Following the crowd in times of crisis:

Descriptive norms predict physical distancing, panic buying, and prosocial behavior during the

COVID-19 pandemic

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Abstract

Individuals engage in a variety of behavioral responses to cope with the COVID-19 pandemic, from complying with or transgressing against physical distancing regulations, to stockpiling or prosocial behavior. We predicted that particularly descriptive social norms are important in driving pandemic-related behavior as they offer guidelines in times of insecurity and crisis. To investigate this assumption, we conducted a longitudinal survey with two measurement points ($n = 1907$) in Germany during spring 2020. Results show that descriptive norms (perceived behavior of close others) positively predicted future transgression against distancing regulations, stockpiling, and prosocial behavior over time. In our analysis, we account for previous behavior as well as other potential predictors (subjective threat, personality). In sum, our findings highlight the power of descriptive norms in increasing compliance with pandemic-related regulations and promoting future prosocial behavior.

Keywords: COVID-19, physical distancing, stockpiling, prosocial behavior, social norms, descriptive norms, compliance, social influence

In the wake of the COVID-19 health crisis, societies had to implement measures to slow down the spread of the pandemic. Aside from locking down institutions and businesses, one of the most notable changes in people's daily lives were regulations to reduce physical contact that came into effect in many countries in spring 2020. Within days, governments imposed regulations that for instance restricted social gatherings and confined social interactions in public to clearly defined physical distances (Hale et al., 2020). In the weeks following the restrictions, a large variety in *compliance* could be observed: Some individuals meticulously adhered to the new rules, while others transgressed against the restrictions (e.g., see Lehrer et al., 2020, regarding statistics for Germany). At the same time, societies experienced a surge of *stockpiling* (Arafat et al., 2020; Baddeley, 2020). Despite repeated admonitions from authorities to the public, grocery stores were struggling for several weeks to comply with a skyrocketing demand in supplies such as canned goods, pasta, flour, toilet paper, disinfectants, and hand soap. Yet whereas some individuals seemed more concerned about their own safety and less about the common good, others actively chose to engage in *prosocial behavior* at own expenses, sometimes even risking their own health (Abel & Brown, 2020; Han et al., 2020). These individuals for instance engaged in neighborhood help (e.g., carrying out tasks for elderly people), donated to Corona help funds, or took part in digital public action (e.g., by offering online courses or support). When focusing on future waves of the COVID-19 pandemic or other upcoming health crises, it is of paramount importance to understand which factors contributed to whether individuals engage in desirable or non-desirable response to the pandemic. Here, we argue for and empirically substantiate the importance of *descriptive social norms* as a powerful predictor of all three pandemic-related behaviors: compliance with imposed regulations, stockpiling, and engagement in prosocial behavior. Using longitudinal data collected at the beginning of the lockdown in March 2020 in Germany, we demonstrate that descriptive social norms predict individual's future behavior and that the strength of the associations between descriptive norms and behavior is much more pronounced than other factors deemed as relevant (i.e., personality, subjective threat).

The Influence of (Descriptive) Social Norms during the COVID-19 Pandemic

Social norms are important drivers of social behavior and behavioral intent (Fishbein & Ajzen, 1977). They represent shared mental representations of appropriate situational

behavior within groups or societies (Aarts & Dijksterhuis, 2003) and can be explicitly stated

or implicitly develop over time out of individuals' interactions (Cialdini & Trost, 1998).

Individuals follow social norms for a variety of reasons: to coordinate themselves with others,

to demonstrate their group membership and affirm their social identity, to resolve uncertainty,

and avoid external sanctions or internal discomfort such as guilt (Gelfand & Jackson, 2016;

Morris et al., 2015). Especially in times of crisis, groups and societies tend to have a stronger

norm orientation and individuals strife to coordinate themselves in order to face the threat

(Roos et al., 2015).

Importantly, one can distinguish between injunctive or descriptive social norms

(Cialdini & Trost, 1998; Morris et al., 2015). *Injunctive norms* specify what "ought" or

"should" be done and can take many forms ranging from implicit moral expectations to

explicitly formalized regulations. For instance, during the COVID-19 pandemic, the

regulations introduced by the government with regard to hygiene and distancing can be

understood as an example of a highly explicit, formalized injunctive norms. In contrast,

descriptive social norms are defined by the perceived prevalence of behavior that other people

show in a respective situation. Regarding COVID-19 related behaviors, this may be the

frequency or duration individuals assume others such as wash their hands with, or whether

they assume that others consistently wear masks in public and comply with the distancing

regulations.

Both injunctive and descriptive norms are powerful influences on individuals'

behavior and may often work in tandem, with everyone expecting others to adhere to

explicitly stated rules. More often than not, descriptive and injunctive norms will also inform

each other. For instance, frequently observed behavior may become a moral expectation and

eventually a formalized rule. On the other hand, individuals may also derive assumptions

about common behavior from what they believe to be moral or allowed (Eriksson et al., 2015;

Morris et al., 2015).

Yet there are situations in which injunctive and descriptive norms do not align. This may be especially true for situations of rapidly changing injunctive norms, such as during the COVID-19 pandemic. From one day to the next, behavior that had been highly appropriate and desirable from a normative perspective before was now prohibited (e.g., physical contact in form of a handshake or hug). This resulted in situations, in which injunctive and descriptive norms were at odds. As previous research has demonstrated, in such situation the impact of descriptive norms will often outweigh injunctive norms. A highly salient explicit rule that is in stark contrast to descriptive norms can paradoxically even foster undesirable behavior by drawing further attention to the mismatch (Cialdini et al., 1990; Keizer et al., 2011). Thus, stronger promotions of injunctive norms might even have a negative effect on individuals' compliance if they feel that no one complies with the regulations anyway.

Descriptive social norms are most powerful in situations characterized by a strong level of uncertainty (Gelfand & Harrington, 2015), as they offer guidelines for the correct behavior in a particular situation, or at least guidelines for behavior that will not leave individuals as the odd one out. At least in Western societies, the COVID-19 health crisis is without precedent for most of the affected citizens who are thus more likely to experience a strong sense of uncertainty and to rely on descriptive norms to cope with the situation. Thus, individuals who assume that close others are complying with the distancing regulations, or engage in prosocial behavior are supposedly more likely to do the same (Abel & Brown, 2020; Kuiper et al., 2020).

Several empirical studies in the context of the COVID-19 pandemic have already provided correlative evidence for associations between respective descriptive norms and compliance with physical distancing, stay-at-home orders, and hygiene measures (Farias & Pilati, 2020; Goldberg et al., 2020; Reinders Folmer, Brownlee, et al., 2020; Reinders Folmer, Kuiper, et al., 2020; van Rooij et al., 2020). Those studies also indicate that the reference point of those norms seems to matter: While the (assumed) behavior of family and friends

predicted individuals' behavior, individuals' assumption how compliant people were *in general* was not predictive for their own behavior (Farias & Pilati, 2020; Lees et al., 2020; Nivette et al., 2020).

The present contribution adds to this research on the effects of descriptive social norms on pandemic-relevant behavior and extends it in three important ways: First, most studies on descriptive norms merely investigated cross-sectional associations between descriptive norms and the respective behavior during the pandemic. However, cross-sectional associations cannot reflect the true predictive power of the observed variables for future behavior. Especially when focusing on behavior, researchers might overestimate the effects of certain antecedents if they do not account for previous behavior, which is usually the best predictor for future behavior (Ouellette & Wood, 1998). Moreover, cross-sectional associations do not allow for investigations of temporal order. From a theoretical perspective it makes sense to presume that social norms precede behavior (Fishbein & Ajzen, 1977). However, the reverse temporal order is also possible, with individuals attempting to justify their own behavior and possibly falling for a false consensus bias by overestimating the representativeness of their own behavior (Mullen et al., 1985). To overcome this limitation, we provide longitudinal data drawn from the onset of governmental regulations meant to combat the spread of the pandemic in Germany. Our analyses account for the impact of previous behavior and further investigate the temporal order of descriptive social norms and engagement in respective pandemic-related behaviors.

Second, previous studies have been limited to assessing compliance with explicit governmental regulations (i.e., hygiene measures, physical distancing, contact reduction). These behaviors all have in common that they were directly bound to very explicit injunctive norms. Disobeying these injunctive norms was deemed as highly undesirable by health organizations and often even prohibited by governments. Direct sanctions through the executive forces such as the police and judicial bodies such as courts likely maximize the

impact of injunctive norms and potentially make it easier to control these behaviors through governmental action. However, voluntary behavior that is not restricted or facilitated through rule of law is also important to mitigate the impact of a pandemic. Particularly, it makes a strong difference if individuals only comply with rules or choose to engage in pro-social action such as helping and supporting others. In addition, individuals that stockpile essential goods may (likely unwillingly) worsen the impact of the pandemic on public health and create distrust and insecurities in a time of crisis. We are not aware of any studies that have investigated the effects of descriptive norms on such less explicitly regulated or ambiguous behaviors during the pandemic. Given that there were no official sanctions for stockpiling or not engaging in active prosocial behavior in most countries, descriptive norms might play a more important role in predicting these behaviors than for compliance with mandatory physical distancing regulations.

Third, while descriptive norms are a powerful influence on individual's behavior, their impact might differ depending on dispositional factors. One such factor is individual's *self-construal* (Markus & Kitayama, 1991). Self-construal refers to the concept that individuals have of their own self in relation to others and is usually distinguished in one's interdependent and independent self-construal. Individuals with a strong interdependent self-construal define themselves mainly via their social relationships and place high importance on others' opinion and approval. Thus, an association between descriptive norms and behavior should be particularly strong for individuals with a strong interdependent self-construal (Ybarra & Trafimow, 1998). In contrast, individuals with a strong independent self-construal define themselves via their unique abilities and traits. Consequently, associations between descriptive norms and behavior might be less pronounced for these individuals who prefer to rely on their own judgment of the situation.

Other Influences on Behavioral Responses: Personality and Subjective Threat

In addition to social norms, behavioral responses to the pandemic might also be preceded or associated with factors situated less in the individuals' social environment, but more in individuals' specific dispositions and the way in which individuals subjectively construe the pandemic. In the present contribution, we additionally investigate whether personality as well as subjective threat predict individuals' responses to the pandemic. Importantly, we assume that descriptive norms will still be a powerful driver of individual's behavior, even when controlling for these two factors.

Regarding personality, particularly *honesty-humility* (i.e., tendency to be fair and genuine when dealing with others) in the HEXACO personality model (Ashton & Lee, 2007) is typically negatively related with antisocial, rule-violating, and selfish behavior (Zettler, Thielmann, et al., 2020). Thus, humble and honest individuals might be more likely to comply with the physical distancing regulations (Twardawski et al., 2020; Zettler, Schild, et al., 2020) and less likely to engage in stockpiling (Columbus, 2020).

Another powerful motivator to engage in protective measures may be the experience of threat. Individuals differ in how much they worry about the spread of the infection, that is, their level of *subjective threat* (Dryhurst et al., 2020). Thus, individuals who feel that they and their community are strongly threatened by the pandemic and that physical distancing represents an effective measure of protection, might be more likely to comply with the regulations (Harper et al., 2020; Kuiper et al., 2020; Zickfeld et al., 2020). In addition, they may also be more likely to engage in stockpiling in order to be sufficiently prepared to cope with the consequences of the pandemic (Garbe et al., 2020). In contrast, individuals who believe that the pandemic represents no severe threat may feel that physical distancing is unnecessary and an unwarranted invasion into personal rights and be less likely to comply with the distancing regulations. The same persons might be less likely to engage in stockpiling as well as prosocial behavior, as they see no necessity for doing so. Importantly, research has demonstrated that subjective threat is only effective if individuals believe in the effectiveness of promoted protective measures (Witte & Allen, 2000). In many countries, official institutions such as government, officials, and the media have strongly promoted and encouraged physical distancing as a means to deal with the pandemic, while trying to discourage stockpiling (Bish & Michie, 2010; Han et al., 2020). Thus, subjective threat might be particularly effective to increase compliance and desirable

behavior for people with high *trust in institutions,* but less so for individuals with low trust in institutions who do not believe in the effectiveness of the promoted measures.

Research Question

We investigated in a longitudinal study whether descriptive social norms regarding physical distancing regulations, stockpiling, as well as prosocial behavior predict individuals' respective behavior a few weeks later. We assume that individuals who believe, for instance, that others transgress against physical distancing regulations should more often transgress against such regulations in the future themselves. In addition, we further assessed personality and subjective threat, assuming that descriptive norms would still predict future behavior when controlling for these two factors. In line with previous research, we assume that honesty-humility should negatively predict future transgressions against physical distancing as well as stockpiling. In addition, subjective threat should be negatively associated with future transgressions against physical distancing and positively with stockpiling as well as prosocial behavior. We further conducted some exploratory analyses regarding a) associations between behavior and other personality dimensions and b) moderation of individual's self-construal and trust in institutions on the associations between norms and future behavior as well as threat and future behavior.

Method

We conducted a longitudinal survey study with two measurement points. The study started on March 26, four days after the German government had imposed nation-wide rules making physical distancing mandatory (e.g., no meetings of more than two people from different households, requirement to keep a minimum distance of 1.5 meters in public). The study was approved by the IRB of the University of [masked for peer-review] (framework "Psychological Effects of the COVID-19 pandemic", IRB Nr.: 2020_255) and preregistered on AsPredicted.org

http://aspredicted.org/blind.php?x=jd44rd[1]. Our complete analysis scripts, outputs and the data are provided at https://osf.io/tsaeh/?view_only=481863a998f3473490eb9746acb9f234.

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[1] The survey aims to test multiple, unrelated research questions, each focusing on a different set of measures. For reasons of transparency, we included all research questions within the same

Participants

Participants were living in Germany at the time of the survey and were recruited via mailing lists, social media groups, and newspaper articles from March 26 - April 2nd. They were invited via email to participate at the second measurement point between April 16th - April 23rd. In total, 1907 individuals participated at the first measurement point, out of which 1342 persons also responded to the second questionnaire (dropout rate = 29.63%)[2]. We could match the data of both measurement points for 97.09% of the participants taking part at the second measurement point. Of all participants, 76.5% were women, 22.6% were men, ten participants were gender-diverse, and seven participants chose not to respond (M_{age} = 36.35, SD = 13.44, Range: 16 - 89). Most participants (81.2%) had a general qualification for university attendance or a higher education degree.

Measures

We measured stable dispositions such as personality, self-construal, and trust in institutions at the first measurement point only, whereas all variables that directly referred to the pandemic (pandemic-related behavior, descriptive norms, subjective threat) were assessed at both measurement points. Items were aggregated to scale values, if not stated otherwise.

Measurement Point 1

Personality. Personality was assessed with the Brief HEXACO Inventory (BHI), a 24-item version of the HEXACO (De Vries, 2013). The BHI assesses honesty-humility (α = .41), emotionality (α = .53), extraversion (α = .45), agreeableness (α = .42), conscientiousness (α = .54), and openness (α = .45) with four items each (5-point scale; *1= strongly disagree, 5 = strongly agree*). The rather low measures for internal consistency (α = .41 - .54) are in line with priorly observed scale characteristics

preregistration. The present contribution focuses only on results and measures related to Research Question 1.

[2] Dropout analyses showed that individuals who dropped out were less conscientious, less honest and had lower trust in institutions, *Hotelling's T* = 0.49, F (17, 1604) = 4.72, p < .001, η^2 = .05. They were also more likely to be male, $\chi^2(1)$ = 4.69, p = .030.

(Desrochers et al., 2019). These coefficients are a) likely due to a strong heterogeneity of the items that carry information about several sub-facets of the personality dimensions and must b) be interpreted alongside a strong retest-reliability (> .70 over a two-month periods) and convincing associations with other measures indicating the same dimensions (De Vries, 2013). As such, measures of internal consistency likely underestimate the reliability of the scale.

Self-construal. Independent (α = .70; example item: *"I prefer to be self-reliant rather than depend on others,"*) and interdependent self-construal (α = .79; example item: *"I will sacrifice my self-interest for the sake of my group"*) was assessed with 6 items each (7-point scale; 1= strongly disagree, 7 = strongly agree; Gudykunst et al., 1996)

Trust in institutions. Trust in institutions was assessed by asking individuals to indicate their trust in the federal government, the state government, the local government, parliaments, politicians, political parties, daily papers, public broadcasting, private broadcasting, the economic system of Germany, the health system of Germany, and scientists (α = .89; 4-point scale, *1 = no trust, 4 = strong trust*).

Measurement point 1 and 2

Prosocial behavior. To assess prosocial behavior during the crisis, participants were asked whether within the previous seven days, they had engaged in neighborhood help (e.g., grocery shopping for older people, childcare, walking dogs, running errands), had engaged digitally (e.g., by offering webinars or online support), donated money to a Corona-related help fund, donated blood, or not at all, with a single choice item for each. Participants further had the option to add other prosocial behaviors as a write-in, although due to low content validity in responses[3], we did not include these responses in the analyses. At the second measurement point, we added whether participants had

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[3] Many participants used the open response to justify not engaging in prosocial behavior (e.g., belonging to a risk group), announced intentions to help in the future, or mentioned behavior that could not be unambiguously classified as prosocial, pandemic-related engagement (e.g., working in a system-relevant job).

engaged in sewing masks for others as an additional answer option. As individuals rarely engaged in more than one or two prosocial activities at a time (only 1.6% at T1 and 3.2% at T2), we aggregated items to a dichotomous measure indicating whether individuals had engaged in any prosocial behavior or not.

Stockpiling. Participants were asked whether the following items describe their behavior within the previous seven days: *"I bought more food (e.g., canned food, pasta, flour) than I would normally do"* and *"I bought more hygiene articles (e.g., toilet paper, soap, disinfectants) than I would normally do"* (5-point scale, *1 = not at all, 5 = very much;* $\rho_{T1} = .80$, $\rho_{T2} = .78$).

Transgressions against physical distancing: Participants were asked whether within the previous seven days, they had transgressed against current regulations about physical distancing (meeting with another person outside of their household without occupational necessity, staying with larger groups or on publics places, visiting or getting visited by family members and friends > 65 years, not paying attention to keep a minimum distance of 1.5 m to other persons in public, only restricting themselves if there was an explicit regulation, knowingly deviating from rules to reduce social contact) with six items (5-point scale, *not at all = 1, very often = 5;* $\alpha_{T1} = .58$, $\alpha_{T2} = .65$).

Descriptive norms. Using similar items as to evaluate stockpiling ($\rho_{T1} = .93$, $\rho_{T2} = .92$), transgressions against physical distancing ($\alpha_{T1} = .83$, $\alpha_{T2} = .81$), and prosocial behavior ($\alpha_{T1} = .70$, $\alpha_{T2} = .70$), participants were asked how often close others (family, friends, acquaintances) would engage in that behavior (7-point scale, *very rarely - very often*).

Subjective Threat. Subjective threat was assessed with three items, *"Thinking about the COVID-19 pandemic makes me feel threatened / insecure / powerless"* (5-point scale, *1 = not at all, 5= very much*; $\alpha_{T1} = .81$, $\alpha_{T2} = .83$).

Analytic Strategy

We analyzed the data in three steps: First, we investigated the predictive power of descriptive norms while controlling for the influence of personality and subjective threat as well as previous behavior. To this aim, we included descriptive norms, personality, and subjective threat as well as the three self-reported behaviors measured at T1 simultaneously as predictors for self-reported behavior measured at T2 in a structural equation model. Controlling for self-reported behavior measured at T1

a) allowed us to detect the influence of the predictor set on change in self-reported behavior at T2 and b) reduced method bias which could have contributed to higher zero-order associations between descriptive norms and self-reported behavior due to similar item wording.

Second, we conducted a latent cross-lagged panel analysis to dissect true temporal effects from cross-sectional associations while controlling for the constructs' relative stability. In these models, descriptive norms measured at T1 were used as predictor variables both for descriptive norms measured at T2 (construct stability) as well as behavioral variables measured at T2 (temporal effect of descriptive norms). Similarly, behavioral variables measured at T1 were introduced into the model as predictors for behavioral variables measured at T2 (construct stability) and descriptive norms measured at T2 (temporal effect of behavior). We also allowed for undirected paths between the constructs within each measurement point (cross-sectional associations). We conducted separate analyses for each behavioral variable and the corresponding descriptive norm, thus, three cross-lagged panel analyses for descriptive norms. In addition, we also conducted three additional cross-lagged panel analyses for each behavioral variable and subjective threat.

Third, in an exploratory analysis we investigated the impact of the potential moderator variables independent and interdependent self-construal, and trust in institutions on the association between descriptive norms and self-reported behavior as well as between threat and self-reported behavior in eighteen moderation models (one per possible moderation = 3 moderators x 2 predictors x 3 behavioral criteria).

All analyses were conducted with Mplus Version 7.2 (Muthén & Muthén, 1998-2015). We applied the Full Information Maximum Likelihood methodology (FIML) to handle missing data when estimating the model parameters. We used the weighted least squares means and variance adjusted estimator (WLMSV) for all models that included prosocial behavior due to the dichotomous nature of the measure (Muthen et al., 1997). For all other models, we used the robust maximum likelihood estimator (MLR), which allows robust estimations of model parameters despite deviations in multivariate normality (as it was the case for all behavioral measures). All conducted models were saturated because we accounted for all associations between predictors as well as between

criteria. This means that the models automatically show a perfect overall fit to the covariance matrix, which is why we do not report model fit indices.

Results

Descriptive statistics and zero-order correlations with the behavioral criteria are depicted in *Table 1*. Expanded raw zero-order correlation tables showing associations between predictor variables for each measurement point are provided as supplemental material under https://osf.io/tsaeh/?view_only=481863a998f3473490eb9746acb9f234. In general, participants reported rather low levels of stockpiling and transgression against physical distancing regulations, while about half of the participants had engaged in any form of prosocial behavior (T1 = 48.7% and T2 = 51.7%).

Step 1 - Predictive Power of Descriptive Norms, Personality, and Threat

The results of the structural equation model are depicted in *Table 2*. Overall, the strongest predictor of self-reported behavior measured at T2 was previous behavior measures at T1, followed by the descriptive norm regarding this behavior measured at T1. This was true for prosocial behavior, stockpiling, and transgressions against physical distancing regulations. Additionally, perceived threat at T1 positively predicted engagement in prosocial behavior and negatively predicted transgressions against physical distancing regulations at T2. We also found a few associations for personality traits with self-reported behavior when controlling for other predictors: More specifically, honesty-humility negatively predicted stockpiling at T2. Furthermore, emotionality positively predicted transgressions against physical distancing regulations at T2, whereas conscientiousness negatively predicted transgressions against physical distancing at T2. It should be noted that aside from the stability coefficients, descriptive norms about stockpiling and prosocial behavior measures at T1 were the strongest predictor for behavior at T2 in the tested set (β= .13 and .16)

Step 2 - Temporal Directions Behind the Observed Associations

We calculated cross-lagged panel models to further qualify the temporal direction of the associations of self-reported behavior with descriptive norms and threat. The model results of the association between behavior and descriptive norms are shown in *Figure 1*. There was a similar result pattern for all three behaviors: Descriptive norms at T1 predicted behavior at T2 but reported behavior

at T1 also predicted for reported descriptive norms at T2. The results of the cross-lagged panel models (depicted in *Figure 2*) on the association between subjective threat and self-reported behavior showed fewer distinct cross-paths for subjective threat than for descriptive norms. Subjective threat at T1 positively predicted prosocial behavior and negatively predicted transgressions against physical distancing regulations at T2, but not vice versa. Interestingly, stockpiling at T1 positively predicted subjective threat at T2 in absence of the reversed effect.

Step 3 - Moderation Effects by Self-Construal and Trust in Institutions

Neither the strength of independent and interdependent self-construal, nor trust in institutions, moderated any relationships. This was true for associations between descriptive norms and behavior (smallest $p = .094$) as well as for associations between perceived threat and behavior (smallest $p = .076$). However, there were small direct effects on behavior for interdependent self-construal (4 out of 6 moderation models) and trust in institutions (3 out of 6 moderation models). Yet when conducting an additional exploratory structural equation model, adding the moderator variables to the predictor set used in step 1, only the (negative) association between interdependent self-construal and transgressions against physical distancing regulations was statistically significant, $\beta = -.05$, $p = .030$.

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Discussion

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A variety of behavioral responses could be observed during the beginning of the COVID-19 pandemic: Some individuals complied with the new regulations about physical distancing or engaged in prosocial behavior, others transgressed against the restrictions or engaged in stockpiling. In a longitudinal study during the onset of governmental regulation to combat the spread of the pandemic in Germany, we found that descriptive social norms predicted individual's compliance with social distancing, their engagement in stockpiling, as well as prosocial behavior two weeks later. These associations remained stable even when controlling for personality, subjective threat as well as individuals' previous behavior. Descriptive norms were the strongest predictor of future behavior (aside from previous behavior), which was especially true for descriptive norms regarding stockpiling and prosocial behavior. In contrast, dispositional variables such as personality showed only negligible effects on future behavior and individual differences (self-construal, trust in institutions) did not moderate any associations between descriptive norms and behavior during the pandemic.

Predictive Power of Descriptive Norms

Overall, behavior was highly consistent between both measurement points, reinforcing the notion that previous behavior predicts later behavior (Ouellette & Wood, 1998). When accounting for previous behavior, we consistently found that *descriptive norms*, that is, participants' perception of how close family and friends behaved during the pandemic, were the strongest predictor for all three observed behaviors measures a few weeks later. Importantly, descriptive norms showed specific associations with the respective future behavior (e.g., descriptive norms regarding stockpiling at T1 predicted stockpiling behavior at T2) and were generally not predictive for other behavior. The only exception was that descriptive norms regarding transgressions against physical distancing also (negatively) predicted future prosocial behavior. One possible explanation could be that people are more eager to help others if they feel that other individuals oblige to social contracts and do not transgress against regulations. Interestingly, descriptive norms regarding stockpiling and prosocial behavior were more strongly associated with respective future behavior than descriptive norms regarding physical distancing. This might be due to the fact that there was less insecurity about the physical distancing regulations, which were clearly communicated. Plus, transgression about those regulations might be sanctioned. In contrast, stockpiling and not engaging in prosocial behavior represent more ambiguous behaviors and thus might be more strongly driven by descriptive norms.

In addition to descriptive norms predicting future behavior, behavior also predicted self-assessed descriptive norms a few weeks later. Two potential reasons come to mind: First, individuals might influence close others to adapt certain behaviors, just as close others might influence them in return. Second, individuals overestimate how common their own behavior or attitudes are, a cognitive bias termed the *consensus bias* (Mullen et al., 1985). Especially when engaging in behavior officially labeled as a transgression, individuals might be motivated to justify their own behavior stating that "everyone else does it, too." This bias may not only impacts present perceptions of descriptive norms, but also fester over time, in so far that individuals interpret subsequent social situations through the lens of their own previous behavior. For instance, individuals that stockpiled toilet paper might be more likely to notice others buying toilet paper as well and interpret such behavior as stockpiling.

We further assessed individuals' self-construal as a potential moderator of the association between descriptive norms and behavior but found that it contributed little to explaining behavior. This was also true for other dispositional factors within our study (HEXACO personality, trust in institutions). One possible explanation for these comparably small effects compared to the larger effects of descriptive norms might be that events such as the COVID-19 pandemic represents extreme and for many individuals unique situations that they never had to cope with in their lifetime. Consequently, dispositions that might explain individual differences in daily behavior, might be less relevant when individuals search for mechanisms to cope with a crisis situation such as the current pandemic (Zajenkowski et al., 2020).

However, in addition to descriptive norms, *subjective threat* predicted future prosocial behavior and transgressions against physical distancing. The effect of subjective threat might be more pronounced when accounting for personal beliefs about the effectiveness of pandemic-related behavior (although trust in institutions did not moderate the association between threat and behavior). If individuals believe that they can sufficiently cope with the threat, threat should motivate protective behavior. Yet individuals may engage in denial or other coping behaviors if they feel that a threat cannot be averted (Witte & Allen, 2000). Interestingly, our longitudinal analyses suggest that stockpiling rather predicted perceived threat than vice versa. This finding stands in stark contrast to the assumption that threat would lead to stock-piling, which has been derived from cross-sectional evidence on the association between the two variables (Garbe et al., 2020; same period of data assessment as our first measurement point). Thus, a reduction in threat might not automatically reduce stockpiling; and respective measures might need to tackle other factors like descriptive norms, for instance.

Strengths and limitations

While the COVID-19 pandemic had sparked a surge of research, many of the first studies investigating associations between behavioral responses and situational or dispositional predictors have been cross-sectional. Thus, they do not allow for conclusions about temporal order, as well as overestimate the predictive power of the investigated variables. Using a longitudinal survey design and cross-lagged panel analyses allowed us to overcome these limitations and to provide more

accurate estimations on how subjective construals of the pandemic predict future behavior during the crisis. The large sample size further allowed us to detect even small effects.

We note that our study is characterized by some specifics that limit the generalizability of our findings. We conducted our survey at a specific point in time (spring 2020, following the introduction of pandemic-related regulations) within a specific cultural context (Germany). As the pandemic unfolds, we see that nations differ vastly in their political response (Hale et al., 2020) and that certain stages of the pandemic might also be associated with different perceptions and responses in the public (e.g., Lehrer et al., 2020). We think that our findings need to be situated within a larger research framework on predictors of pandemic-related behavior in different countries and at different points in time. Although only looking at cross-sectional associations regarding physical distancing norms, other studies from Brazil (Farias & Pilati, 2020), the Netherlands (Reinders Folmer, Kuiper, et al., 2020) and the United States (Reinders Folmer, Brownlee, et al., 2020; van Rooij et al., 2020) found similar associations between descriptive norms and compliance with the regulations.

It is also important to note that our convenience sample was not representative for the German population and was specifically characterized by a strong overrepresentation of women and highly educated individuals. This might have affected the frequencies of the observed behaviors. Particularly, frequencies of stockpiling or transgressions against the physical distancing regulation were comparably rare, which might have led to an underestimations of effect sizes. A representative sample of the population might have potentially resulted in more variance and thus even stronger effects.

Practical Implications

In addition to previous recommendations how to increase compliance with the measures (e.g., by increasing individuals' empathy, see Pfattheicher et al., 2020) here we present findings highlighting the importance of perceived descriptive norms for individuals' behavior. As such, policymakers might be well advised to consider the power of descriptive norms if they want to ensure compliance with physical distancing regulations and promote prosocial behavior and discourage stockpiling. If undesirable behavior is frequently made salient in one's close surroundings, individuals might perceive that undesirable behavior represents the descriptive norm and change their own behavior accordingly. Over time, those descriptive norms ("no one is doing that here") might even turn into

(informal) injunctive norms, such that individuals dismiss compliance with official regulations as irrational and exaggerated.

From a normative perspective, political leaders and media figureheads might thus wish to act as role models (Valente & Pumpuang, 2007) by complying with policy measures meant to mitigate the pandemic (e.g. wearing masks, using hand sanitizer, abstaining from large political gatherings). However, given the particular importance of descriptive norms regarding the behavior of *close others* (compared to the general population, e.g. Farias & Pilati, 2020), it might be even more essential for policy-makers to motivate their followers to become role models themselves within their respective communities. Our results underline the importance of establishing strong descriptive norms within communities rather than solely communicating about potentially harmful effects of transgressions against regulations. Thus, communication should ideally focus on highlighting positive examples (Abel & Brown, 2020) and also encourage individuals to share and talk about engagement in desirable behavior, following the principle to "do good and talk about it."

Second, policy-makers might attempt to correct individuals' assumptions about descriptive norms (Morris et al., 2015). Media in Germany as well as other countries has frequently covered protests of anti-regulation movements who were also often subject of political debates and talkshows. While understandable from a democratic standpoint, this might unduly heighten the salience and spread of these ideas and make people feel that non-compliance with the regulations is more frequent than is actually is. Thus – provided that the majority of individuals is in fact showing compliance with injunctive norms (Schultz et al., 2007) - it might make sense to shift the focus of the conversation more to those compliant individuals than to the minority who does not. Again, this might work better within smaller or close groups or communities in which a strong shared social identity can be created (Gelfand & Jackson, 2016). If people feel that "we" are complying with the regulations and put in effort to support others and fight the pandemic together, they are much likely to do so as well.

Conclusion

Descriptive norms, that is, perceived behavior of close others measured at the beginning of the first lockdown during the COVID-19 pandemic, predicted whether individuals transgressed against physical distancing regulations, engaged in stockpiling, or showed prosocial behavior a few weeks

later. These associations are unparalleled by the predictive power of other variables within our model besides previous behavior. Subjective threat further predicted future prosocial behavior and transgressions against physical distancing regulations, whereas dispositional factors were mostly negligible when predicting future behavior. In sum, this pattern of results points to the strong power of descriptive social norms in driving individuals' behavior during the pandemic.

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Table 1

Descriptive statistics and zero-order correlations of all variables with the behavioral criteria measured at T2.

| Scale	M	SD	Scale range	r_{pb_T2}	r_{buy_T2}	r_{tpd_T2}
Honesty-Humility (T1)	3.82	0.61	1-5	.04	-.10**	-.14**
Emotionality (T1)	3.23	0.68	1-5	-.06*	.06*	-.10
Extraversion (T1)	3.79	0.63	1-5	.06*	.02	-.01
Agreeableness (T1)	2.99	0.56	1-5	.03	-.04	-.03
Conscientiousness (T1)	3.44	0.63	1-5	.06	-.04	-.13**
Openness (T1)	3.81	0.55	1-5	.02	-.01	-.07*
Independent self-construal (T1)	5.76	0.71	1-7	.01	-.05	.02
Dependent self-construal (T1)	5.30	0.83	1-7	.10**	-.08**	-.12**
Trust in institutions (T1)	2.64	0.47	1-4	.08**	-.02	-.09**
Prosocial behavior (T1)	0.49	0.50	0-1	.59**	-.02	-.02
Stockpiling (T1)	1.79	0.92	1-5	.03	.47**	-.02
Transgressions against physical distancing regulations (T1)	1.42	0.47	1-5	-.08**	-.03	.59**
Descriptive norms regarding prosocial behavior (T1)	3.12	1.29	1-7	.29**	.03	-.08**
Descriptive norms regarding stockpiling (T1)	3.55	1.91	1-7	-.01	.34**	.04
Descriptive norms regarding transgressions against physical distancing (T1)	2.35	1.15	1-7	-.12**	.00	.30**
Subjective threat (T1)	3.36	1.00	1-5	.07*	.14**	-.11**
Prosocial behavior (T2)	0.52	0.50	0-1	-	.08**	-.08**
Stockpiling (T2)	1.40	0.68	1-5	.08**	-	-.01
Transgressions against physical distancing regulations (T2)	1.57	0.53	1-5	-.08**	-.01	-
Descriptive norms regarding prosocial behavior (T2)	2.76	1.19	1-7	.34**	.06*	-.06*
Descriptive norms regarding stockpiling (T2)	2.48	1.56	1-7	.01	.51**	.03
Descriptive norms regarding transgressions against physical distancing (T2)	2.54	1.13	1-7	-.07*	.06*	.49**
Subjective threat (T2)	3.04	1.01	1-5	.07*	.18**	-.11**

Note. * $p < .05$; ** $p < .01$; r_{pb_T2} = associations with prosocial behavior at T2; r_{buy_T2} = associations with stockpiling at T2; r_{tpd_T2} = associations with transgressions against physical distancing regulations at T2
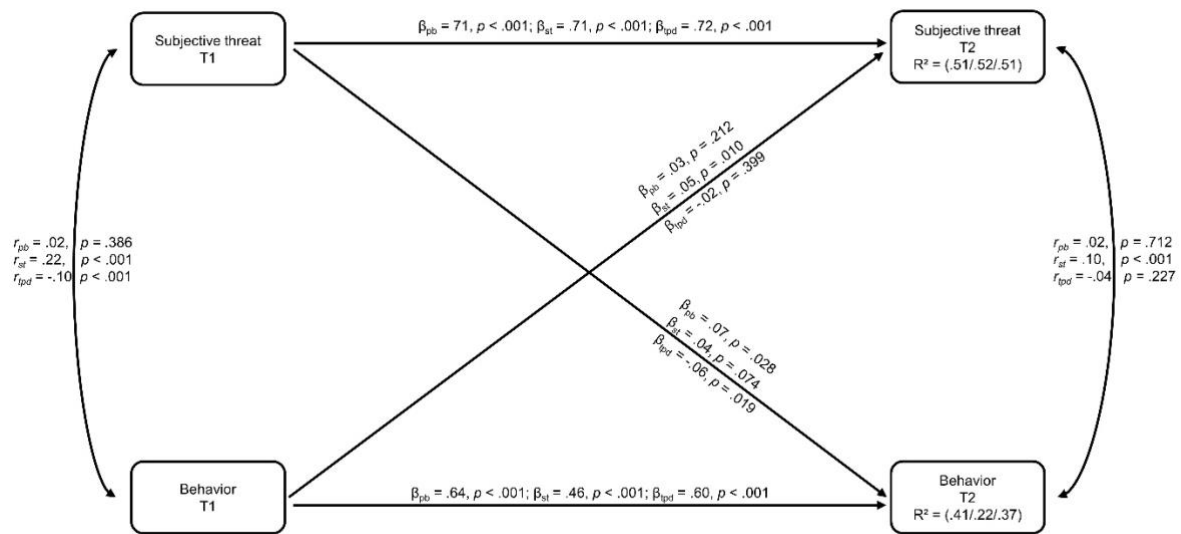
Table 2

Direct effects derived from the conducted structural equation model.

Scale	Criterion = Prosocial behavior (T2)	Criterion = Stockpiling (T2)	Criterion = Transgressions against physical distancing regulations (T2)
Honesty-Humility (T1)	β = .02, *p* = .592	**β = -.08, *p* = .002**	β = -.02, *p* = .366
Emotionality (T1)	β = -.06, *p* = .102	β = .01, *p* = .748	**β = .06, *p* = .045**
Extraversion (T1)	β = -.03, *p* = .416	β = .02, *p* = .518	β = .04, *p* = .125
Agreeableness (T1)	β = -.03, *p* = .439	β = .02, *p* = .556	β = .01, *p* = .784
Conscientiousness (T1)	β = .04, *p* = .284	β = -.03, *p* = .256	**β = -.07, *p* = .003**
Openness (T1)	β = -.02, *p* = .527	β = -.01, *p* = .578	β = -.03, *p* = .216
Prosocial behavior (T1)	**β = .57, *p* < .001**	β = -.04, *p* = .230	β = .05, *p* = .112
Stockpiling (T1)	β = .03, *p* = .465	**β = .38, *p* < .001**	β = .01, *p* = .781
Transgressions against physical distancing regulations (T1)	β = .01, *p* = .880	β = -.01, *p* = .775	**β = .56, *p* < .001**
Descriptive norms regarding prosocial behavior (T1)	**β = .16, *p* < .001**	β = .02, *p* = .577	β = -.05, *p* = .084
Descriptive norms regarding stockpiling (T1)	β = -.03, *p* = .421	**β = .13, *p* < .001**	β = .01, *p* = .643
Descriptive norms regarding transgressions against physical distancing regulations (T1)	**β = -.12, *p* = .003**	β = -.04, *p* = .193	**β = .06, *p* = .006**
Subjective threat (T1)	**β = .08, *p* = .027**	β = .04, *p* = .176	**β = -.07, *p* = .003**
R²	***R² = .45, p < .001***	***R² = .24, p < .001***	***R² = .38, p < .001***

Note. Bold numbers indicate statistically significant coefficients at *p* < .05.

Figure 1

Cross-lagged panel model regarding descriptive norms and behavior
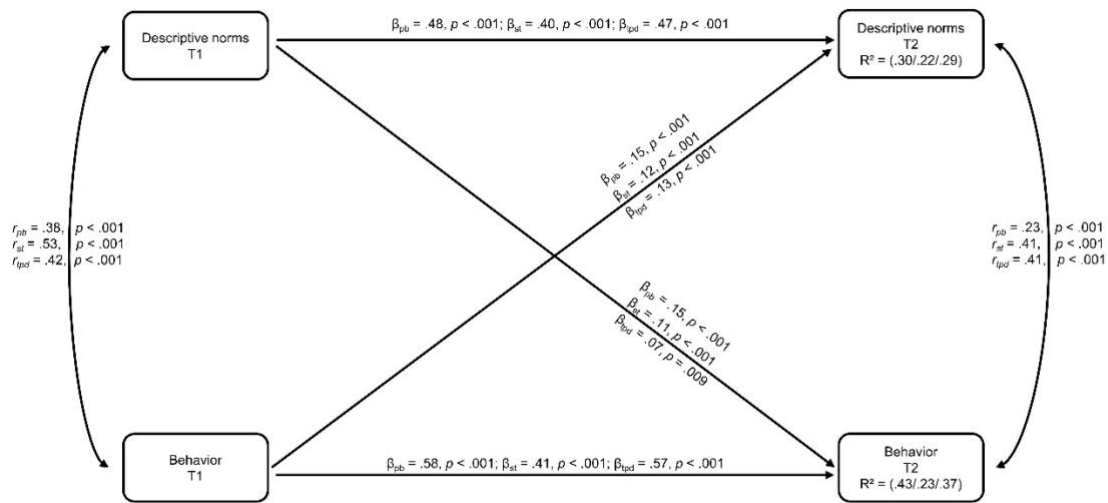
Notes. The first coefficients indicate path coefficients derived from the model on prosocial behavior

(*pb*), the second coefficients refer to the model on stockpiling (*st*) and the third coefficients are

founded in the cross-lagged panel model on transgressions against physical distancing regulations

(*tpd*). Each model only included the descriptive norm that were meant to be tied to the respective

behavior (e.g., norms on prosocial behavior as predictors for own prosocial behavior).

Figure 2

Cross-lagged panel model regarding subjective threat and behavior

Notes. The first coefficients indicate path coefficients derived from the model on prosocial behavior

(*pb*), the second coefficients refer to the model on stockpiling (*st*) and the third coefficients are

founded in the cross-lagged panel model on transgressions against physical distancing regulations

(*tpd*)