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Demographic, Personality, and Social Cognition Correlates of Coronavirus Guideline Adherence in a U.S. Sample

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Objective: The present study examined patterns and psychosocial correlates of coronavirus guideline adherence in a U.S. sample ($N = 500$) during the initial 15-day period advocated by the White House Coronavirus Task Force. ***Method:*** Descriptive and correlational analyses were used to examine the frequency of past 7-day adherence to each of 10 guidelines, as well as overall adherence. Guided by a disposition-belief-motivation model of health behavior, path analyses tested associations of personality traits and demographic factors to overall adherence via perceived norms, perceived control, attitudes, and self-efficacy related to guideline adherence, as well as perceived exposure risk and perceived health consequence if exposed. ***Results:*** Adherence ranged from 94.4% reporting always avoiding eating/drinking inside bars/restaurants/food courts to 13.6% reporting always avoiding touching one's face. Modeling showed total associations with overall adherence for greater conscientiousness ($\beta = .191$, $p < .001$), openness ($\beta = .098$, $p < .05$), perceptions of social endorsement ($\beta = .202$, $p < .001$), positive attitudes ($\beta = .105$, $p < .05$), self-efficacy ($\beta = .234$, $p < .001$), and the presence versus absence or uncertainty of a shelter-in-place order ($\beta = .102$, $p < .01$). Age, self-rated health, sex, education, income, children in the household, agreeableness, extraversion, neuroticism, perceived exposure risk, and perceived health consequence showed null-to-negligible associations with overall adherence. ***Conclusions:*** The results clarify adherence frequency, highlight characteristics associated with greater adherence, and suggest the need to strengthen the social contract between government and citizenry by clearly communicating adherence benefits, costs, and timelines.

Keywords: COVID-19, personality, conscientiousness, social cognition, guideline adherence

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> There's no magic bullet. There's no magic vaccine or therapy. It's just behaviors; each of our behaviors translating into something that changes the course of this viral pandemic over the next 30 days.
>
> —Dr. Deborah Birx, White House Coronavirus Task Force briefing, March 31, 2020.

It is exceptionally rare for a public health event to prompt a national response designed to substantially change the social and behavioral patterns of each of the nation's 327 million residents. On March 16, 2020, that was the case in the U.S., when President Trump and the White House Coronavirus Task Force introduced "15 Days to Slow the Spread" (see online supplemental materials), guidelines intended to decelerate the pace (i.e., "flatten the curve") of coronavirus infections and illness in order to prevent patient volume from overwhelming the capacity and resources of the nation's hospitals. The guidelines, which appear in Table 1, pertained to social distancing and hygienic practices, including avoiding social gatherings of more than 10 people, avoiding discretionary travel, trips, and visits, hand washing, avoiding touching one's face, and disinfecting frequently used items. As with all attempts at behavioral intervention, responsivity is fundamental to success, that is, how closely individuals adhere to the guidelines. The purpose of the present research was to evaluate patterns and psychosocial correlates of guideline adherence during this initial period.

As pandemics and strict nationwide guidelines produced in response to them are unprecedented in the U.S. in the past century, there is little psychological and behavioral research that directly applies to these circumstances. However, long-standing models of health-related behavioral expression appear to be applicable, especially those that posit fundamental roles for beliefs and perceptions in the expression of behavior. In particular, social cognition models, including the Health Belief Model, Social Cognitive Theory, and the Theory of Planned Behavior, have shown the predictive utility of behavioral attitudes, risk perceptions, and self-efficacy for a wide range of health behaviors (Ajzen, 2002; Armitage & Conner, 2000; Bandura, 2004; Rodgers, Conner, & Murray, 2008). Moreover, findings from personality and health research have highlighted the utility of conscientiousness-related traits (reliable vs. careless) in predicting health-promoting atti-

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Table 1
Past 7-Day Guideline Adherence Item Endorsement Frequencies and Scale Descriptive Statistics (N = 500)

Adherence item or scale	*M (SD)* α	Never	Sometimes	About half the time	Most of the time	Always	Missing
I worked or engaged in schooling from home or otherwise remained at home whenever possible.	4.36 (.99)	4.00%	3.40%	2.80%	32.40%	57.10%	0.20%
I avoided social gatherings in groups of more than 10 people.	4.79 (.71)	2.20%	0.60%	2.00%	6.20%	88.80%	0.20%
I avoided being closer than 6 feet to other people (other than those I live with).	4.34 (.83)	1.20%	4.20%	3.60%	41.10%	49.80%	0.20%
I avoided eating or drinking inside bars, restaurants, or food courts.	4.89 (.53)	0.80%	1.20%	0.80%	2.40%	94.40%	0.40%
I avoided visiting nursing homes or retirement or long-term care facilities (unless to provide critical assistance).	4.85 (.68)	2.40%	0.60%	0.60%	2.00%	94.00%	0.40%
I avoided social visits, and other discretionary travel, such as shopping trips (other than for food).	4.64 (.77)	1.80%	1.40%	2.80%	19.00%	74.80%	0.20%
I washed my hands for 20 seconds, especially after touching any frequently used item or surface.	4.35 (.90)	0.80%	6.20%	6.00%	31.40%	55.60%	0.00%
I avoided touching my face.	3.47 (1.08)	6.40%	13.20%	21.20%	45.40%	13.60%	0.20%
I coughed or sneezed into a tissue, or the inside of my elbow.	4.45 (.95)	2.80%	3.80%	4.00%	24.40%	64.60%	0.40%
I disinfected frequently used items.	3.71 (1.29)	8.60%	12.20%	13.20%	31.10%	34.80%	0.20%
Guideline adherence scale	4.39 (.53) 0.79	—	—	—	—	—	—

tudes, self-efficacy, behaviors, and outcomes, as well as generalized tendencies for delaying gratification and following rules and norms (Bogg & Roberts, 2004; Conner & Abraham, 2001; Molloy, O'Carroll, & Ferguson, 2014; Rhodes & Courneya, 2003; Vo & Bogg, 2015). The application of social cognition models and a major personality trait taxonomy in the context of a universal mandate for behavioral modification may help clarify the boundary conditions under which these approaches can contribute to an understanding of health-related behaviors.

The primary goal of the present work was to assess the associations among demographic factors, personality traits, guideline-related social cognitions, and adherence to the White House Coronavirus Task Force guidelines in a national sample of U.S. adults (stratified by age, sex, and race). The present study addressed the following four aims related to guideline adherence during the initial 15-day window advocated by the task force (March 16, 2020 to March 30, 2020):

1. Examine associations between demographic factors (including age, self-rated health, sex, presence of children in the household, income, education level, shelter-in-place orders) and guideline adherence.

2. Consistent with the Health Belief Model, Social Cognitive Theory, and the Theory of Planned Behavior, test the extent to which perceived norms for guideline adherence, perceived control over guideline adherence, attitudes (positive vs. negative views of guidelines), self-efficacy (confidence in overcoming obstacles to guideline adherence), perceived risk of exposure, and perceived health consequence if exposed, are associated with guideline adherence.

3. In line with trait-consistent temperamental models of behavior, investigate how personality traits, especially conscientiousness, are associated with guideline adherence.

4. Consistent with instrumental perspectives of trait–behavior relations, test for indirect (mediated) relations between personality traits and guideline adherence via guideline-related social cognitions.

The hypotheses for the present work were guided by temperamental and instrumental process frameworks for trait–behavior relations as specified in the disposition-belief-motivation model of health-related behaviors (cf. Hampson, 2012; Vo & Bogg, 2015). In disposition-belief-motivation models, beliefs and motivations can serve as indirect means by which dispositional tendencies can influence behaviors. As applied here, a temperamental process perspective posits that traits that may directly influence the expression of guideline adherence via trait-consistent behavioral reactions to the environment (i.e., a behavior is closely aligned with a level of trait expression, such as an extravert displaying assertive behaviors in a social gathering). An instrumental disposition-belief-motivation perspective posits that traits (dispositions) may also indirectly influence the expression of guideline adherence (behaviors) via social cognition perceptions of the environment (beliefs and motivations).

As preregistered at AsPredicted.org, it was expected that conscientious, agreeable (helpful, unselfish), and open (curious, reflective) individuals would endorse stronger perceived norms, perceived control, attitudes, self-efficacy, and guideline adherence. In addition, it was expected that less extraverted (i.e., shy, reserved) and less neurotic (i.e., calm, relaxed) individuals would

endorse stronger perceived norms, perceived control, attitudes, self-efficacy, and guideline adherence. Moreover, in line with an instrumental view of beliefs and motivations, it was hypothesized that the relations between personality traits and adherence would be mediated by guideline-related social cognitions.

Method

Sample and Procedure

The survey was conducted using Prolific (www.prolific.co), an online sampling platform that provides the option of recruiting a U.S. sample. Using the larger sampling pool of Prolific respondents in the U.S., Prolific uses census data to invite, screen, and stratify participants by age, sex, and race. The invitation for recruitment of the national sample was distributed to more than 20,000 pool members who initially qualified to fill one of 50 subgroups defined by five strata for age (18–27, 28–37, 38–47, 48–57, and 58+), five strata for race (simplified by Prolific; White, Mixed, Asian, Black, and Other), and two strata for sex (female, male). As with all Prolific studies, participation is based on a first-come first-serve procedure, where, for the representative sample, a respondent could participate as long as space remained in a relevant subgroup. Income, education, geography, and other characteristics of the population are not used for stratification by Prolific. In this way, representativeness is strictly limited to Prolific's operationalization of strata for age, sex, and race, and therefore does not meaningfully depict the multiplicity of features of the U.S. populace, as would Pew or Gallup samples. Additional details regarding Prolific's methods for attaining representativeness (as well as its limitations) can be found at https://researcher-help.prolific.co/hc/en-gb/articles/360019236753-Representative-Samples-on-Prolific. In the present work, a sample size of 500 was targeted to ensure power requirements for small-to-moderate effect sizes were met, as well as requirements for multivariate path modeling using bootstrapping procedures (described below).

The sample of 500 participants was assessed online using a Qualtrics survey linked through Prolific's user interface between March 24, 2020 and March 26, 2020. Assessment occurred during the second week of the initial 15-day period advocated by the task force. Participants were compensated via PayPal by Prolific at $17.10/hr. The mean duration for survey completion was 8.50 min (SD = 4.42 min). To encourage engagement and check for attentiveness, questions were limited to five per page. In addition, to discourage acquiescent responding and other response biases, items varied in the framing of stems and the content of response options. Moreover, the longest block of items with the same response options (i.e., the BFI-44) used intermittent reverse item coding as a check on attention (e.g., a participant should not agree strongly that they worry a lot and that they are emotionally stable and not easily upset). No cases were excluded for acquiescent or inattentive response patterns. The study was approved by Wayne State University's Institutional Review Board with exempt status. Descriptive sample statistics are reported in Table 2.

Table 2
Demographic and Personality Descriptive Statistics (N = 500)

Variable	*M* (*SD*) or %
Age	45.40 (15.78)
Sex (% Female)	51.40%
Race	
White	74.20%
Black or African American	13.00%
Native American Indian or Alaska Native	0.40%
Asian	6.80%
Native Hawaiian or Pacific Islander	0.00%
Other	1.80%
Multi-ethnic	3.00%
No selection	0.60%
Spanish, Hispanic, or Latino (% Yes)	7.00%
Education	
Less than high school degree	0.60%
High school graduate (diploma or GED)	11.60%
Some college but no degree	22.00%
Associate degree in college (2-year)	9.80%
Bachelor's degree in college (4-year)	36.00%
Master's degree	14.60%
Doctoral degree	2.40%
Professional degree (JD, MD)	3.00%
Income	
Less than $10K	6.20%
$10K–19K	7.20%
$20K–29K	11.20%
$30K–$39K	10.20%
$40K–$49K	10.80%
$50K–$59K	9.80%
$60K–$69K	6.40%
$70K–$79K	8.40%
$80K–$89K	3.40%
$90K–$99K	6.40%
$100K–$149K	14.60%
$150K+	5.40%
Relationship status	
Married	43.00%
Widowed	3.40%
Divorced	13.20%
Separated	2.00%
Never married	38.40%
Children in household (Yes)	26.40%
Self-rated health (5-point item response scale)	3.34 (0.94)
Shelter-in-place order	
Yes (%)	58.60%
No (%)	31.20%
Not sure (%)	10.20%
Personality traits (5-point item response scale)	
Agreeableness	3.96 (0.67)
Extraversion	2.94 (0.94)
Conscientiousness	3.95 (0.71)
Neuroticism	2.67 (1.01)
Openness to experience	3.82 (0.65)

Measures

Demographic characteristics. Items assessed age (in years), sex (female, male), ethnicity, Spanish/Hispanic/Latino status (yes, no), education, income, relationship status, and presence of children in the household (yes, no). Race was assessed with seven categories (Asian, Black or African American, Native American Indian or Alaska Native, Native Hawaiian or Pacific Islander, Other, White, or Multiethnic [a combination of the other categories selected by the participant]). Highest level of education attained was assessed using scores from 1 to 8 (1 = *Less than a high school degree*, 8 = *Professional or Doctorate degree*). Income was assessed using scores from 1 to 12 (1 = *Less than $10,000*; 12 =*$150,000 or more*). Relationship status was assessed using

five categories (divorced, married, never married, separated, widowed). Self-rated health was assessed with a single item using a 5-point scale (In general, would you say your health is? 1 = *Poor*, 5 = *Excellent*).

The presence of a shelter-in-place order was assessed with a trichotomous item (yes, no, I'm not sure.).

Guideline adherence. Ten items using a 5-point scale (1 = *Never*, 5 = *Always*) pertaining to guideline adherence were written to create a measure of guideline adherence for the past seven days, as specified in the March 16, 2020 presidential briefing and accompanying White House Coronavirus Task Force pamphlet (see online supplemental materials for original "15 Days to Slow The Spread" document). The mean of the 10 items was used to create a scale reflecting the overall frequency of following the guidelines during the past seven days (α = .79). The precise wording of the 10 items appears in Table 1.

Guideline-related social cognitions. Four multi-item scales were used for the coronavirus guideline social cognitions of perceived norms, perceived control, attitudes, and self-efficacy. The precise wording of all social cognition items is included below.

For *perceived norms*, the mean of two adapted items was used to measure social support for following the guidelines using a five-point scale (α = .87; 1 = *Disagree strongly*, 5 = *Agree strongly*; "People who are important to me think I should follow the U.S. governmental guidelines to help slow the spread of the Coronavirus" and "People who are important to me encourage me to follow the U.S. governmental guidelines to help slow the spread of the Coronavirus."; Courneya, Bobick, & Schinke, 1999).

For *perceived control*, the mean of two adapted items was used to measure perceptions of personal agency for following the guidelines using a 5-point scale (α = .45; 1 = *Disagree strongly*, 5 = *Agree strongly*; "If I wanted to, I could easily follow the U.S. governmental guidelines to help slow the spread of the Coronavirus" and "How much I follow the U.S. governmental guidelines to help slow the spread of the Coronavirus is completely up to me."; Courneya & Bobick, 2000).

For *attitudes*, the mean of four adapted items was used to measure evaluations of the guidelines using bipolar semantic differential adjectives on a 5-point scale (α = .77; *unpleasant* (1) – *pleasant* (5); *harmful* (1) – *beneficial* (5); *foolish* (1) – *wise* (5); *useless* (1) – *useful* (5); Courneya & Bobick, 2000).

For *self-efficacy*, the mean of four items was used to measure confidence in overcoming obstacles to following the guidelines using a 5-point scale (α = .87; 1 = *Disagree strongly*, 5 = *Agree strongly*; "How confident do you feel you can follow the U.S. governmental guidelines to help slow the spread of the Coronavirus when you feel like you do not have any symptoms?" "How confident do you feel you can follow the U.S. governmental guidelines to help slow the spread of the Coronavirus when you feel lonely?" "How confident do you feel you can follow the U.S. governmental guidelines to help slow the spread of the Coronavirus when you feel the need to get out?" "How confident do you feel you can follow the U.S. governmental guidelines to help slow the spread of the Coronavirus when family or friends ask you to visit them or ask if they can visit you?").

Perceptions of *risk of exposure* to coronavirus and *consequences to health* if exposed were assessed with two separate items using a 5-point scale (1 = *Disagree strongly*, 5 = *Agree strongly*; "I feel I am at risk of being exposed to the Coronavirus" and "If I were exposed to the Coronavirus, then the health consequences to me would be severe.").

Big Five traits. Personality traits were assessed using the well-validated 44-item Big Five Inventory (BFI), which assesses the traits of agreeableness, conscientiousness, extraversion, neuroticism, and openness (John, Naumann, & Soto, 2008). All items were rated using a 5-point scale (1 = *Disagree strongly*, 5 = *Agree strongly*). An eight-item scale was used to assess agreeableness (e.g., "is helpful and unselfish with others"; α = .82). A nine-item scale was used to assess conscientiousness (e.g., "does a thorough job"; α = .85). A nine-item scale was used to assess extraversion (e.g., "is outgoing, sociable"; α = .89). An eight-item scale was used to assess neuroticism (e.g., "gets nervous easily"; α = .91). A 10-item scale was used to assess openness (e.g., "is curious about many different things"; α = .82).

Analyses

Correlational analyses were used to examine the strength and direction of associations among the study variables. It should be noted that the social cognition scale scores for perceived norms, perceived control, attitudes, and self-efficacy, as well as the guideline adherence scale score, showed evidence of skewed distributions. To address this, raw scores were subjected to a Blom transformation, which rank orders the raw scores (settling ties by using the mean of the contested ranks) and then transforming the ranks to z-scores using the normal distribution. Simulation research analyzing multiple transformation types showed that a Blom transformation of symptom count data (i.e., skewed data, which are similar to the coronavirus belief and guideline adherence scales in the present study) resulted in a more accurate selection of a true model from a set of alternative models (van den Oord et al., 2000).

Path modeling was conducted according to the hypothesized effects (described above), with the addition of incorporating relevant demographic variables, perceived risk of exposure, and perceived consequence to health if exposed as indicated by the correlational effects, which were exploratory considerations. In addition, in the path model, correlations were freed between terms when indicated by the bivariate analyses. Missing values of age for four cases and one missing value for perceived exposure risk were imputed using mean substitution to meet assumptions for bootstrapping. The path model was analyzed via Amos v.26. Bootstrapping procedures (k = 5,000) were used to test for indirect effects, as indicated by 95% confidence intervals around the estimates of indirect effects that did not include zero (Cheong & MacKinnon, 2012; Hancock & Liu, 2012; MacKinnon, Fairchild, & Fritz, 2007). Model fit was assessed using the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). Greater CFI scores (range: 0 to 1) indicate better fit. For example, a model with a CFI score of .90 or greater (meaning at least 90% of the covariation in the data is reproduced by the tested model) suggests adequate fit (Bentler, 1990). RMSEA is an index of the closeness of fit of a tested model in relation to its degrees of freedom. Values approaching zero indicate good fit (Browne & Cudeck, 1993). By convention, if RMSEA is less than or equal to .05, then this suggests adequate fit.

Results

Sample Characteristics

Table 2 displays the descriptive statistics for the demographic and personality variables. According to Prolific, the representativeness of age by sex by race group proportions for the U.S. can be calculated from U.S. Census Bureau population group estimates from 2015. It should be noted that, in the present work, Prolific used a backend prescreen for race based on the five simplified subgroups described above. However, upon initiating the survey, participants were allowed to choose among the complete list of racial categories used by the U.S. Census Bureau, including selecting multiple options. Census data from the 2015 American Community Survey (ACS) estimated demographic characteristics as follows: median age of 37.6 years, 50.8% female, 73.6% White, 12.6% Black of African American, .8% Native American Indian or Alaska Native, 5.6% Asian, .2% Native Hawaiian or Pacific Islander, 4.7% other, and 3% for two or more races. Aside from age, which was older in the acquired sample, these figures correspond to the those reported in Table 2. It also should be noted that, as a function of the simplified racial categories used by Prolific, the percent identifying as Latino, Hispanic, or Spanish in the present study was less than half of that estimated by the 2015 ACS study (17.1%). The 2015 ACS demographic data are available at https://data.census.gov/cedsci/table?d=ACS%205-Year%20Estimates%20Data%20Profiles&table=DP05&tid=ACSDP5Y2015.DP05.

Descriptive and Correlational Results

Guideline (non)adherence. Table 1 displays the descriptive statistics for the guideline adherence items and the guideline adherence scale. Evidence of variability in (non)adherence was observed for each of the 10 guidelines. Less than 12% nonadherence (i.e., not replying "Always") was observed for avoiding social gatherings of 10 or more people, avoiding eating/drinking in bars/restaurants, and avoiding visiting nursing homes or retirement/care facilities. By contrast, greater than 50% nonadherence was observed for avoiding being closer than six feet to other people, disinfecting frequently used items, and avoiding touching the face. Table 3 displays the correlations among the guideline adherence items. A positive manifold of small- to large-sized correlations (i.e., rs = .10 to .50, per Cohen's (1992) conventions for interpreting effect size estimates) was observed among the 10 items, with a medium-sized mean interitem correlation (r = .29).

Bivariate relations between social cognitions and adherence. Table 4 displays the descriptive statistics for the guideline-related social cognition scales and items. Table 5 displays the correlations between guideline-related social cognitions and the 10 adherence items and the adherence scale score. As was predicted, the results showed guideline-related social cognitions were positively associated with the 10 adherence guidelines and the adherence scale (in nearly all combinations, $p < .01$). For the guideline adherence scale, effects sizes ranged from small, $r = .13$, $p < .01$ for the perceived risk of exposure item, to the higher end of medium size, $r = .43$, $p < .01$ for attitudes.

Bivariate relations between demographic variables, personality traits, and guideline-related social-cognitions and guideline adherence. Table 6 displays the correlations among age, self-rated health, income, education, personality traits, and the guideline-related social cognitions and the 10 guideline adherence items and the adherence scale. Among the demographic variables, age and self-rated health showed the most consistent (small- to medium-sized) associations with some of the guideline-related social cognitions and, in the case of age, overall guideline adherence as well, $r = .14$, $p < .01$. Income and education showed a complete pattern of null relations with the 10 guideline adherence items and the guideline adherence scale. Independent samples t tests showed a small difference in the guideline adherence scale based on sex (female; $p < .01$, Cohen's $d = .26$), but not for presence (vs. absence) of children in the household ($p > .05$, Cohen's $d = .10$).

The patterns of bivariate relations between personality traits and guideline-related social cognitions and guideline adherence were somewhat sparse, but showed some of the predicted associations. In particular, as shown in Table 6, greater agreeableness, conscientiousness, neuroticism, and openness were positively associated with endorsement of guideline-related social cognitions. Specifically, greater agreeableness showed small-sized associations with greater perceived norms, perceived control, attitudes, self-efficacy, and perceived health consequence (rs = .12 to .21, ps < .01). Greater conscientiousness was associated with greater perceived control, attitudes, and self-efficacy (rs = .09 to .18, ps < .01 to .05). Lower neuroticism was associated with greater perceived control, self-efficacy, and lower perceived risk of exposure

Table 3
Correlations Among Guideline Adherence Items

Item	1	2	3	4	5	6	7	8	9
1. Work/school at home	—								
2. Avoided social gatherings >10 people	.33**	—							
3. Avoided being closer than 6 feet to others	.39**	.36**	—						
4. Avoided eating/drinking out	.33**	.49**	.43**	—					
5. Avoided visits at nursing homes	.31**	.34**	.29**	.56**	—				
6. Avoided social visits and travel	.40**	.41**	.42**	.45**	.27**	—			
7. Washed hands for >20 seconds	.13**	.16**	.34**	.20**	.20**	.19**	—		
8. Avoided touching face	.11*	.15**	.38**	.19**	0.08	.21**	.52**	—	
9. Coughed/Sneezed into tissue or elbow	.23**	.17**	.27**	.19**	.21**	.19**	.30**	.33**	—
10. Disinfected frequently used items	.12**	.15**	.32**	.11*	.09*	.19**	.55**	.56**	.40**

* $p < .05$. ** $p < .01$.

Table 4
Guideline-Related Social Cognition Descriptive Statistics (N = 500)

Scale/item	*M* (*SD*) α
Perceived norms scale	4.56 (.77) 0.87
Perceived control scale	4.49 (.74) 0.45
Attitudes scale	4.20 (.67) 0.77
Guideline self-efficacy scale	4.09 (.87) 0.87
Perceived risk of exposure	3.44 (1.25)
Perceived health consequence if exposed	3.05 (1.28)

Note. All social cognition items used 5-point response scales.

(*r*s = −.11 to .16, *p*s < .01 to .05). Greater openness was associated with greater perceived norms, perceived control, attitudes, self-efficacy, and perceived health consequence (*r*s = .12 to .17, *p*s < .01 to .05). Greater extraversion was only associated with greater perceived norms, $r = .10$, $p < .05$. In relation to overall guideline adherence, all of the relations but the association between extraversion and adherence were in the expected direction, with conscientiousness approaching a medium-sized effect ($r = .28$, $p < .01$).

Differences in guideline adherence based on shelter-in-place orders. The association between shelter-in-place (stay-at-home) orders and guideline adherence was evaluated in two ways. First, an independent samples *t* test showed a null effect for reporting the presence versus the absence of such an order ($p > .05$, Cohen's $d = .20$). As shown in Table 2, participants also could indicate being "not sure" whether such an order was in place (10.2% of respondents selected this option). When combined with the group reporting the absence of a shelter-in-place order, an independent samples *t* test showed a small significant difference as compared to the group reporting the presence of such an order ($p < .01$, Cohen's $d = .27$), indicating greater adherence when reporting the presence versus the absence or uncertainty of an order.

Direct, indirect, and total associations between personality traits, social cognitions, sex, age, self-rated health, shelter-in-place orders, and overall guideline adherence. As informed by the hypotheses and the correlational and group analyses, the path model included the five personality traits, the six guideline-related social cognitions, as well as age, self-rated health, sex, and shelter-in-place order in the multivariate model for overall guideline adherence. The ordering of associations was in keeping with the instrumental hypotheses, which posited indirect associations of personality traits through relevant guideline-related social cognitions. Age and self-rated health were treated as predictors of relevant guideline-related social cognitions, and guideline adherence (resulting in the possibility of testing indirect effects for both). In addition, age and self-rated health were treated as correlates of relevant personality traits. Finally, as noted above, terms were allowed to freely covary, as indicated by the correlational results. In the path model, this resulted in all pairwise combinations of correlations among the personality traits, as well as correlations among most of the guideline-related social cognitions, as well as a correlation between age and self-rated health. These correlated terms were included in the analytic model, but are not presented in Figure 1, to facilitate clarity of presentation. All correlated terms and nonsignificant direct associations are reported in the caption of Figure 1.

The tested path model showed good internal fit ($\chi^2 = 122.117$, $df = 50$, $p < .001$: CFI = .951, RMSEA = .054; $r^{2\ \text{guideline adherence}} = .34$). All standardized direct associations are reported as standardized weights in Figure 1. As noted above, for clarity of presentation, all nonsignificant standardized direct associations and covarying terms are reported in the figure caption.

As shown in Figure 1, among the guideline-related social cognitions, greater perceived norms ($p < .01$), attitudes ($p < .05$), and self-efficacy ($p < .01$) showed significant direct associations with greater guideline adherence.

Among the personality traits, greater agreeableness showed significant direct associations with greater perceived norms ($p < .05$), perceived control ($p < .01$), attitudes ($p < .01$), and perceived health consequence ($p < .05$), but not with guideline adherence ($p > .05$). In contrast, greater conscientiousness showed a significant direct association with greater guideline adherence ($p < .01$), but not with the social cognitions (*p*s > .05). Greater openness showed significant direct associations with greater attitudes ($p < .01$) and perceived health consequence ($p < .05$), but not with guideline adherence ($p > .05$). All tested direct associa-

Table 5
Correlations Between Guideline-Related Social Cognitions and Adherence Items and Scale

Adherence item or scale	Perceived norms	Perceived control	Attitudes	Self-efficacy	Perceived risk of exposure	Perceived risk of health consequence
Work/school at home	.22**	.25**	.25**	.28**	.05	.14**
Avoided social gatherings >10 people	.25**	.16**	.22**	.24**	.14**	.15**
Avoided being closer than 6 feet to others	.36**	.29**	.32**	.39**	.09*	.21**
Avoided eating/drinking out	.24**	.18**	.21**	.29**	.12**	.16**
Avoided visits at nursing homes	.22**	.15**	.16**	.21**	.15**	.13**
Avoided social visits and travel	.24**	.15**	.26**	.29**	.12**	.20**
Washed hands for >20 seconds	.29**	.22**	.29**	.28**	.05	.17**
Avoided touching face	.22**	.13**	.18**	.24**	.10*	.15**
Coughed/Sneezed into tissue or elbow	.25**	.12**	.20**	.18**	.14**	.06
Disinfected frequently used items	.30**	.15**	.25**	.27**	.09*	.13**
Guideline adherence scale	.38**	.27**	.36**	.43**	.13**	.24**

* $p < .05$. ** $p < .01$.

Table 6
Correlations Among Demographic Variables, Personality Traits, and Guideline-Related Social Cognitions and Guideline Adherence

Social cognitions	Age	Self-rated health	Income	Education	Agreeableness	Extraversion	Conscientiousness	Neuroticism	Openness
Perceived norms	.08	.02	.09	.11*	.15**	.10*	.07	.01	.13*
Perceived control	.09*	−.01	−.05	.01	.21**	.04	.18**	−.11*	.13**
Attitudes	.09*	−.07	−.09*	−.04	.18**	.03	.09*	−.05	.16**
Self-efficacy	.22**	−.07	−.07	.00	.15**	.05	.18**	−.11*	.12**
Perceived risk of exposure	.02	−.23**	.04	.05	−.06	−.05	−.06	.16**	.06
Perceived risk of health consequence	.31**	−.41**	−.19**	−.04	.12**	.06	.06	.08	.17**
Guideline adherence items and scale									
Work/school at home	.04	−.01	.09	.08	.08	−.04	.08	.01	.13**
Avoided social gatherings >10 people	.07	.02	.06	.04	.15**	.04	.06	.03	.08
Avoided being closer than 6 feet to others	.12*	.03	.02	.07	.11*	.05	.15**	−.04	.11*
Avoided eating/drinking out	.07	−.08	−.02	−.03	.12**	−.01	.05	−.01	.03
Avoided visits at nursing homes	.07	.00	.04	−.02	.13**	.04	.07	−.02	.04
Avoided social visits and travel	.07	−.06	−.04	.03	.05	.00	.08	−.02	.13**
Washed hands for >20 seconds	.08	.08	.01	.03	.19**	.13**	.23**	−.15**	.12**
Avoided touching face	.15**	.09*	.00	.09	.18**	.17**	.19**	−.16**	.12**
Coughed/sneezed into tissue or elbow	.03	.08	.06	.06	.11*	.08	.13**	−.06	.04
Disinfected frequently used items	.05	.04	.02	.01	.15**	.17**	.23**	−.11*	.10*
Guideline adherence scale	.14**	.03	.00	.04	.22*	.17**	.28**	−.16**	.19**

* $p < .05$. ** $p < .01$.

tions for extraversion and neuroticism were nonsignificant in the model ($ps > .05$).

Among the demographic variables, greater age showed significant direct associations with greater self-efficacy and perceived health consequence ($ps < .01$), but not guideline adherence ($p > .05$). Lower self-rated health showed significant direct associations with greater perceived risk of exposure and perceived health consequence ($ps < .01$), but not guideline adherence ($p < .05$). Sex (being female) did not show a significant direct association with guideline adherence ($p > .05$). The presence versus absence or uncertainty of a shelter-in-place order showed a significant direct association with greater guideline adherence ($p < .01$).

Tests of indirect associations with guideline adherence showed small significant positive associations for agreeableness [$\beta = .063$; 95% CI (.012, .123)], openness [$\beta = .053$; 95% CI (.098, .064)], and age [$\beta = .06$; 95% CI (.021, .097)], and a small significant negative association for self-rated health [$\beta = -.046$; 95% CI (−.081, −.016)].

To help summarize the patterns of associations in the path model, tests of total effects (combined direct and indirect associations) were used to clarify the overall associations of agreeableness, conscientiousness, openness, age, and self-rated health with guideline adherence. These results showed significant total associations with overall adherence for conscientiousness [$\beta = .191$; 95% CI (.092, .290)], openness [$\beta = .098$; 95% CI (.011, .188)], and self-rated health [$\beta = -.046$; 95% CI (−.081, −.016)], but not for agreeableness [$\beta = .074$; 95% CI (−.029, .174)] and age [$\beta = -.000$; 95% CI (−.088, .077)].

Discussion

The purpose of the present research was to investigate patterns and psychosocial correlates of adherence to the White House Coronavirus Task Force guidelines for slowing the spread of the novel coronavirus (SARS-CoV-2) using a U.S. sample. As assessed during the week following the release of the guidelines, the results showed there to be generally high, but not perfect, frequency of following most of the 10 guidelines, especially for avoiding social gatherings in groups of more than 10 people, avoiding eating or drinking inside bars, restaurants, or food courts, and avoiding visiting nursing homes or retirement or long-term care facilities. It also is notable that nontrivial minorities of participants indicated less frequent adherence to all of the guidelines as well, especially avoiding touching of the face, coughing or sneezing into an elbow, disinfecting frequently used items, washing hands for 20 s or more, avoiding being closer than six feet to other people, and avoiding social visits. These patterns reveal the variations to guideline adherence that may further contribute to the unwitting spread of SARS-CoV-2, as well as morbidity and mortality due to COVID-19.

The results of the path modeling show some of these variations can be explained by individual differences in personality traits, beliefs about guideline adherence, and, to a lesser extent, perceptions of current health. Specifically, in line with trait-consistent temperamental process models of behavior, conscientiousness was directly associated with greater past seven-day frequency of overall guideline adherence by virtue of the general tendencies to be reliable (vs. careless). Consistent with an instrumental disposition-belief-motivation perspective, open individuals were more likely

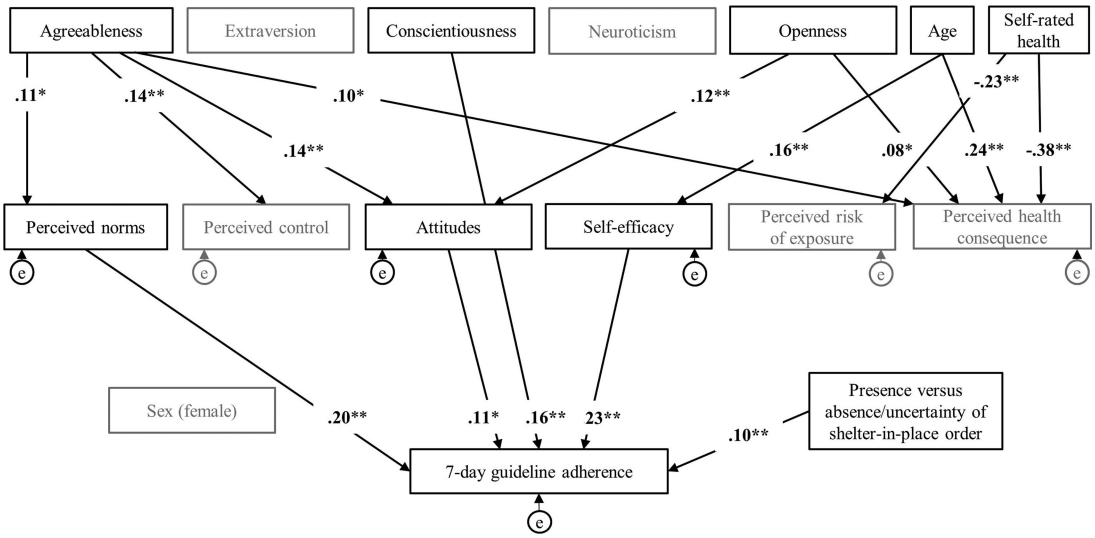

Figure 1. Path model of direct associations among personality traits, age, self-rated health, guideline-related social cognitions, sex, shelter-in-place order, and guideline adherence. * $p < .05$; ** $p < .01$. All terms are standardized weights. Blom-transformed scores were used for perceived norms, perceived control, attitudes, self-efficacy, and the guideline adherence scale. Gray variables were not significant direct predictors of other variables in the model. Nonsignificant standardized direct associations and correlated terms were omitted for clarity of presentation. Nonsignificant standardized direct associations were as follows (all *p*s $> .05$): agreeableness → self-efficacy = .05; agreeableness → adherence = .01; extraversion → perceived norms = .07; extraversion → adherence = .05; conscientiousness → perceived control = .10; conscientiousness → attitudes = .01; conscientiousness → self-efficacy = .09; neuroticism → perceived control = −.02; neuroticism → self-efficacy = −.03; neuroticism → perceived risk of exposure = .05; neuroticism → adherence = −.06; openness → perceived norms = .08; openness → perceived control = .08; openness → self-efficacy = .06; openness → adherence = .05; age → perceived control = .00; age → attitudes = .03; age → adherence = −.07; perceived control → adherence = .05; perceived risk of exposure → adherence = .06; perceived health consequence → adherence = .08; sex (female) → adherence = .06. The associations among the correlated terms were as follows ($p < .001$, unless otherwise noted): Directly correlated manifest variables: agreeableness ↔ conscientiousness = .45; agreeableness ↔ extraversion = .33; agreeableness ↔ neuroticism = −.45; agreeableness ↔ openness = .23; conscientiousness ↔ extraversion = .32; conscientiousness ↔ neuroticism = −.53; conscientiousness ↔ openness = .20; extraversion ↔ neuroticism = −.35; extraversion ↔ openness = .26; neuroticism ↔ openness = −.19; age ↔ agreeableness = .23; age ↔ conscientiousness = .30; age ↔ extraversion = .22; age ↔ neuroticism = −.32; age ↔ openness = .18; self-rated health ↔ agreeableness = .11 ($p < .05$); self-rated health ↔ extraversion = .15; self-rated health ↔ conscientiousness = .13 ($p < .05$); self-rated health ↔ neuroticism = −.21; age ↔ self-rated health = −.10 ($p < .05$); Correlated error terms for variables: perceived norms ↔ perceived control = .25; perceived norms ↔ attitudes = .32; perceived norms ↔ self-efficacy = .29; perceived norms ↔ perceived risk of exposure = .22; perceived norms ↔ perceived health consequence = .18; perceived control ↔ attitudes = .26; perceived control ↔ self-efficacy = .29; perceived control ↔ perceived health consequence = .13 ($p < .05$); attitudes ↔ self-efficacy = .50; attitudes ↔ perceived risk of exposure = .02 (*ns*); attitudes ↔ perceived health consequence = .15; self-efficacy ↔ perceived health consequence = .15; perceived risk of exposure ↔ perceived health consequence = .36.

to follow the guidelines by virtue of more positive attitudes associated with following the guidelines. Also consistent with an instrumental disposition-belief-motivation perspective, agreeable individuals were more likely to follow the guidelines by virtue of greater endorsement of norms and attitudes associated with following the guidelines. However, the total association between agreeableness and guideline adherence was not statistically significant. Moreover, the total associations between extraversion and neuroticism and guideline adherence also were not statistically significant.

Consistent with Social Cognitive Theory, individuals who were more confident in overcoming obstacles to following the guidelines—entreaties for social company or not feeling like it—were more likely to follow the guidelines. Consistent with the Theory of Planned Behavior, individuals who perceived others as supportive or encouraging of following the guidelines were more likely to follow the guidelines, as were individuals who held more positive views of the guidelines—as being wise or useful. In contrast, as components of the Health Belief Model, individuals who perceived greater risk of exposure and/or greater perceived health consequence were not more likely to follow the guidelines. Moreover, the results did not show consistent effects or differences for age, sex, education, income, and the presence/absence of children in the household on guideline adherence.

The findings for conscientiousness are consistent with a large body of research demonstrating the health relevance of this personality trait (e.g., Bogg & Roberts, 2013). Moreover, guideline adherence is a prototypical exemplar of conscientiousness—following socially prescribed norms and delaying gratification (Roberts, Jackson, Fayard, & Edmonds, 2009). The small total effect observed for openness is more novel, but does add to a growing body of research demonstrating the health relevance of this personality trait (e.g., Bogg & Vo, 2014; Graham et al., 2017). Similarly, the findings for perceived norms, attitudes, and self-efficacy are consistent with decades of theorizing and research using Social Cognitive Theory and the Theory of Planned Behavior. Indeed, from the vantage point of the study of individual differences in health-related behaviors, guideline adherence, despite its unprecedented status, is associated with many of the same tendencies and beliefs as other behaviors. However, with the spread of morbidity and mortality throughout the population at stake, the implications for these associations are much more acute and severe.

Implications

Given that members of the White House Coronavirus Task Force have stated they expect a resurgence of SARS-CoV-2 during the fall of 2020 and that a safe and reliable vaccine is not likely to be available until the winter of 2021, the present findings have implications for the ongoing and future use of national-level guidelines and state-, county-, and city-level emergency orders to slow the spread of the virus. To be clear, these implications pertain more to the focused and consistent implementation of existing public health approaches, rather than to wholesale changes or shifts in strategy.

One of the lessons learned from the person–situation debate within personality psychology is that consistent relations between personality traits and behaviors should not be expected in "powerful" and "clearly normatively scripted situations" (Kenrick & Funder, 1988, p. 31). It is when traits are provided with sufficient situational affordances for variable expression that covariation with behavior should be expected. As can be inferred from the results of the present study, situational flexibility was observed to the extent conscientiousness and social cognitions were found to be directly associated with guideline adherence. While these findings are validating from a construct perspective, they also show how individual differences can affect public health measures and guidance.

In the U.S, the prevailing ethical premise of public health policy during a pandemic is the use of evidence-based measures that do not unduly restrict individual liberties or harm well-being (Gostin, Friedman, & Wetter, 2020). In instances where more extreme measures, such as stay-at-home orders, are deemed necessary based on available evidence, then the affected population must be assured that basic needs (e.g., medical care, schooling, housing, income) will be provided for by the government and that such measures and their associated penalties have clear sunset provisions. In such a way, an unambiguous social contract can be established—one with both positive and negative contingencies associated with complying with the measures. As a prerequisite consideration to a social contract, the results of the present work suggest all those affected must be fully informed and/or reminded as to whether they are subject to more onerous measures, such as shelter-in-place or stay-at-home orders.

Several approaches could be used to strengthen perceptions of the binding nature of such a social contract. Early, consistent, and visible messaging regarding the nature and scope of the threats associated with transmission and infection would be required. This would entail careful coordination between public health and political leaders at all levels of government in order to frame the guidelines as necessary and legal emergency measures, rather than advisements for consideration. Coordinated messaging regarding the measures would likely help alter any (mis)perceptions that individual rights and liberties are absolute, that there is arbitrary local/regional variation in the utility or importance of such measures, and that public officials might appear to ignore, minimize, or repudiate the measures.

Establishing and maintaining a clear social contract is consistent with the goals of emergency public health measures (i.e., introducing and sustaining new norms for behaviors while mitigating collateral harms to well-being through the use of emergency measures). Under an effective social contract for such measures, the influences of individual differences would likely remain, but could be reduced. In principle, the terms of the social contract should serve as the primary influences of guideline adherence. In such a context, a primary task of the political–public-health apparatus would be establishing and strengthening perceptions of a social contract. To the extent there is a perception of a stronger set of contingencies for guideline adherence, then there should be a reduction in the influence of the individual characteristics associated with adherence. As noted, such a perspective is consistent with principles from the fields of personality and social psychology, which hold that more powerful situations tend to attenuate the influence of individual difference factors on behavior.

Clear articulation and sustained communication of the following could serve to strengthen perceptions of a social contract for adherence behaviors:

1. The benefits of adherence—the offsetting means by which the collateral effects of emergency measures on individual and institutional well-being would be mitigated.

2. The costs of nonadherence—aside from risks of infection and illness, the precise consequences for violations of the emergency measures and assurances that individual and institutional violators should expect them to be fair and certain.

3. The limited timeframe for adherence—the necessity of emergency measures will be continually reevaluated and emergency orders for such measures will be rescinded at the earliest appropriate opportunity.

The above recommendations are not intended to be exhaustive, but illustrate example means by which the perceived influence of the situational constraints surrounding social distancing and hygienic measures can be strengthened via explicit social contract. This will remain a concern, given the subsequent implementation of additional measures (e.g., masks), as well as fluctuations in

restrictions based on changes in local rates of coronavirus infections. Clarifying the existence, structure, and contingencies of such a contract could help reduce gaps in adherence associated with lower conscientiousness and weaker beliefs about adherence behaviors.

Limitations

Although the approach of the present work provides some clarity and insights into the patterns and correlates of guideline adherence in the U.S. during the initial 15-day period of guideline implementation, the results do not come without limitations. First, the representativeness of the sample by age, sex, and race was inherently limited. The sampling strategy available from Prolific did not allow for further stratification by income, education, region, and so forth, or many other characteristics and features of the population used to strengthen claims of representativeness. Second, because the approach of the study emphasized assessment during the initial 15-day period, obtaining approval from the relevant institutional review board was prioritized. This resulted in an approach that avoided survey questions that could potentially be personally identifiable (e.g., ZIP codes), violate HIPAA or other relevant privacy regulations (e.g., symptomatic/diagnosed family members), or otherwise pose a risk greater than everyday life (e.g., reporting maladaptive coping behaviors). This approach was effective in obtaining exempt status in a timely manner, but also resulted in a more limited assessment of candidate psychosocial correlates of guideline adherence. Third, the precision of the guideline items and scale was limited by its retrospective framing and self-report format. Moreover, although the scale demonstrated adequate rudimentary psychometric properties, a more sophisticated probing of its structure is warranted. Fourth, intention (planning) to follow the guidelines, while an integral component of the Theory of Planned Behavior, was excluded due to the cross-sectional design of the study, which precluded the appropriate temporal ordering of intention prior to behavior. Finally, prospective and longitudinal designs would allow for tests of temporally predictive effects to guideline adherence, as well as COVID-19 symptoms and diagnoses, rather than relying on the tests of associations reported in the present work.

Summary

The primary goal of the coronavirus guidelines was to help slow the spread of transmission to prevent infection and illness and the related exhaustion of medical facilities, supplies, and personnel. The present work shows clear gaps in adherence to the guidelines that may interfere with the attainment of this goal. Indeed, the extension of the original 15-day period for an additional 30 days suggests reaching the goal remained a tenuous prospect. The present work also highlights that part of addressing adherence requires not only the best biomedical advice, but also a consideration of the dispositional tendencies and beliefs related to following such advice.

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