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Compliance with COVID-19 public health guidelines: an attitude-behaviour gap bridged by personal concern and distance to conspiracy ideation

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ABSTRACT

Objective: This study examined predictors of compliance with public health guidelines to curb transmission of COVID-19.

Design: Applying an exploratory longitudinal design, participants ($N=431$) from Germany and Austria completed surveys in April/May 2020 (T1) and July/August 2020 (T2).

Measures: Three outcome measures operationalised compliance with public health guidelines at T2: self-reported adherence (behavioural), agreement and opposition (attitudinal). At T1, demographics, perceived distress (PHQ-4, crisis of meaning), resources (self-control, meaningfulness), locus of control, conspiracy mentality and social media use were assessed. At T2, situational variables were added (person at risk, infection of close person, fear of infection, COVID-19 stress). Temporal shifts from T1 to T2 were examined as complementary information.

Results: An attitude-behaviour gap at T2 was identified, as agreement with and opposition to the guidelines were only modestly correlated with adherence to them. Measures of personal concern (fear of infection, person at risk) were associated with both adherence and positive attitudes towards the measures. COVID-19 stress and conspiracy mentality predicted negative attitudes, but not adherence. Age predicted adherence positively, social media use negatively.

Conclusion: The findings support the significance of personal concern for compliance with public health guidelines and suggest a critical impact of social media use and conspiracy mentality.

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Introduction

In 1998, Albert Bandura commented on the development in health promotion: 'We have shifted from trying to scare people into health, to rewarding them into health,

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to equipping them with self-regulatory skills to manage their health habits, to shoring up their habit changes with dependable social supports' (Bandura, 1998, p. 623). In 2021, we still see authorities in many countries struggle with health promotion, specifically due to citizens' hesitant compliance with COVID-19 related health guidelines. Individual behaviour, however, is the main driver of transmission of the current COVID-19 pandemic. Although the development of vaccines has advanced at an unprecedented rate, widespread immunisation through vaccines faces multiple obstacles. Compliance with non-pharmaceutical interventions therefore continues to be of utmost relevance – which will likely apply similarly to expected future viral pandemics (see Daszak et al., 2020). In Germany and Austria – the two countries where the present study was conducted – as well as in many other countries, the recurring increase in infection rates (e.g. in September 2020, February 2021 and August 2021) after successfully curbing a surge in infections through various measures indicates that compliance with these very measures is not consistently met (Becher et al., 2020). This suggests 'pandemic fatigue' – defined as a 'demotivation to follow recommended protective behaviours' (WHO, 2020a, p. 5) – on the one hand, while temporal changes in adherence to the measures also reflect that such long-term ego depletion (Schnell & Krampe, 2020) is not an irreversible process, but correlates with the gravity of the pandemic (Bundesamt für Risikobewertung, 2020).

As yet, there is still insufficient knowledge about who complies with health measures that have been identified as necessary, and under which circumstances. Many governments seem to be adopting a trial-and-error approach, drawing, inter alia, on strategies that Bandura (1998) already considered to be outdated. Relatively early in the pandemic, Austrian governmental communication, for example, explicitly aimed to induce fear (Der Standard, 2020). As the pandemic progressed, both reward (consumption vouchers) and punishment (extended lockdown restrictions for non-tested persons) scenarios were discussed to motivate citizens' health behaviour. Ultimately, the necessary amendments to the law were rejected. Comparing infection rates between Austria and Germany, they followed a similar trajectory during the pandemic, but Austria had more daily new confirmed COVID-19 cases per million inhabitants for most of the time (Roser et al., 2021). For a more targeted approach in the future, empirical analyses are needed. The present study aimed to offer relevant insights from longitudinal and cross-sectional data, with a largely explorative approach. Two research objectives were targeted: The primary research objective was to identify predictors of compliance from a range of psychological and situational variables. The secondary research objective was to offer insights into temporal dynamics in these variables, by analysing changes in self-reports from the early months of the pandemic to a time of low infection rates.

To address the primary research objective, we tested which role distress experiences, personal resources, controllability, conspiracy mentality and social media use played in the prediction of compliance with COVID-19 related public health guidelines. While strengthening personal resilience, e.g. by boosting resources and sense of control and preventing distress, seems to be an obvious concern in times of crisis, there is also a reasonable question about how experiences of resilience, control and distress relate to the preparedness to restrict one's own actions in accordance with government regulations. Is compliance with public health guidelines a natural consequence of stability as

indicated by low general mental distress, crisis of meaning and COVID-19 stress and by high degrees of self-control and meaningfulness? Should this be the case, it might be sufficient to strengthen personal resilience and avoid mental ill-health. If this is not the case, different public health strategies are needed. Moreover, public agency and communication can have a significant impact on people's locus of control. Can compliance be supported through strengthening citizens' internal locus of control, counteracting externality and conspiracy mentality? Currently, corona skeptics in particular are calling out to shun official media and to gather information via certain social media channels only (e.g. Roland, 2020). Social media use might thus bias the perception of public health guidelines, which is why this information was collected here too.

In order to establish a sequence of reports and test the assumed direction of the effects, we used a longitudinal design. The temporal separation of the measurements also prevents the occurrence of a common method bias, which cannot be ruled out in cross-sectional studies (Podsakoff et al., 2012). General mental distress, crisis of meaning, meaningfulness, self-control, locus of control, conspiracy mentality and social media use were measured during the first months of the pandemic (T1) and used to predict compliance with public health guidelines at T2. In order to take pandemic-related experiences at the time of measurement of compliance into account, the following situational variables were assessed at T2 and added as predictors: being a person at risk, infection of a close person, degree of fear of infection and COVID-19 stress. Three measures were used to operationalise compliance: One assessed the self-reported adherence to public health guidelines; two others assessed attitudes towards the guidelines that were imposed by the authorities, operationalised separately as agreement and opposition. This takes into account that the evaluation of measures is not the same as actual adherence, that positive attitudes and critical evaluations may be partly independent of each other, and that all three aspects can be informative for the evaluation of public health measures. The study design thus provides information on whether certain populations are less willing to bear public health measures; whether stressful conditions and personality-enhancing characteristics make it more or less likely; and whether perceptions of control, conspiracy mentality and social media use predict (non)compliance. Due to the time-lagged approach, our data provide more valid information than results from exclusively cross-sectional studies when it comes to predicting future health behaviour based on citizens' experiences and characteristics – which is of particular interest for the development of public health policies. Moreover, the simultaneous inclusion of a wide range of predictors allows more realistic conclusions than studies that only focus on a few parameters.

Explaining compliance with COVID-related public health guidelines

Albeit with considerable variation between and within countries and over time, there is international consensus that citizens should follow certain public health measures to prevent the spread of the corona virus (WHO, 2020b). These include various forms of physical distancing such as limiting face-to-face contact and travel, and personal hygiene measures such as wearing mouth and nose protection, washing hands regularly, sneezing into the crook of your arm, and so forth. Who complies with these guidelines? The following summarises findings from initial – mostly

cross-sectional – studies that have examined similar or related constructs to the present study.

Demographically, COVID-19 related public health behaviours seem to be adopted more by people of older age (Almutairi et al., 2020; Haischer et al., 2020; Solomou & Constantinidou, 2020). Numerous studies also show higher compliance in women than in men (Almutairi et al., 2020; Galasso et al., 2020; Haischer et al., 2020; Nivette et al., 2021; Solomou & Constantinidou, 2020). Reported associations with education levels are inconclusive. Nivette et al. (2021) reported higher compliance among lower education levels, while others (Almutairi et al., 2020; Carlucci et al., 2020; Zhao et al., 2020) found higher compliance among more educated participants.

The prevalence of symptoms of depression and anxiety has risen with the outbreak of the pandemic (Bueno-Notivol et al., 2020; Salari et al., 2020; Schnell & Krampe, 2020). Wright et al. (2020) reported a positive association between compliance and depression and anxiety cross-sectionally, but depression and anxiety did not predict compliance longitudinally. Contrary to this, Solomou and Constantinidou (2020) found a small negative correlation between general mental distress and precautionary measures, and Stickley et al. (2021) reported lower engagement in preventive behaviours among individuals with anxiety and depression. Findings are thus inconclusive and call for further examination.

Apart from psychological instability, the COVID-19 pandemic is associated with increased crises of meaning (Bhatt et al., 2020; Schnell & Krampe, 2020). A crisis of meaning is experienced as a sense of emptiness, void and futility (Schnell, 2021). It is associated with anxiety and depression (Frølund Pedersen et al., 2018), low self-efficacy (Sørensen et al., 2019) and suicidal ideation (Schnell et al., 2018). It stands to reason that during a crisis of meaning, public health measures might also be seen as pointless and compliance with these measures is therefore low. As yet, no findings on this issue have been published.

Another question is whether psychological characteristics that are considered resources in times of crisis can predict health behaviour in the context of a pandemic. Such resources include self-control and the perception of one's own life as meaningful. Self-control is the ability to override or modify one's inner responses and to interrupt undesired behaviour (Vohs & Baumeister, 2016). It is associated with numerous indicators of psychological well-being (Hofmann et al., 2014; Tangney et al., 2004; Vötter & Schnell, 2019). Moreover, self-control appeared as a buffer between COVID-19 stress and general mental distress (Schnell & Krampe, 2020). Low self-control – i.e. impulsivity – is closely linked with offending behaviour (Vazsonyi et al., 2017). During the current pandemic, some studies found positive correlations between self-control and compliance, e.g. in the Netherlands (Kuiper et al., 2020) and among young adults in Switzerland (Nivette et al. 2021).

Meaningfulness has been shown to serve as a motivator and moderator when it comes to dealing with crises (Schnell, 2021; Schnell & Krampe, 2020). In particular, people who see meaning in their life tend to take responsibility for their health and show more health behaviour than those with less or no meaning (Homan & Boyatzis, 2010; Wiesmann & Hannich, 2008). However, such behaviour is mostly clearly recognisable as beneficial to self. It remains open whether COVID-related health behaviour, which less obviously serves to ensure one's own protection and is justified on the

part of the authorities with the assumption of responsibility for others, the weaker or the health system, is also reinforced by a personal sense of meaning, since people value very different things as meaningful (Schnell, 2009).

A sense of control is particularly at stake in times of societal crisis (Fritsche et al., 2011; Krampe et al., *in press*). The COVID-19 pandemic is characterised by unpredictability, insecurity and the overturning of familiar routines and structures, which all challenge the confidence of being able to influence one's own environment. The concept of locus of control (Rotter, 1966) operationalises an individual's perception of their ability to alter the environment in desired ways. An internal locus of control represents the belief that one's action can affect the environment, whereas an external locus of control denotes the belief that one's actions are insignificant, and that change depends on chance, or powerful others. An internal locus of control is known to be highly conducive to agentic action. Individuals with an internal locus of control tend to take more responsibility for their action, also with regard to health behaviour (Steptoe & Wardle, 2001). Thus, an internal health locus of control was related to lower risk-taking of tourists during the avian influenza outbreak (Aro et al., 2009). With regard to parents' willingness to vaccinate their children, Amit Aharon et al. (2018) reported a positive association between an external (health) locus of control (high powerful others) and vaccination compliance. They only found an indirect effect of internal (health) locus of control, which was mediated by high levels of pro-vaccination and low levels of anti-vaccination attitudes. This suggests that a confident positive mind-set with regard to the measures is necessary in advance for an internal locus of control to come into play in the exercise of these measures.

Uncertainty and anxiety associated with major crises are known to make conspiracy thinking flourish (Oleksy et al., 2021). According to Freeman et al. (2020), conspiracy theories have four defining characteristics: 'the world or an event is held to be not as it seems; there is believed to be a cover-up by powerful others; the theory is accepted only by a minority; and the theory is unsupported by evidence' (Freeman et al., 2020, p. 1). Conspiracy theorists are likely to question any regulations imposed by 'powerful others' such as governments or the WHO and implement them less consistently. First cross-sectional studies have indeed provided evidence for a negative link between COVID-19 related conspiracy beliefs and compliance with public health guidelines (Allington et al., 2021; Freeman et al., 2020; Garry et al., 2020; Pavela Banai et al., 2021). Evidence is inconclusive, however, with regard to general conspiracy mentality. Freeman et al. (2020) reported evidence for a negative relationship between conspiracy mentality and compliance with public health guidelines. Bruder and Kunert (2021) found a negative association between conspiracy mentality and contact-related, but not hygiene-related preventive behaviour, and Marinthe et al. (2020) found no direct correlation between conspiracy mentality and normative prevention behaviours, but an indirect effect via perceived risk of self-contamination.

Large-scale extraordinary situations demand collective action. Effective communication and information are thus vital. Technology and social media offer opportunities to do this in a fast and comprehensive way. At the same time, this technology 'is enabling and amplifying an infodemic that continues to undermine the global response and jeopardises measures to control the pandemic' (WHO, 2020c), through misinformation and disinformation. Small but increasingly visible segments of the population

question the accuracy and sufficiency of information provided by official communication channels. Several non-official web-based media platforms and social media claim to provide more truthful or non-censored information. Scientific analysis has suggested that during the SARS and MERS outbreaks in countries such as China and South Korea, official information dissemination was limited and social media compensated for this (Kim, 2016; Tai & Sun, 2007). On the other hand, several studies provide evidence that social media are disseminators of misinformation and conspiracy beliefs (Allington et al., 2021; Wang et al., 2019). Accordingly, Allington et al. (2021) found COVID-19 health-protective behaviours negatively related both to searching for information on social media and conspiracy beliefs. Social media have been identified as a fertile breeding ground for misinformation and conspiracy. According to Goreis and Kothgassner (2020), so-called filter bubbles can bias the kind of available information through a combination of personal preferences and learning algorithms. Social media use and conspiracy beliefs thus seem to reinforce each other: 'Conspiracy beliefs can be easily spread via social media platforms and people who have conspiracy beliefs are more likely to get information from social media – the latter is crucial knowledge as to break this vicious circle of misinformation' (Goreis & Kothgassner, 2020, p. 38).

Assessment of one's own risk, the affliction of close persons and fear of own infection are likely to influence compliance: A perceived personal risk has been identified as a crucial factor in enhancing compliance (Carlucci et al., 2020; Kwok et al., 2020; Xie et al., 2020). Also knowing a COVID-19 patient seems to increase compliance (Galasso et al., 2020; Qeadan et al., 2020). Both factors probably contribute to a more general fear of COVID-19, which has been termed 'functional' in the current pandemic (Harper et al., 2020), since it has repeatedly been shown to predict compliance with public health measures. Measures of COVID-19 stress go beyond fear of infection; a link with health compliance is thus not as clear. Indeed, Zhao et al. (2020) found high levels of perceived stress related to lower compliance.

The present study examined the above-mentioned demographic, psychological, behavioural (all T1) and situational (T2) variables as predictors of compliance with COVID-19 related public health guidelines. Due to the exploratory nature of this study, no hypotheses were formulated.

Method

Study design and attrition analysis

We applied a longitudinal plus cross-sectional design. Demographics, psychological and behavioural variables measured in March/April 2020 (T1) as well as situational variables measured in July/August 2020 (T2) were used to predict measures of compliance at T2 (primary research objective). For additional insight into the dynamic between these two time points (secondary research objective), within-subject changes in repeatedly measured psychological variables were analysed. $N=1568$ participants completed the questionnaire at the first survey period. Repeated participation was invited, but not required for eligibility. $N=431$ people took part in the survey again after three months (27.5% of the initial sample). Evidence of biased attrition on

demographics and psychological measures included at T1 was examined. Multiple logistic regression indicated that people with higher education were more likely to continue their participation, while those with higher conspiracy mentality were more likely to leave. The odds ratios for both effects (1.21 and 0.72, respectively; standardised predictors) were very small (<1.5 ; Chen et al., 2010). We therefore assume that the results were not substantially biased.

Procedure and participants

Internet-based surveys during the 'first wave' of the pandemic in April/May 2020 (T1) and in a period of relatively low incidence in July/August 2020 (T2) were conducted. Participants at T1 were invited via newsletters, posts in newspapers and news websites in Germany and Austria. After completing the questionnaire, they were asked to provide their contact information (stored separately) should they agree to be contacted for a follow-up. Three months later such an invitation was sent out. Participation was voluntary, without compensation and could be terminated anytime. Ethical approval was issued by the Review Board (Psychology) of the University of Innsbruck. Inclusion criteria were providing informed consent, a minimum age of 18, complete processing of the questionnaires and affirmation of a question on honest responding.

A total of 431 participants completed the questionnaire at both times. Of these, 66% ($n=284$) identified as women and 34% ($n=147$) as men. Mean age was 42 ($SD=17$; $n=2$ missing values), ranging from 18 to 82 years. Most respondents originated from Germany (61%), followed by Austria (31%). The remaining 9% were mainly Italian or Swiss. Nine percent reported lower education, 25% advanced education, 66% had a university degree.

Predictor variables

Demographics

The sociodemographic section assessed participants' age, gender, nationality, education, children and relationship status. Moreover, we asked if participants were living alone or with others, about their housing (room, flat or house) and access to a private outside area (balcony, terrace, garden).

Psychological and behavioural variables

General mental distress was measured by the PHQ-4 (Kroenke et al., 2009), a brief four-item measure of core symptoms of depression and anxiety (four-point Likert scale, 0–3). Participants responded with a view to the past two weeks (for all reliabilities, see Table 1). Crisis of meaning was assessed by the respective 5-item scale from the Sources of Meaning and Meaning in Life Questionnaire (SoMe; Schnell & Becker, 2007; Schnell, 2014), measuring the degree of a perceived lack of meaning (six-point Likert scale, 0–5).

Self-control, i.e. a person's ability to control or modify their impulses, was assessed using the 13-item SCS (SCS-KD; Bertrams & Dickhäuser, 2009; five-point Likert scale, 1–5). Internal and external locus of control were measured by the IE-4 (Kovaleva et

Table 1. Descriptive statistics, χ^2 - and *t*-tests (*N* = 431).

	Variable	%	$\chi^2(1, 431)$	<i>M</i> / <i>SD</i> _{T1}	<i>M</i> / <i>SD</i> _{T2}	<i>r</i> _{T1-T2}	<i>t</i>	<i>df</i>	<i>p</i>	<i>g</i> _{av} ^a	α_{T1}	α_{T2}	Range
Outcomes	Adherence to guidelines (T2)			3.11/1.05								.68	0–5
	Agreement with guidelines (T2)			7.49/1.96								.90	0–10
	Opposition to guidelines (T2)			1.72/2.18								.88	0–10
Demographics	Age (T1)			41.47/16.51									18–82
	Gender: male/female (T1)	34/66											
	Nationality: GER/AUT/other (T1)	61/31/9											
	Education: university degree (T1)	66											
	Relationship (T1)	62											
	Children: one or more (T1)	36											
	Living alone (T1)	25											
	Housing: flat or house (vs. room) (T1)	92											
	Access to outside (T1)	84											
	Being a person at risk (T2)	20											
Situational var.	Infection of a close person (T2)	13											
	Fear of infection (T1, T2)			2.22/1.00	2.30/1.01	.64	-1.86	426	.064	0.08			1–5
	COVID-19 stress (T1, T2)			1.44/0.90	1.27/0.73	.62	4.69	430	<.001	0.21	.79	.73	0–5
Psychological and behavioural var.	PHQ-4 (sum score)			3.29/2.78	2.97/2.59	.61	2.75	430	.006	0.12	.84	.83	0–12
	% beyond cut-off 3 (T1/T2)	53/50	94.11***										
	% beyond cut-off 4 (T1/T2)	39/34	78.31***										
	% beyond cut-off 6 (T1/T2)	18/15	69.85***										
	Crisis of meaning			1.08/1.26	0.96/1.20	.72	2.80	430	.005	0.10	.92	.94	0–5
	% beyond cut-off 3 (T1/T2)	12/10	94.66***										
	Self-control (T1, T2)			3.10/0.69	3.31/0.64	.75	-9.46	430	<.001	0.32	.82	.83	1–5
	Meaningfulness (T1, T2)			3.01/1.16	3.07/1.12	.76	-1.59	430	.112	0.05	.81	.83	0–5
	Locus of control: Internal (T1)			3.92/0.83							.69	.69	1–5
	Locus of control: External (T1)			2.22/0.83							.50	.50	1–5
Conspiracy mentality (T1, T2)			3.70/2.16	3.60/2.13	.74	1.32	430	.189	0.05	.84	.86	0–10	
Social media use (T1)	33												

Note.

^aHedges' *g*, a bias-corrected version of Cohen's *d*, for dependent groups (see Lakens, 2013). Significance levels:

*** *p* < .001 (two-sided).

al., 2012), containing two items each for both subscales (five-point Likert scale, 1–5). Meaningfulness was measured by the respective five-item scale from SoMe (Schnell, 2014; Schnell & Becker, 2007; six-point Likert scale, 0–5).

The five-item conspiracy mentality questionnaire (Bruder et al., 2013) assessed the generic tendency to engage in conspiracist ideation on an eleven-point scale (0–10). Finally, social media use was assessed by asking respondents which sources of information they used, listing print and online newspapers, TV, radio, official information platforms (e.g. by the federal government, Robert Koch Institute, WHO, etc.), YouTube, Instagram and Facebook. A dichotomous variable was created distinguishing those who reported (also) consulting social media (YouTube, Instagram and/or Facebook – coded as '1') from those who did not (coded as '0'). Although most of the psychological and behavioural variables were assessed at T1 and T2, only T1 values were used to (longitudinally) predict compliance at T2.

Situational variables

A set of four variables assessed participants' momentary affection by COVID-19: One item each was used to elicit whether the respondent was a person at risk (0/1), whether a close person had been infected with the virus (0/1), and how much the respondent feared contracting the virus (1 – not at all to 5 – very much so). A seven-item COVID-19 stress scale (Schnell & Krampe, 2020) was employed to determine the experience of acute stress due to the pandemic. Using a six-point Likert scale (0 – not at all to 5 – very much so), it taps feelings of intolerability, boredom, anger, fear and pessimism. Most of these variables were also collected at both time points, but only the T2 values were used as predictors of compliance. In this way, relevant contextual features at the time of assessing compliance could be accounted for.

Outcome variables

Adherence to public health guidelines assessed self-reported health behaviour in accordance with the four then prevailing guidelines, keeping physical distance in public and when meeting friends and family, wearing a face mask in shops and staying at home as often as possible. Participants were asked: At present, how often (six-point Likert scale, 0 – never to 5 – always) do you 'keep 1-2 metres away from other people in public?'; 'wear mouth-nose protection in shops?'; 'keep a distance of 1-2 metres when meeting friends and family who don't live in your household?' and 'stay at home as often as possible?'

Agreement with and opposition to public health guidelines measured the participants' attitudes towards these guidelines. Agreement with public health guidelines assessed the extent to which respondents found these measures 'appropriate', 'understandable', 'well-explained', 'reasonable' and 'meaningful' (five items). Opposition to public health guidelines measured the extent to which respondents found these measures 'oppressive', 'excessive', 'unreasonably restrictive of their civil rights' and 'unlawful surveillance' (four items). Participants were asked to position a slider on an eleven-point scale (0 – not at all to 10 – very much so) to indicate how much the

nine adjectives described how they felt about the authorities' public health decisions regarding the pandemic.

Data analysis

After calculating descriptive statistics, bivariate correlations and three multiple regression analyses were conducted to predict the three respective outcomes (adherence, agreement, opposition). For the latter analyses, respondents who had other nationalities than German or Austrian were excluded ($n=37$). Assumptions for linear regression analysis were checked following [Tabachnick and Fidell \(2013\)](#). Missing values were detected for age ($n=2$), housing ($n=6$), access to outside ($n=6$) and fear of infection ($n=4$); the corresponding cases were excluded from the regression analyses. Due to non-normality, opposition to public health guidelines was log-transformed, resulting in an acceptable distribution. Multivariate outliers were analysed using Mahalanobis distance ($p < .001$) and excluded from the respective analysis ($n=1$ for adherence; $n=2$ for agreement; $n=2$ for opposition). To address the secondary research objective, we investigated putative temporal shifts in general and pandemic-related distress (PHQ-4, crisis of meaning, COVID-19 stress, fear of infection), psychological resources (self-control, meaningfulness) and conspiracy mentality by conducting t -tests for dependent samples and using Hedges' g_{av} – a bias-corrected version of Cohen's d for dependent groups ([Lakens, 2013](#)) – as effect size measure. We also tested for differences in the frequency of several PHQ-4 cut-offs ([Kerper et al., 2014](#); [Kroenke et al., 2009](#)) and presence of a crisis of meaning ([Schnell et al., 2018](#)) by conducting chi-square tests. These analyses are reported first.

Results

At the second time point in summer 2020, when compliance with public health guidelines was measured, descriptive data characterised the situation and pandemic-related experiences of the sample as follows (see [Table 1](#)): 20% of the sample belonged to a risk group; 13% had experienced the Sars-CoV-2 infection of a close person. Acute COVID-19 stress and fear of infection were in the low to moderate range; general mental distress was elevated ([Löwe et al., 2010](#)). Degrees of meaningfulness were comparable to those before the pandemic; the frequency of crises of meaning was in fact lower in the present sample than in the general population before the pandemic (10% vs. 14%; [Schnell, 2021](#)).

Temporal shifts from the 'first wave' to a period of relatively low incidence

General mental distress (PHQ-4), crisis of meaning and COVID-19 stress slightly decreased over the course of the study ($g_{av} = 0.12, 0.10, 0.21$, resp.; sign. χ^2 tests for crisis of meaning and all PHQ-4 cut-offs; see [Table 1](#)), whereas the fear of being infected by the coronavirus remained stable. Degrees of meaningfulness and conspiracy mentality did not change either. Conversely, participants' ability to control their

impulses and modify inadequate emotions and thoughts, i.e. self-control, increased over time ($g_{av} = 0.32$).

Adherence to, agreement with and opposition to COVID-19 public health guidelines

When averaged (range 0–5), adherence was at a medium level (see Table 1): $M=3.11$, $SD=1.05$, $Mdn=3.25$. While a full 72% mostly or always wore face masks in shops and 78% mostly or always kept their distance from others in public, only 23% mostly or always kept their distance from friends and family. Only 26% said they stayed at home as often as possible. Agreement with the measures, in contrast, was rather high with $M=7.49$, $SD=1.96$ and $Mdn=7.80$ (range 0–10), whereas opposition to the guidelines was – on average – low with $M=1.72$, $SD=2.18$ and $Mdn=0.75$ (range 0–10). When the approving and the opposing attitude were related to self-reported behaviour (adherence), only moderate correlations were found ($r = .35$, 95% CI [.25, .44] and $r = -.39$, 95% CI [–.48, –.30], resp.; Table 2).

Table 2. Bivariate Pearson correlations between outcome measures and predictors ($N=394$).

		Adherence	Agreement	Opposition ^a
Outcomes (T2)	Agreement	.35**	–	–
	Opposition ^a	–.39**	–.67**	–
Demographics (T1)	Age	.39**	.03	–.11*
	Gender	–.10*	–.06	.09
	Nationality	–.40**	–.19**	.27**
	Education	.01	.07	–.07
	Relationship status	–.01	–.00	–.03
	Children	.20**	.00	.02
	Living alone	.17**	.01	–.07
	Housing	.03	–.09	.02
	Access to outside	–.03	.04	–.02
Situational variables (T2)	Person at risk	.38**	.13*	–.20**
	Infection close person	–.12*	–.06	.03
	Fear of infection	.36**	.24**	–.16**
	COVID-19 stress	.08	–.25**	.23**
Psychological and behavioural var. (T1)	PHQ-4 (sum score)	.03	–.04	.04
	Crisis of meaning	.00	–.06	.02
	Self-control	–.01	–.03	.09
	Meaningfulness	–.05	–.03	.07
	Locus of control: Internal	–.11*	.00	.09
	Locus of control: External	.10*	.00	–.01
	Conspiracy mentality	–.12*	–.34**	.40**
	Social media use	–.21**	–.04	.12*

Note.

^aLog-transformed; gender (0= male, 1=female); nationality (0=Germany, 1=Austria); education (0=advanced or less, 1=university degree); relationship status (0=no, 1=yes); children (0=none, 1=one or more); living alone (0=no, 1=yes); housing (0=room, 1=flat/house); access to outside (0=no access, 1=access to balcony/terrace/garden); person at risk (0=no, 1=yes); infection close person (0=no, 1=yes); social media use (0=no, 1=yes). Significance levels:

* $p < .05$,

** $p < .01$

(all two-sided).

Situational variables from T2 and demographic, psychological and behavioural variables from T1 were included in three multiple regressions to predict adherence to, agreement with and opposition to public health guidelines. Results are displayed in [Table 3](#).

Whereas higher age, being a person at risk, and fear of infection emerged as significant positive predictors of adherence to public health guidelines, Austrian nationality, having access to a private outside area, and social media use were negatively linked to this measure. In total, 40% of the variance in adherence could be explained by the predictors.

Agreement to public health guidelines was also lower for Austrian than for German participants. In addition, experiencing COVID-19 stress and evidence of conspiracy mentality were negatively related to agreement. Fear of infection and an external locus of control, in contrast, predicted agreement positively. All entered predictors together explained 31% of the variance in the dependent variable.

Findings for opposition to public health guidelines were almost inverted, but with slight differences. Opposition was more marked among Austrians, among people who reported higher COVID-19 stress, and in individuals with a higher degree of conspiracy mentality. Being a person at risk and fearing infection were related to lower levels of opposition. In sum, 32% of the total variance were accounted for by our regression model.

Discussion

Data from two time periods during the COVID-19 pandemic were examined. A first survey started during the so-called first wave, when there was an initial peak of new infections in Germany and Austria, and these were successfully reduced by an initial lockdown (April/May). The second survey took place in the summer of the same year (July/August), when infection rates were at a comparable low level in both countries and public health guidelines were issued. The initial analysis of temporal shifts showed that the high scores in general mental distress (PHQ-4) and the moderate scores in acute COVID-19 stress at the first time point had decreased significantly – albeit only slightly – by the second time point. The frequency of crises of meaning also decreased slightly, while the level of meaningfulness remained stable. Fear of infection and conspiracy mentality did not change during this time; they were consistently moderate. Self-control showed a different trajectory: Here, a slight recovery seems to have taken place, which – following the theory of ego-depletion – could be explained by two factors: On the one hand, at the time of the second survey and in the months before, there was no necessity for such stringent self-control as during the first survey, so that exhaustion (Muraven & Baumeister, 2000) cannot be assumed. On the other hand, the efforts during the first wave and the lockdown had proven to be effective, which may have increased confidence in the necessity and meaningfulness of self-control. A convincing top-down justification for personal restraint is considered an important motivator for adhering to it (van Koningsbruggen et al., 2011).

At the time of the second survey, guidelines were in place regarding physical distancing, staying at home and wearing a face mask in shops. The data shows that

Table 3. Multiple regression analyses for adherence to, agreement with and opposition to COVID-19 public health guidelines.

Predictors	Regression statistics											
	Adherence			Agreement			Opposition (log-tr.)					
	β	SE	p	95% CI	β	SE	p	95% CI	β	SE	p	95% CI
Age	0.16	0.07	.028	[0.02, 0.29]	-0.14	0.08	.055	[-0.29, 0.00]	0.11	0.07	.130	[-0.03, 0.26]
Gender	0.01	0.05	.812	[-0.08, 0.10]	-0.03	0.05	.574	[-0.13, 0.07]	-0.00	0.05	.980	[-0.10, 0.10]
Nationality	-0.29	0.05	<.001	[-0.38, -0.20]	-0.13	0.05	.007	[-0.23, -0.04]	0.21	0.05	<.001	[0.11, 0.30]
Education	-0.03	0.04	.514	[-0.11, 0.06]	0.05	0.05	.333	[-0.05, 0.14]	-0.04	0.05	.452	[-0.13, 0.06]
Relationship status	0.05	0.05	.285	[-0.04, 0.15]	0.03	0.05	.605	[-0.08, 0.13]	-0.10	0.05	.069	[-0.20, 0.01]
Children	0.03	0.06	.623	[-0.08, 0.14]	0.01	0.06	.914	[-0.11, 0.12]	0.05	0.06	.367	[-0.06, 0.17]
Living alone	0.07	0.05	.178	[-0.03, 0.18]	0.06	0.06	.332	[-0.06, 0.17]	-0.09	0.06	.134	[-0.20, 0.03]
Housing	0.06	0.04	.162	[-0.03, 0.15]	-0.02	0.05	.710	[-0.11, 0.08]	-0.05	0.05	.320	[-0.14, 0.05]
Access to outside	-0.10	0.04	.023	[-0.18, -0.01]	0.05	0.05	.245	[-0.04, 0.15]	-0.03	0.05	.587	[-0.12, 0.07]
Person at risk	0.16	0.05	.003	[0.06, 0.26]	0.09	0.06	.116	[-0.02, 0.20]	-0.14	0.06	.014	[-0.25, -0.03]
Infection close person	-0.04	0.04	.372	[-0.12, 0.05]	-0.02	0.05	.722	[-0.11, 0.07]	-0.00	0.05	.934	[-0.10, 0.09]
Fear of infection	0.32	0.05	<.001	[0.23, 0.41]	0.32	0.05	<.001	[0.22, 0.41]	-0.19	0.05	<.001	[-0.29, -0.10]
COVID-19 stress	-0.08	0.05	.135	[-0.17, 0.02]	-0.36	0.05	<.001	[-0.46, -0.25]	0.29	0.05	<.001	[0.18, 0.39]
PHQ-4 (sum score)	0.03	0.06	.674	[-0.10, 0.15]	0.06	0.07	.400	[-0.07, 0.19]	-0.01	0.07	.931	[-0.13, 0.12]
Crisis of meaning	-0.01	0.07	.909	[-0.14, 0.13]	-0.07	0.07	.366	[-0.21, 0.08]	0.04	0.07	.571	[-0.10, 0.18]
Self-control	-0.00	0.05	.943	[-0.10, 0.09]	-0.04	0.05	.419	[-0.14, 0.06]	0.09	0.05	.074	[-0.01, 0.18]
Meaningfulness	-0.03	0.06	.594	[-0.14, 0.08]	0.01	0.06	.892	[-0.11, 0.13]	0.04	0.06	.536	[-0.08, 0.16]
Locus of Control: Internal	0.07	0.05	.206	[-0.04, 0.17]	0.04	0.06	.452	[-0.07, 0.15]	0.01	0.05	.837	[-0.10, 0.12]
Locus of Control: External	0.05	0.05	.267	[-0.04, 0.15]	0.11	0.05	.035	[0.01, 0.21]	-0.09	0.05	.098	[-0.19, 0.02]
Conspiracy mentality	-0.01	0.05	.806	[-0.10, 0.08]	-0.25	0.05	<.001	[-0.34, -0.15]	0.28	0.05	<.001	[0.19, 0.38]
Social media use	-0.10	0.04	.019	[-0.19, -0.02]	0.00	0.05	.969	[-0.09, 0.09]	0.07	0.05	.142	[-0.02, 0.16]
R ²	.40				.31				.32			
Adjusted R ²	.36				.27				.28			
n _{eff}	381				380				380			

Notes: Coding of all variables is equal to Table 2. n_{eff} refers to the effective sample size for the analysis, when cases with missings and outliers were excluded. Bold: significant at p < .05.

they were not consistently put into practice, although agreement with the measures was high and opposition to them low. Accordingly, both measures of attitude – agreement and opposition – were only moderately correlated with adherence ($r = .35$ and $-.39$). For comparison, a meta-analysis on prospective prediction of health-related behaviours (McEachan et al., 2011) reported a mean correlation between attitude and behaviour of $\rho = .31$ ($SD=0.16$). This discrepancy between a high level of approval, a low level of opposition but a low level of self-reported adherence is a first important finding, indicating that a lack of adherence was mostly not a consequence of a negative evaluation of the guidelines. The present study investigated alternative causes separately for adherence to, agreement with and opposition to the COVID-19 related public health guidelines.

Adherence was positively predicted by age: older people were more likely to report following public health guidelines. This might be due to older people experiencing themselves as more vulnerable than younger people; doctors as well as public discourse have consistently emphasised that older people are considered a special risk group. In fact, fear of infection and self-assessment as a person at risk also significantly predicted adherence, which again underlines the importance of personal concern for behavioural compliance with the public health guidelines.

Austrian citizens were significantly less likely to adhere to the measures than Germans. Documented infection rates support this finding: From July to December 2020, Austria had a substantially higher number of confirmed COVID-19 cases per million people than Germany (Roser et al., 2021). Whether this was due to the way the public health guidelines were communicated and implemented cannot be judged here – the guidelines themselves were comparable at the time of the assessment.

Rather surprisingly, access to a private outdoor space proved to be a small negative predictor of adherence: participants who had the possibility to spend time outdoors whenever they wanted reported lower adherence to public health guidelines. This association was not present in the bivariate correlation, however, and is thus likely to result from suppressor effects. Since it is both small and unprecedented in the literature, it will not be further interpreted. Finally, and consistent with the bivariate analysis, the time-lagged prediction of adherence by social media use was significantly negative, suggesting that social media use adversely affects COVID-19 related health behaviour of its users (to a small extent). Allington et al.'s (2021) cross-sectional finding of a negative relationship between COVID-19 health-protective behaviours and searching for information on social media is thus replicated and further strengthened through the longitudinal nature of our data.

Although the time-lagged bivariate correlations in our study showed a small negative association between conspiracy theory and adherence with the public health guidelines, this effect disappeared in the multiple regression, which is in line with findings from France and Turkey (Alper et al., 2020; Marinthe et al., 2020). Overall, 40% of variance in adherence to public health guidelines was predicted by the survey measures. Considering that the aim of this study was not to explain as much variance in compliance as possible, this represents a high level of explained variance.

Regarding agreement with and opposition to public health guidelines, a total of 31% and 32% of the variance was explained respectively. Again, and for both measures, there was an effect of nationality: German participants were more likely to

agree with and less likely to oppose the guidelines. The respondents also agreed more and opposed less when they feared infection. Self-assessment as a person at risk negatively predicted opposition to the guidelines. Personal concern – in terms of fear of infection and risk perception – thus also played a role with regard to attitudes towards the guidelines.

To a considerable extent, the severity of perceived stress due to the pandemic was related to the attitudes towards the public health measures: When people suffered strongly from COVID-19 stress, they tended to oppose the measures, and not agree with them. This could be interpreted in two ways, as these are simultaneously measured variables: On the one hand, a high subjective burden of the pandemic could lead to a negative evaluation of public health guidelines as an additional imposition. On the other hand, the guidelines might also contribute to the personal perception of stress. It is noticeable, however, that this effect was only visible with regard to attitudes but did not affect behaviour. It could thus be an expression of a more general dissatisfaction, which, however, does not extend to preventing responsible action. This assumption is further supported by the fact that the other distress measures (general mental distress, crisis of meaning) were not at all related to compliance, neither in terms of attitudes nor behaviour. Yet, these findings contradict Zhao et al.'s (2020) data from Hong Kong, which showed that people who perceived stress, anxiety or depressive symptoms were less likely to adhere to public health guidelines.

In contrast to its marginal association with adherence, conspiracy mentality clearly predicted the attitudes towards the official guidelines. People who engaged in conspiracy ideation disagreed with and opposed the guidelines. The time-lagged correlation between conspiracy mentality and agreement with the guidelines in our study even exceeded that reported for a Romanian cross-sectional study (Maftai & Holman, 2020; $r = -.33$ vs. $-.18$, resp.). Although we did not assess pandemic-related but generic conspiracy beliefs, and both were only moderately correlated in a British sample (Freeman et al., 2020), the general assumption that 'individuals or secretive powers consciously manipulate the course of events' had a notable influence on the evaluation of public health guidelines in the current context. Effects on behaviour could probably have been observed if we had surveyed more specific pandemic-related conspiracy theories.

Only for agreement with the public health guidelines, a small significant positive effect of an external locus of control was found: the assumption that one's own life is largely determined by others or fate was associated with slightly higher agreement with the guidelines. Although this effect was not reflected in the bivariate correlations, it ties in with Amit Aharon et al.'s (2018) finding on parents' compliance with childhood vaccinations. Ryan et al. (2003) suggested, after finding a positive link between an external locus of control and arthritis patients' perceived control over their ability to live with the disease, that relying on external resources might be especially helpful under unpredictable and multifaceted circumstances – which also applied to the pandemic situation during the survey period.

Finally, general mental distress and crises of meaning did not impact compliance at all. The same held for the resources meaningfulness and self-control. The latter (non-)finding in particular contradicts claims such as Redondo and Puelles' (2017) who called for a strengthening of self-control as a way to narrow the attitude-behaviour gap, and Nivette et al.'s (2021) finding that low self-control predicted low compliance.

Summarising the results of the regression models, the often-reported age effect proved to be significant only for adherence to the guidelines. All three compliance measures varied with the nationality of the respondents: Austrians were less compliant than Germans. Situational variables played an important role for all three measures of compliance. People at risk and those who feared infection were more likely to comply, whereas acute COVID-19 stress – which measures aspects of anger, boredom and pessimism and is therefore indicative of reactance or perceived injustice (Gifford, 2011) – predicted opposition to the guidelines, and low agreement. Higher levels of conspiracy mentality at T1 predicted negative attitudes (low agreement and high opposition) towards the guidelines at T2, but not the actual (self-reported) adherence to them. This, in turn, was lower when participants had searched for information on social media three months before.

While measures of personal concern were associated with both self-reported behaviour and attitudes towards the measures, COVID-19 stress, conspiracy mentality and external locus of control predicted only one or both attitudes. Age and social media use, on the other hand, predicted actual (self-reported) behaviour.

Limitations

The present study has several limitations. First, we could not apply probability sampling for our baseline, which prohibits us to make statistical inferences about the whole population. The sample is not a representative cross-section of society, but we do see a broad range of demographics, characteristics, attitudes and behaviours represented. As the study did not aim to make statements about the prevalence of certain characteristics, but to investigate intrapersonal changes and correlations, the composition of the sample does not in principle call into question the validity of the results presented. Second, all measures were self-reports and thus subject to the typical biases with regard to honesty, social desirability or recall (Althubaiti, 2016). Third, the employed locus of control short form (Kovaleva et al., 2012) does not distinguish between external control by powerful others and by chance. This differentiation might have yielded more precise results, as external control by powerful others, but not by chance, has repeatedly emerged as a positive factor in health behaviour (Amit Aharon et al., 2018; Ryan et al., 2003). Fourth, the attrition analysis suggested that those respondents who participated at both time points in our study were slightly more educated and had a lower conspiracy mentality than those who only participated at T1. These effects were small, and the sample still showed substantial variance with regard to both variables. Since the study focused on intrapersonal changes, we assume that attrition did not lead to any relevant bias. Finally, the question may arise to what extent our results might have been affected by pandemic-related contextual changes between T1 (peak of new infections, lockdown) and T2 (relatively low levels of infection rates, issuing of public health guidelines). To account for contextual characteristics, we assessed situational variables at T2 and included them in the multiple regressions. Our main aim, however, was to test whether characteristics and experiences at one point in time could predict attitudes and behaviour at a later point in time, independently of the variables' stability and changes in context.

Implications and future directions

Our results suggest that the problem of non-compliance in Austria and Germany is not predominantly a matter of disagreement. Although our sample largely agreed with public health guidelines, only some adhered to them consistently. Their characteristics suggest a particularly strong perception of personal risk: they were of higher age, classified themselves as persons at risk and feared infection. This finding supports the notion of 'functional fear' (Harper et al., 2020) and thus seems to put back into play a strategy of health promotion that had been deemed outdated by Bandura (1998), i.e. 'scaring people into health'. There is a difference, however, between 'scaring' and raising awareness of actual risks. Indeed, increasing fear might even reduce health behaviour in younger adults (Greening, 1997). To stress the personal relevance of preventive behaviour, tailored message tactics have shown to be useful (Keller & Lehmann, 2008): For low-involvement audiences – such as at the beginning of the pandemic, when few people felt directly affected – only moderately fearful frames should be used, while emphasising the benefits of one's behaviour for others (such as risk groups), and the credibility of the information source.

Respondents who had indicated in the spring that they believed ill-intending powerful others were influencing the fate of the world provided negative assessments of the public health guidelines in the summer. Similarly, those who felt frustrated, angry and stressed due to the pandemic during the summer gave the measures a negative rating. Interestingly, these correlations remained at the level of attitudes and did not systematically impact behaviour. When it comes to strengthening compliance with public health measures, these thus might not be particularly relevant entry points. What seems to be more important is the use and design of different communication channels. Anyone who spends time on social media today encounters a plethora of corona-specific conspiracy theories (Goreis & Kothgassner, 2020), which seem to have a more immediate impact on pandemic-related behaviour than general conspiracy ideation. A better presence of evidence-based information in social media would thus be an important step.

Last but not least, our data suggest that personal resources and psychological stress are not relevant factors for compliance with public health measures. Their consideration and strengthening, respectively prevention and treatment are, of course, a desideratum, but addressing them is no guarantee for health-conscious and responsible behaviour.

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Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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