one type of perception may attenuate the influence of another type of perception on behavior. Moving forward, the potential role of dual-processing and attenuation may be useful to consider when developing health messages for audiences who distrust experts as sources of health information. Some efforts to re-build trust in medical and scientific institutions have simply called for the public to “trust science” (Henig, 2020; Jarrett, 2021; Parikh, 2021; “Science Stores,” 2020). This path may be unrealistic in the short run, at least. An alternative communication approach is to highlight

evidence supporting recommended behaviors and strengthen confidence in behavioral benefits. For example, public health messages might emphasize that facemask wearing reduces viral spread or that vaccines reduce risk of serious infection. Such messaging may appeal to individuals who are motivated to engage in deliberative processing, even if they distrust public health sources (Martinelli & Veltri, 2021).

Strengths & Limitations

This study has several strengths—including the use of a longitudinal nationally representative panel with high cooperation and retention rates from members of the panel, examination of predictors of multiple behaviors, and integration of two foundational cognitive theories of behavior. Yet, this work is not without limitations. Due to space considerations in the larger survey project, trust was operationalized using a single-item measure. Inclusion of additional items within each construct may have strengthened measurement validity. It is also worth noting that results were parallel for all protective behaviors, though conventionally significant for facemask wearing at T2, and social distancing and vaccination at T3 and marginally significant ($p < .10$) for social distancing at T2 and facemask wearing at T3.

Finally, as with any observational survey study, conclusions may be weakened by reliance on self-reported behaviors, possible biases in sampling procedures, and concerns about unmeasured confounders. While I controlled for several demographic variables, it is possible that unmeasured variables may have influenced results. However, by controlling for behavior at baseline, I reduce this threat—unmeasured confounders would have had to impact baseline trust and beliefs and subsequent behavior over and above effects on baseline behavior. Threats to inference remain if there are unmeasured confounders that affected beliefs or trust at one time and behavior with some delay.

Conclusions

Ultimately, this study advances the literature by demonstrating belief in behavioral benefits may be particularly important for recommendation adherence when trust in expert sources is low. Put another way, individuals who distrust public health officials as sources of information might still engage in recommended protective behaviors if presented with information that strengthens their belief in the protective benefits. As pandemic priorities continue to evolve, emphasizing evidence and arguments in favor of recommended behaviors may be vital for increasing adherence among audiences who distrust public health experts.

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Table 1

Descriptive Statistics for Time 1 Measures Comparing Samples Available at Each Measurement Wave

Variable	Unweighted Time 1 M (SD) or %	T1 Measures, Weighted at Each Wave		
		Time 1 M (SD) or %	Time 2 M (SD) or %	Time 3 M (SD) or %
Female	51.45%	51.31%	51.34%	51.92%
Age	49.03 (16.99)	46.11 (17.35)	46.28 (17.47)	45.83 (17.13)
Education (years)	14.77 (2.76)	14.02 (2.82)	14.06 (2.81)	13.9 (2.81)
Household size	2.66 (1.51)	2.87 (1.59)	2.87 (1.65)	2.72 (1.39)
Income (\$/year) ¹	60-70K (20-150K)	60-70K (30-100K)	60-70K (30-100K)	60-70K (30-100K)
Parent/guardian of kids <18 years	30.17%	32.24%	32.39%	31.18%
Has partner/spouse	61.55%	63.28%	64.67%	62.02%
Works mostly away from home	22.83%	23.80%	23.80%	24.70%
Owens home	67.41%	65.40%	66.19%	67.33%
Region				
Northeast	19.40%	17.48%	16.60%	17.51%
North Central	22.59%	20.81%	21.46%	21.10%
South	36.27%	37.44%	36.99%	37.41%
West	21.74%	24.28%	24.95%	23.98%
Race/Ethn.				
Black	14.99%	10.81%	10.62%	11.63%
White	70.11%	71.51%	72.06%	71.95%
Latinx	9.96%	16.37%	15.41%	15.94%
Political ID				
Republican	23.74%	22.67%	23.17%	25.33%
Democrat	37.43%	35.65%	35.74%	36.70%
Independent	32.77%	33.21%	32.96%	31.11%
Trust public health sources	3.03 (0.77)	2.98 (0.76)	3.01 (0.75)	2.98 (0.77)
Pro-facemask beliefs	3.16 (0.83)	3.16 (0.83)	3.17 (0.84)	3.12 (0.85)
Facemask wearing scale	2.92 (1.04)	2.92 (1.06)	2.88 (1.05)	2.90 (1.07)
Pro-social distance beliefs	3.25 (0.79)	3.23 (0.79)	3.26 (0.79)	3.20 (0.80)
Social distance scale	2.77 (1.52)	2.79 (1.53)	2.76 (1.53)	2.75 (1.50)
Pro-vaccine beliefs (T2)	N/A	N/A	2.72 (0.02)	2.69 (0.03)
Vaccine intention (T2)	N/A	N/A	2.83 (0.04)	2.78 (0.05)
<i>N</i>	1074	1074	889	750

Note. M indicates mean and SD indicates standard deviation. Weights developed to represent U.S. population. Descriptive data of samples available at each wave for variables measured at T1. N/A indicates data not collected. ¹Median household income and interquartile range.

Table 2*Weighted Descriptive Data and Correlations of Primary Variables for Study 1*

	M (SD)	1	2	3	4	5	
Time 1	1. Facemask scale	2.37 (0.96)	1.00				
	2. Social distance (0-5)	2.54 (1.61)	0.44***	1.00			
	3. Trust public health sources	2.98 (0.77)	0.13***	0.14***	1.00		
	4. Pro-facemask beliefs	3.12 (0.85)	0.43***	0.38***	0.37***	1.00	
	5. Pro-social distance beliefs	3.20 (0.80)	0.41***	0.36***	0.39***	0.89***	1.00
Time 2	Facemask scale	2.53 (0.89)	0.65***	0.28***	0.14**	0.41***	0.40***
	Social distance (0-5)	2.54 (1.61)	0.34***	0.56***	0.12**	0.32***	0.33***
	Pro-facemask beliefs	3.20 (0.81)	0.39***	0.32***	0.44***	0.75***	0.74***
	Pro-social distance beliefs	3.33 (0.78)	0.39***	0.35***	0.42***	0.72***	0.73***
Time 3	Facemask wearing	2.98 (1.07)	0.44***	0.27***	0.26***	0.41***	0.39***
	Social distance	2.97 (0.99)	0.40***	0.35***	0.24***	0.39***	0.40***
	Trust public health sources	2.77 (0.92)	0.27***	0.28***	0.60***	0.55***	0.52***

Note. Weights developed to represent U.S. population for each wave. * $p < 0.05$, ** $p < 0.01$,

*** $p < 0.001$; T1 $N=1074$; T2 $N=889$; T3 $N=750$. All items measured on 1-4 scale unless

otherwise indicated. Means (M) and standard deviations (SD) shown for respondents retained

at T3.

Table 3

OLS Regression: Protective Behavior on Time 1 Trust in Public Health Sources and Behavioral Belief

Variable (Time 1)	Facemask Wearing				Social Distancing			
	Time 2		Time 3		Time 2		Time 3	
	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)	<i>B</i> (SE)
Behavior	0.55*** (0.04)	0.55*** (0.04)	0.35*** (0.06)	0.35*** (0.06)	0.53*** (0.04)	0.53*** (0.04)	0.15*** (0.03)	0.15*** (0.03)
Trust public health sources	0.0034 (0.05)	0.32** (0.12)	0.18* (0.08)	0.53** (0.18)	-0.031 (0.08)	0.40 (0.26)	0.11 (0.07)	0.76*** (0.17)
Pro-behavioral beliefs	0.15*** (0.04)	0.41*** (0.12)	0.27*** (0.07)	0.57** (0.20)	0.31*** (0.08)	0.66** (0.22)	0.34*** (0.07)	0.87*** (0.16)
Trust X Pro-beliefs		-0.10* (0.04)		-0.11# (0.06)		-0.13# (0.08)		-0.20*** (0.06)
Constant	0.82*** (0.14)	0.01 (0.33)	0.78*** (0.21)	-0.12 (0.49)	0.22 (0.28)	-0.88 (0.65)	1.15*** (0.21)	-0.49 (0.42)
<i>N</i>	833	833	706	706	833	833	745	745
<i>R</i> ²	0.43	0.43	0.27	0.27	0.21	0.23	0.21	0.23

Note. Standard errors in parentheses; Weights developed to represent U.S. population.

#*p*<0.10, * *p* < 0.05, ** *p* < 0.01, *** *p* < 0.001

Table 4*Weighted Descriptive Data and Correlations of Primary Variables for Study 2*

	M (SD)	1	2	3
1. Time 3 Vaccine intention/behavior	3.76 (1.64)	1.00		
2. Time 2 Vaccine intention	2.78 (1.19)	0.58***		
3. Time 2 Pro-vaccine beliefs	2.69 (0.73)	0.60***	0.60***	1.00
4. Time 2 Trust public health sources	2.76 (0.64)	0.53***	0.53***	0.51***

Note. Weights developed to represent U.S. population for each wave. * $p < 0.05$, ** $p < 0.01$,

*** $p < 0.001$; N=659

Table 5*OLS Regression: Time 3 COVID-19 Vaccine Intention/Behavior on Trust in Public Health**Sources and Behavioral Belief*

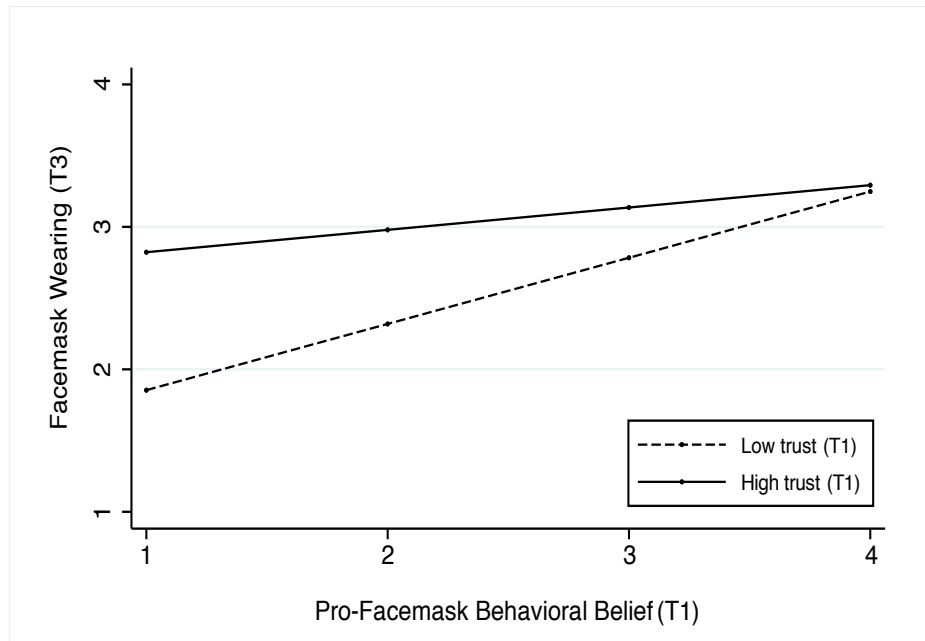
Variable (Time 2)	Vaccine Intention/Behavior (Time 3)	
	<i>B</i> (SE)	<i>B</i> (SE)
Vaccine intention	0.27*** (0.08)	0.27** (0.08)
Trust in public health sources	0.42*** (0.12)	1.13*** (0.32)
Pro-vaccine beliefs	0.59*** (0.13)	1.28*** (0.30)
Trust X Pro-vaccine beliefs		-0.27** (0.10)
Constant	-0.31 (0.25)	-2.06** (0.70)
<i>N</i>	659	659
<i>R</i> ²	0.47	0.49

Note. Standard errors in parentheses; Weights developed to represent U.S. population.

#p<0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

Figure 1

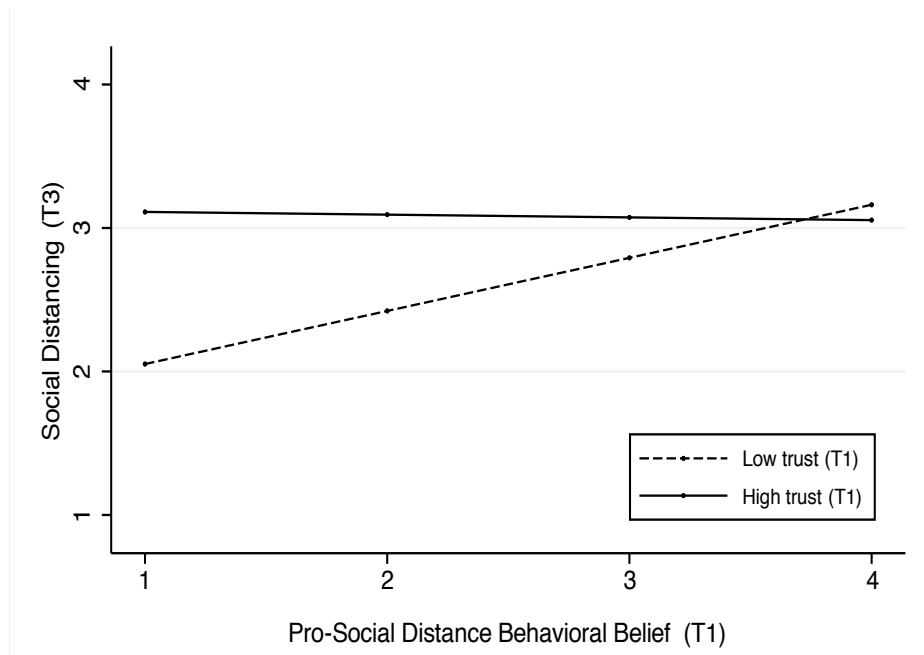
Predictive margins: Facemask Wearing at Time 3 (T3) on Pro-Facemask Wearing Beliefs and Trust/Distrust in Public Health Sources Time 1 (T1)



Note. Predictive margins show T3 facemask wearing linear prediction on T1 pro-facemask belief, controlling for T1 facemask wearing, for respondents with higher and lower T1 trust in public health officials as sources of information about COVID-19. Trust was measured from 1 (strongly distrust) – 4 (strongly trust). Mean trust level was 4.00 for the high trust group (>1 standard deviation above mean; n=285) and 1.80 for the low trust group (<1 standard deviation below the mean; n=213).

Figure 2

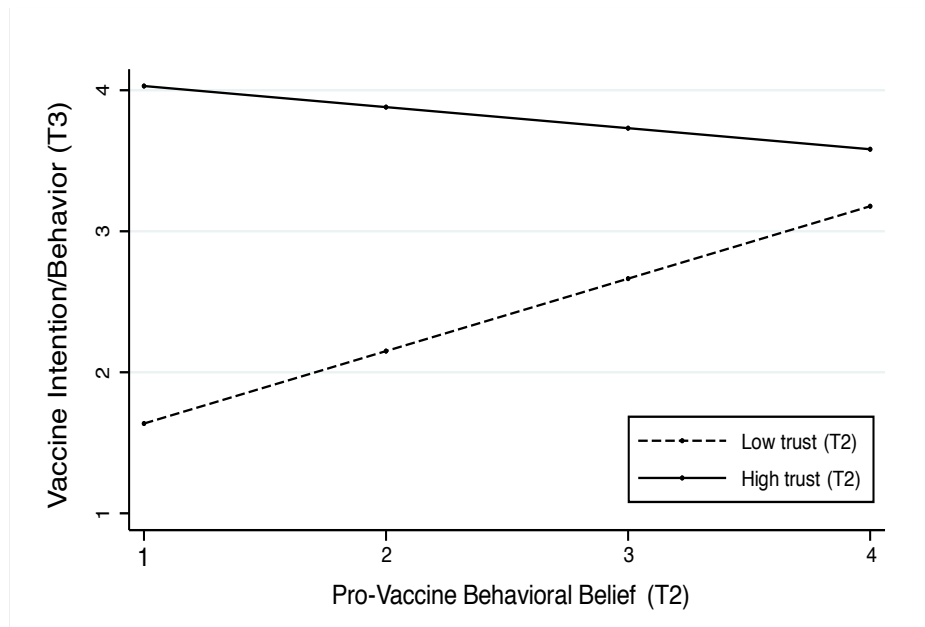
Predictive margins: Social Distancing at Time 3 (T3) on Pro-Social Distancing Beliefs and Trust/Distrust in Public Health Sources at Time 1 (T1)



Note. Predictive margins show T3 social distancing linear prediction on T1 pro-social distance belief, controlling for T1 social distancing, for respondents with higher and lower T1 trust in public health officials as sources of information about COVID-19. Trust was measured from 1 (strongly distrust) – 4 (strongly trust). Mean trust level was 4.00 for the high trust group (>1 standard deviation above mean; n=285) and 1.80 for the low trust group (<1 standard deviation below the mean; n=213).

Figure 3

Predictive Margins: Vaccination Behavior/Intentions at Time 3 (T3) on Pro-Vaccine Beliefs and Trust/Distrust in Public Health Sources at Time 2 (T2)



Note. Predictive margins show T3 vaccine intentions/behavior linear prediction on T2 pro-vaccine beliefs, controlling for T2 vaccine intentions, for respondents with higher and lower T2 trust in public health officials as sources of information about COVID-19. Trust was measured from 1 (strongly distrust) – 4 (strongly trust). Mean trust level was 3.65 for the high trust group (>1 standard deviation above mean; n=115) and 1.69 for the low trust group (<1 standard deviation below the mean; n=132).