We distance most when we think our social circle does

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Abstract

Why do we adopt new rules, such as social distancing? While decades of psychology research stresses the importance of social influence on individual behaviour, many COVID-19 campaigns focused on convincing individuals that distancing is the right thing to do. In a global dataset (114 countries, n=6674), we investigated how social influences predict people's adherence to distancing rules during the pandemic. Analyses showed that people practised distancing more when they thought their close social circle did so; this social influence mattered more than people thinking distancing was the right thing. People's adherence also aligned with their fellow citizens', but only if they deeply bonded with their country. Personal vulnerability to the disease predicted distancing more for people with larger social circles. Empathy, collective efficacy and collectivism also significantly predicted distancing. During crises, policymakers can achieve behavioural change by emphasising shared values and harnessing the social influence of close friends and relatives.

Keywords: COVID-19, social distancing, social closeness, norm change, identity fusion, vulnerability
Introduction

Is social distancing for COVID-19 safer with 6 or 10 feet apart? Should people with symptoms self-isolate for 7 or 14 days? Defining rules to protect people during the COVID-19 pandemic has proven hugely challenging; ensuring adherence to these rules even more so. Campaigns to promote distancing measures target misinformation and individual biases, while trying to persuade individuals that the threat is serious, and distancing the right thing to do. Thinking that individuals change behaviour only because of personal motives or principles, goes against decades of work in social and human sciences, which show that people apply new rules because they realise others apply them. Beyond a simple “monkey see, monkey do” mechanism, humans are social cooperators who construe norm changes as a collective problem and align more closely with those with whom they have closer bonds. Yet, given the severity of the pandemic threat, the question is worth asking: are we paying more attention to self-preservation and judgement or do others’ behaviours influence ours when so much is at stake for all of us?

In this study, we used a large dataset (6674 participants from a total of 114 countries) to investigate the predictors of people’s adherence to distancing and measured the impact of social influence at three different scales: one’s close social circle, one’s fellow citizens, and the entire world. In principle, all three scales could benefit from distancing, and influence people’s own adherence behaviour. We posit, however, that social closeness of the scales will crucially determine their impact on people’s adherence to distancing.

This study is unique in its consideration of a combination of individual and social factors that influence distancing behaviour. Existing empirical research on COVID-19 predominantly investigates individuals’ coping mechanisms and the pandemic’s mental health consequences. The few existing studies on what drives adherence to distancing rules have been limited either due to focussing on single factors and personal reasons, such as the fear of contracting the disease, and/or due to their relatively narrow geographical and cultural scope. Yet, impactful opinion pieces from diverse disciplines have consistently called for researchers and policymakers to consider the complex social influences from both our close social circles and more broadly from others in our communities. So far, empirical support for this proposal was lacking.

Addressing this gap, we examined adherence to distancing rules during the COVID-19 pandemic by comparing people’s own adherence and approval — whether they thought distancing was the right thing to do — to how much they believed others around them adhered and approved. Specifically, we assessed whether people adhered to distancing rules more because they felt personally vulnerable or thought this was the right thing to do, or because they considered that others were also doing it or considered it right. We also assessed how closeness, social orientation and number of social connections weighted to predict distancing.

As an exceptionally social species, humans heavily depend on their close social circle for survival, support and guidance. Examinations of large, cross-cultural databases reveal the presence of a distinct pattern that reflects the frequency and bondedness of human social interactions. On average, people tend to have about five others in their close social circle whom they turn to for advice or comfort during major life challenges. Our survey captures the distinctive influence of this social circle on individual behaviour. Extending beyond this close social circle are larger circles of decreasing closeness, such as colleagues, neighbours, or fellow-citizens. These
relational bonds can be projected on to larger groups, for instance to one’s country. This is the
case with identity fusion, a particularly potent form of social bonding that can occur among virtual
strangers\textsuperscript{21,22}. Such fusion of personal and group identities is often observed in times of hardship;
sharing in particularly harrowing ordeals with other group members helps to glue people
together\textsuperscript{23–25}. Thus, whilst experiencing the COVID-19 pandemic, existing social connections with
one’s close circle, country or the entire world may have salient effects on individuals’ thoughts
and behaviours. In our survey, we aimed to probe how our connections with others at these
different social scales may guide people’s adherence to the distancing rules.

Lab and field research suggest that, when it comes to enacting behavioural change, actions speak
louder than words: we are distinctly influenced by others if we think they also follow the rule, rather
than simply approve of it\textsuperscript{26,27}). Even when individuals see a personal interest in changing their
behaviour (e.g., adhere to distancing because of the material threat of contracting the disease),
these personal motives are insufficient. Behaviour change also rests on people expecting that
others will approve, and more importantly, adhere to the new norm. The social-cognitive
mechanisms explaining how others’ actions influence our own conduct are robustly rooted in early
development, and indeed our evolutionary history. People learn about their group’s social norms
and conventions through observing and imitating others’ actions (for reviews\textsuperscript{28–30}). Imitation and
social bonds are intricately linked: closeness breeds imitation, and imitation breeds closeness (for
reviews\textsuperscript{1,31}). Therefore, in the COVID-19 pandemic context, people may be more likely to adhere
to the distancing rules if they think that their close circle or community also abides by them\textsuperscript{12}.

During the pandemic, our tendency to adopt new norms conditioned on others could nevertheless
be tempered due to the importance of protecting oneself against the disease. Beyond uneven
vulnerabilities across age groups and patients, reports from many countries have shown elevated
levels of fear and anxiety in the months immediately following the COVID-19 outbreak \textsuperscript{32,33}.
Notably, however, fear of COVID-19 stems not only from perceiving one’s self as vulnerable to
the disease, but equally, from perceiving loved ones as vulnerable\textsuperscript{34}. Therefore, perceived
vulnerability of others may encourage adherence to distancing in addition to perceived self-
vulnerability to the disease. Fear can trigger social contact seeking\textsuperscript{2} and adaptive responses to
threatening situations\textsuperscript{9,35,36}. When fear is coupled with social support\textsuperscript{37–39}, belief in collective
responsibility and efficacy\textsuperscript{40,41}, people are more likely to act to resolve the issue at hand. Thus, in
a fearful context such as the COVID-19 pandemic, those who feel vulnerable to the disease may
be more likely to adhere to distancing rules if they have stronger social support.

Building upon this research, we argue that effective solutions for the current pandemic, and future
crises, should leverage humans’ hyper-sociality\textsuperscript{37}. According to our framework (see Figure 1),
social influence, especially from our closest circle, outweighs people’s individual motives to
adhere to distancing. We tested five specific preregistered hypotheses. \textbf{Hypothesis 1:} Others’
perceived adherence to distancing would be a stronger predictor of self-adherence than others’
perceived approval of the distancing rules. \textbf{Hypothesis 2:} Self-adherence would depend more on
perceived adherence of one’s close social circle than the outer social scales of country or world,
and one’s own approval of the distancing rules. \textbf{Hypothesis 3:} The influence of fellow citizens’
adherence behaviour would depend on whether people were strongly fused with their country.
\textbf{Hypothesis 4:} Perceived vulnerability of close ones would predict self-adherence in addition to
perceived self-vulnerability to the disease. **Hypothesis 5:** The effects of vulnerability of self and others on self-adherence would be stronger for people with a larger social circle.

![Diagram](image)

**Figure 1.** Proposed theoretical framework explaining how the effects of perceived vulnerability to the disease, adherence to distancing and approval of distancing (top row) operate on three social scales (i.e., close circle, country and world) to predict self-adherence. Adherence was measured by asking participants how much they followed the distancing advice in their country. For details on how each measure was obtained, see Methods Table 1.

**Results**

We conducted an online survey in 12 languages, with 6674 respondents from 114 countries (see Methods for participant characteristics). In the survey, we asked participants about (i) the size of their active close social circle, (ii) their degree of fusion with their country, (ii) how much they adhered to distancing measures and how much they approved of them (iii) how much they thought that others (i.e., close social circle, fellow citizens in the country, humankind) adhered to and approved of distancing measures, and (iv) how vulnerable they perceived themselves and close others to contracting the disease. In addition, we collected measures of people’s general social orientations by assessing how much they believe that collective responsibility and collective efficacy were necessary to fight the pandemic, and how collectivistic and empathetic they were. For details on how each variable was measured, see Methods, Table 2.

Self-adherence to distancing rules was the main outcome variable in our analyses. It was contextually sensitive and measured by asking participants to indicate on a slider scale how much they were adhering to the general advice of keeping physical distance from others, depending on how the advice was *currently applied where they lived*. Options ranged from “1= have not been following the advice at all” through “50= have been following the advice exactly” to “100= have been doing more than what is advised”. To note, this item was strongly correlated ($r(5473)=-.21$, $p<.0001$) with another item measuring distancing behaviour, in which participants rated how much they have been going out in the past week on a scale ranging from “1= much less than usual” through “50= about the same as usual” to “100= much more than usual”.

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All analyses included the covariates of participant age, gender, education level (four levels), time spent outside of home (three levels: mostly, sometimes, rarely) and country’s stringency of lockdown measures in the participant’s country of residence (using OxCGRT index\textsuperscript{42}). When fitting the regression models, all variables were scaled at SD=1 to enable better comparisons of the $\beta$ coefficients.

Our hypotheses and our method were part of a pre-registration made prior to data collection (see: https://osf.io/hyiq9/).

1. Social norm change: Personal approval vs others’ approval and adherence

To examine Hypotheses 1–3, we assessed whether self-adherence to distancing could be predicted by others’ approval and adherence beyond people’s own approval of the distancing rules. Depending on how the ‘other’ was being defined, we had three sets of variables examining others’ approval of and adherence to distancing: close social circle (recent contacts whom participants said they would turn to in hardship), country (fellow citizens) and world (humankind). Participants who indicated not having contacted anyone in their close social circle in the past week (n= 1199) had missing data for the approval and adherence variables of close circle and were therefore excluded from these analyses. For more details about the measures, please see Methods, Table 2.

We conducted a multiple regression model (95% CIs of 5000 bootstrap simulations reported) with predictors approval\textsubscript{self}, adherence\textsubscript{close circle}, adherence\textsubscript{country} (and its interaction with fusion to country) and adherence\textsubscript{world}. This model explained 27.96% of the variance ($F(18,5293)= 115.5, p<.0001$), with approval\textsubscript{self} ($\beta= 0.26 [0.243, 0.303], p< .0001$), adherence\textsubscript{close circle} ($\beta= 0.43 [0.365, 0.424], p< .0001$), adherence\textsubscript{country} ($\beta= 0.06 [-0.041, 0.021], p=.04$) and adherence\textsubscript{world} ($\beta= 0.05 [0.023, 0.073], p=.002$) significantly predicting self-adherence. As predicted, the interaction of adherence\textsubscript{country} and fusion was significant ($\beta=-0.09, p=.009$) such that self-adherence was linked to the perceived adherence of fellow citizens only for participants who were fused with their country (fused: $\beta= 0.07, p=.02$; not fused: $\beta=-0.02, p=.15$; see Figure 1B). These findings support our hypothesis that the perceived adherence of one’s close circle had the strongest impact, followed by approval\textsubscript{self}, with the adherence of fellow citizens and humankind having similar, and weaker, effects.

We also examined how one’s own and others’ approval of the rules predicted self-adherence to distancing. A multiple regression model with approval\textsubscript{self}, approval\textsubscript{close circle}, approval\textsubscript{country} (and its interaction with fusion to country) and approval\textsubscript{world} explained 12.90% of the variance ($F(18,5293)= 44.68, p<.0001$), with approval\textsubscript{self} ($\beta= 0.33 [0.291, 0.364], p< .0001$), approval\textsubscript{close circle} ($\beta= 0.05 [0.014, 0.084], p=.002$) and approval\textsubscript{world} ($\beta= -0.03 [-0.069, -0.005], p=.03$) significantly predicting self-adherence. Contrary to our prediction, the interaction of approval\textsubscript{country} and fusion was not significant ($p= .14$). These findings show that, when the impact of approval of the rules is considered on adherence, personal approval was the strongest predictor. In line with our hypothesis, perceived approval of one’s close circle had a stronger impact on self-adherence than perceived approval of fellow citizens or the humankind.

We used Vuong’s non-nested likelihood ratio test to compare the two models: (i) including others’ perceived adherence as predictors (‘social adherence’ model) and (ii) including others’ perceived
We found that in line with our hypothesis, the 'social adherence' model was a better fit than the 'social approval' model ($z = 13.31, p < .0001$). This suggests that our perceptions about what others do influences what we do more strongly than our perceptions about what others think should be done.

Altogether, these findings support our hypotheses by showing that others’ perceived adherence behaviour was a better predictor of self-adherence than others’ perceived approval of distancing. Moreover, among different social scales (i.e., close social circle, country, world), the perceived adherence and approval of one’s close circle were the most important determinants of self-adherence, with the close circle’s adherence being even more important than one’s own approval of the action (Figure 2A). Finally, the adherence of fellow citizens impacted self-adherence only for people fused with their country (Figure 2B).

**Figure 2.** Self-oriented vs other-oriented predictors of distancing. n.s. $p > .05$, *$p < .05$, **$p < .001$, ***$p < .0001$.

A. How much one’s close circle adheres to distancing is a better predictor of self-adherence than one’s own approval of distancing, which is a better predictor than the approval of the close circle.

B. How much fellow citizens in one’s country adhere to distancing predicts self-adherence only when one feels fused with their country.
2. Perceived vulnerability of self and close others

Perception of vulnerability was assessed with participant ratings of how vulnerable they considered themselves (vulnerability_self) and others close to them (vulnerability_others) to contracting the disease on a continuous slider scale. We conducted two multiple linear regression models, one including only vulnerability_self as its predictor and the second including both vulnerability_self and vulnerability_others as its predictors, in addition to the variables adjusted for. Both the model with only vulnerability_self ($F(13, 6590)= 10.80, p< .0001, R^2 = .019$) and the model including both vulnerability variables ($F(14, 6589)= 11.41, p< .0001, R^2 = .022$) were significantly different from the intercept-only models. A comparison of the two models revealed that the model including both vulnerability_self and vulnerability_others was a significantly better fit ($F(1, 6589)= 19.05, p< .00001$) than the model that solely included vulnerability_self as its predictor. This finding supports our hypothesis that perceived vulnerability of close others would predict adherence in addition to the effect of perceived self-vulnerability.

To examine the hypothesis that perceived vulnerability of self and others would be more strongly associated with self-adherence to distancing for people with a larger close social circle, we conducted two multiple regression models. The first model including vulnerability_self and its interaction with close circle size as the predictor variable explained 2.2% of the variance ($F(15,6588)= 11.05, p< .0001$), with the interaction effect being significant ($\beta = 0.06, p< .0001$). Perceived self-vulnerability was not linked to self-adherence for people with a close circle size of 0-1 ($\beta = 0.004, p = .87$), while it positively predicted self-adherence for people with a close circle size of 2-4 ($\beta = .084, p< .0001$) and 5 or more people ($\beta = 182, p< .0001$). This observed trend of increased link between perceived vulnerability of others and self-adherence was statistically significant (close circle size 0-1 vs 2-4: $\beta = 0.08, p = .01$; close circle size 0-1 vs 5+: $\beta = 0.18, p< .0001$; see Figure 3A). These findings indicate an important influence of the close social bonds on what may seem as a purely self-oriented motive: while perceived self-vulnerability was a strong motivator of adherence, it was particularly so for people with a larger close social circle.

The second model with vulnerability_others and its interaction with close circle size as the predictor variable explained 1.6% of the variance ($F(15,6588)= 8.09, p< .0001$). The interaction between vulnerability_others and close circle size was significant ($\beta = 0.03, p = .02$). Similarly, while perceived vulnerability of others was not linked to self-adherence for people with a close circle size of 0-1 ($\beta = 0.008, p = .78$), it positively predicted self-adherence for people with a close circle size of 2-4 ($\beta = 0.086, p< .0001$) and 5 or more people ($\beta = 0.108, p< .0001$). This observed trend of increased link between perceived vulnerability of others and self-adherence was statistically significant (close circle size 0-1 vs 2-4: $\beta = 0.08, p = .02$; close circle size 0-1 vs 5+: $\beta = 0.09, p = .008$; see Figure 3B).
3. Comparison of all contributors of self-adherence to distancing

To examine how all of the above-mentioned variables (i.e., perceived adherence and approval of others, own approval and vulnerability of self and others to the disease) contribute to predict self-adherence, we conducted a multiple linear regression model with all variables of interest included as predictors and participant age, gender, education level, time spent at home and stringency of lockdown measures in country entered as covariates. The adherence and approval variables within each social scale (i.e., close social circle, country and world) were strongly correlated with each other (close circle: $r(5363)$=.39; country: $r(5363)$=.45; world: $r(5363)$=.36, all $p$s $<$ .0001). Since our previous findings had shown others’ adherence to be a better fit for self-adherence than others’ approval, in the current regression model, adherence$\_self$ was regressed on: approval$\_self$, adherence$\_close$ circle, adherence$\_country$ (and its interaction with fusion to country), adherence$\_world$, vulnerability$\_self$ and vulnerability$\_others$ (the latter two in interaction with close circle size). This model explained 29% of the variance ($F(23, 5288)$= 93.40, $p$ $<$ .0001), with adherence$\_self$ ($\beta$= 0.25, $p$ $<$ .0001), adherence$\_close$ circle ($\beta$= 0.42, $p$ $<$ .0001), adherence$\_country$ ($\beta$= 0.06, $p$ $=$ .03) and adherence$\_world$ ($\beta$= 0.05, $p$= .002) being significant predictors. As before, the interaction effect between adherence$\_country$ and fusion ($\beta$= -0.09, $p$= .006), and between vulnerability$\_self$ and close circle size ($\beta$= 0.008, $p$= .01) were significant. The direct effects of vulnerability$\_self$ and vulnerability$\_others$ or the interaction between vulnerability$\_others$ and close circle size were no longer significant predictors of self-adherence (both $p$s $>$ .05). These results show that the influences of others’ adherence and the interaction of close circle size and self-vulnerability were robust predictors of self-adherence, which remained significant even when all variables were examined together.

Figure 3. Perceived self-vulnerability of (A) self and (B) others to the disease motivates self-adherence to distancing for people with a larger social support circle. n.s. $p$$>$0.05, **$p$$<$ .0001
As an exploratory analysis, we also assessed how four additional variables, all of which tapped into one’s way of relating to the social environment, predicted distancing. These additional variables were (i) belief that it was a collective responsibility to deal with the pandemic, (ii) belief in the collective efficacy of the actions taken against the pandemic, (iii) vertical collectivism, which defines the participants’ willingness to sacrifice themselves for their group, and (iv) empathy quotient, which defines participants’ ability to understand and align with others’ emotional states (using a shortened version of the empathy quotient scale). A new regression model with these additional exploratory variables explained 30% of the variance (F(27, 5281) = 85.31, p < .0001; see Figure 4), with all of the significant and insignificant predictors from the previous model displaying the same pattern. In addition, collective efficacy (β = 0.18, p < .0001), vertical collectivism (β = 0.42, p = .03) and empathy (β = 0.22, p = .005) were significant predictors of self-adherence, while collective responsibility was not (p > .05).

Bootstrapping simulations of the exploratory model revealed that the top 3 predictors of self-adherence to distancing were: adherence to close circle [0.291, 0.364], followed by approval to self [0.014, 0.084] and collective efficacy [-0.084, -0.020]. This exploratory analysis further confirms our hypotheses by showing the important role of close social circle’s adherence behaviour and how additional aspects of social alignment importantly predict self-adherence.

Figure 4. Multilinear regression results with all variables of interest included as predictors of self-adherence. Dotted borders indicate variables that were entered as an interaction term in the model. Black arrows indicate a statistically significant direct effect, stripy arrows indicate a significant interaction effect, white arrows indicate insignificant effects, and the width of the arrow indicates the degree of significance.

Interaction effects are reported separately for each level of the moderator variable: A) people fused, and B) people not fused with their country. People with a close social circle size of C) 0-1, D) 2-4, E) 5 or more. n.s.: p > .05, * p < .05, ** p < .001, ***p < .0001.
Discussion

The COVID-19 pandemic necessitates rapid behavioural change. One central strategy to reduce the spread of the virus is distancing behaviour (i.e., avoiding close physical proximity in social interactions). In this paper, we examined how social influences at different scales of closeness (i.e., by others in one’s close social circle, country and world) impacted people’s adherence to distancing.

Congruent with our pre-registered hypotheses, our results demonstrated that adherence to distancing heavily depended on the perceived adherence rather than the perceived approval of others. In particular, perceived adherence of one’s close social circle had the strongest effect, exceeding the effect that people’s own approval of the distancing norms had. Fellow citizens’ perceived adherence only mattered for people closely bonded with their country. Moreover, perceived vulnerability of loved ones predicted adherence in addition to perceived self-vulnerability to the disease, and self-vulnerability impacted adherence more strongly for people with larger close social circles. Extending the growing body of literature on the consequences of social distancing, this study uniquely shows the role of social influence in driving people’s acceptance of these new rules.

Our results add to the extensive literature on social group formation, imitation and bonding by showing how social influences from one’s close circle guide behavioural change during the pandemic. We know that via a well-established mechanism of selective social learning from - and imitation of - bonded others, in-group versus out-group distinctions (i.e., us versus them) are formed and entrenched (for reviews1,31,45). People tend to trust, agree, favour, help, share and identify more with in-group members46–48 who make up their close social circle. A recent study has shown that people reacted to violators of pandemic-measures differently depending on whether the violator was an in-group or an out-group member49. Thus, in a rapidly-changing and threatening situation such as the pandemic, people may have an increased need to self-identify and turn more towards their closely bonded inner groups for reference and guidance – whether that be their close social circles of family and friends or fellow citizens50,51.

Importantly, our study focussed on people’s perceptions of what others did and thought about the distancing rules, rather than measuring others’ objective behaviour. Thus, we capture the role of social expectations in norm change, demonstrated in numerous controlled and field experiments27. Expecting that others follow the new rule is crucial, if not necessary, to encourage people to adhere to it. Our data provide evidence for policymakers that widespread adherence to pandemic rules can be achieved by highlighting that others in the community are complying to the rules. This could be done by encouraging people to communicate about their good behaviour more. Notably, this approach is different from the currently applied methods of persuading people that distancing is individually or globally the right thing to do.

Further explaining the mechanisms of social influence, our study revealed that others’ perceived adherence played a greater role than their perceived approval of the distancing rules. In other words, actions spoke louder than mere approval, even of one’s own. Exploratory analyses showed that beliefs in collective efficacy, collectivism and empathy strongly predicted adherence. Previous research with smaller samples has shown how increased empathy and collectivism can enhance self-sacrificial behaviour for the benefit of society, including the intention to engage in
social distancing. Our study extends these previous findings by demonstrating the strength of
the influences that collective efficacy beliefs, empathy and collectivism have on adherence to
distancing over more selfish motives such as self-vulnerability to the disease.

The impact of close social bonds was also apparent in how people’s perceptions of vulnerability
to the disease affected their adherence to distancing. Perceived vulnerability of both self and
close others was more strongly associated with adherence to distancing for people with a close
social circle of at least 2 people. It is not surprising that those with a larger social circle may have
an elevated sense of threat, and therefore adhere to distancing more in an attempt to protect
themselves and loved ones whom they perceive as vulnerable. However, the fact that even the
seemingly most selfish factor we assessed (i.e., perceived vulnerability of self) matters more in
the presence of a larger social circle warrants explanation. The literature on health and self-care
behaviour offers important insights by showing how feelings socially supported can motivate
chronic patients to make healthy lifestyle and behavioural changes. Social support in the
face of a threatening, fear-invoking situation may facilitate an increased belief in one’s ability to
cope with a problem, which is known to promote behavioural change (for a meta-analysis).
In a similar manner, our participants with larger social circles may have felt more supported, and
indeed more responsible, for looking after themselves, eventually transforming their negative
feelings about vulnerability to the disease into problem-solving and adherence to distancing rules.

These novel findings have several key implications for policymakers. Firstly, when rapid change
is needed, creating infrastructures that enable and encourage as many people as possible to
practice the new rule seems more efficient than trying to convince people that the new rule is the
right thing to do morally or legally. Making sure that these good practices change people’s
perception of adherence plays a crucial role: Upon seeing or knowing that others follow new rules,
everyone is more likely to start adopting the new rules even if they have not yet fully internalised
its value, which can be a lengthier process. Secondly, it should be acknowledged that following
what others in one’s close circle do could also lead to a failure to adhere to the new norms, if the
close social circle displays poor rule following. Therefore, ensuring that a sense of community
and shared fate is created at the large-scale (i.e., with fellow citizens in the country) as well as at
the small-scale (i.e., within the close social circle of family, friends) is essential. Finally, to promote
adherence to pandemic-related measures, public messages should emphasise empathy,
collectivistic values (e.g., self-sacrifice for the benefit of the community) and the efficacy of actions
taken collectively.

Responding to the rapidly changing pandemic context, the current paper identified a major driver
of people’s adherence behaviour in a global sample. Future research can investigate potential
cross-cultural or socio-economic differences that may play a role in people’s responses to the
pandemic. A limitation of this study, one shared with most existing empirical studies on COVID-
19, is the difficulty of parsing out causal relationships due to collecting self-report measures and
at a single time-point, with no pre-pandemic baseline measures for comparison. For instance,
people’s responses about their close social circle’s adherence may be reflecting how well they
themselves have been adhering to distancing. The results should be evaluated with such inherent
drawbacks in mind. Although a baseline or control condition was not possible to have, we based
our conclusions on robust comparisons between influences from different social scales (i.e., close
circle, country, world). Moreover, acknowledging the large variety in national responses to the
pandemic, we controlled for the stringency of the lockdown measures in the participants’ country of current residence. Using our open-access dataset and the datasets of many other studies collected during the pandemic, future research will be able to provide more specific insights into people’s responses to the pandemic, including variance in the social influence.

Using a global sample, this paper examined how social influence enables rapid behavioural change (i.e., adherence to distancing) during the pandemic. Our findings demonstrate that beyond convincing individuals about the threat of the disease or the necessity of adherence to the new rules, the influences of close social circles need to be considered. Campaign messages should endorse a sense of community and togetherness by emphasising empathy, collective values and widespread adherence by others within the community. For effective policies during the COVID-19 pandemic and future crises that require collective behavioural response, our message is: Even when the challenge is to practise social distancing, social closeness is the solution.

Methods

Ethics
The study was approved by the ethics committee of the School of Psychology, University of Nottingham. All relevant ethical regulations were followed.

Participants
We recruited 6674 participants from 114 countries. Due to having missing data on some of our variables (see below), the models reported in Results section 1 had 5312 participants, and the models reported in Results section 2 had 6604 participants. A full breakdown of the demographics of both datasets are provided in the Supplementary Information (SI) Table S1.

On the survey landing page, participants chose which language they wished to take the survey in (options: Arabic, Bangla, German, English, Spanish, French, Hindi, Italian, Persian, Swedish, Turkish, Mandarin). This range of languages was partly driven by researchers’ expertise and backgrounds, and partly aimed at recruiting people from diverse cultural backgrounds.

Sampling strategy. Participants were recruited via announcements on social media, student mailing lists at Nottingham and Ludwig Maximilian Universities, the participant pool of RISC (France), press releases by the Universities of Nottingham and Oxford, and blog posts published in the UK, Germany and Turkey. To obtain as widely and globally representative a sample as possible, we made each language available for a total of 5 weeks, with the first language (English) becoming online on 9th April 2020 and the last one (Hindi) on 29th April 2020. Although no sample size cut-off was determined, we had a stopping rule such that only participants within the first 5 weeks of a language becoming available were included in the study.

Procedure
A demo version of the entire survey (for T1) is available for viewing at https://distancing-covid19-survey.herokuapp.com/demo. Full details about the survey items can be found in SI Methods; below, we explain how the measures used in this study were obtained (see Table 1). Not all measures in the survey are analysed for this study as the focus of this study is to examine specifically the social influences on people’s adherence behaviour. The rest of the measures used will be analysed for future studies and will be available open-access for other researchers to use.
Participants were informed about the aims of the study, its contents (with a link to World Health Organization information about COVID-19 and mental health, if they desired more information), the voluntary nature of participation, data confidentiality, our aims in processing their data, and their rights. Participants then provided informed consent in line with the Declaration of Helsinki and GDPR, and were assigned an anonymous ID. They then undertook the following tasks in a fixed order, with each block numbered and labelled for ease of reference.

1 (Close social circle) Following Dunbar & Stiller (2007), we obtained the size of participants' close social circle by asking them to enter the first names of people they had voluntarily had a conversation with in the past week, which of these contacts they would turn to for comfort or advice with a major personal problem, the mode of interaction (face-to-face, video chat etc.) and whether these people were in the same household or country as the participants. The names entered were not retained in our dataset and were only used to extract the number of people in each category. Participants could skip these questions if they had had no such interaction. The measure of close social circle used in this study is the number of people that participants indicated they would turn to for advice or comfort.

2 (Social norm change) Participants were first reminded that the general advice for COVID-19 is to keep physical distance from others. Then, they were asked to indicate on slider scales how much they were following this general advice (adherence), and how much they thought it would be wrong not to adhere to the general advice (approval) in the past week. These two questions (adherence and approval) were then repeated for social groups of varying distance: their close social circle (with a reminder of the provided names from block 1), the people in their country, and people around the world. The order of presentation of these social groups was randomised.

3 (Vulnerability) Participants were asked ‘In your opinion, how vulnerable are the following people to the coronavirus disease?’ and were given the categories: ‘Myself’, ‘Someone I care about in my household’ and ‘Someone I care about outside of my household’. These three items were answered on a continuous slider scale, with the extreme ends labelled: “Not vulnerable at all” and “Extremely vulnerable”. Two measures from these questions are used in this study: vulnerability_self and vulnerability_others. Given that in-household vulnerability levels would be strongly correlated with participants’ self-vulnerability levels, we orthogonalised the in-household vulnerability ratings by regressing them on the self-vulnerability ratings and taking the residuals. Then we averaged these scaled residuals with appropriately rescaled outside-household ratings to yield an overall rating of participants’ perception of others’ vulnerability to the disease, which made up the score for the vulnerability_others variable.

4 (Social orientation) Participants answered 4 items (see Table 1) using continuous slider scales to indicate how much they agreed with statements describing the collective responsibility of their country and the collective efficacy of the actions being taken in response to the COVID-19 pandemic.

Participants used Likert-type scales to respond to two previously-established scales: the 8-item Vertical Collectivism sub-scale\textsuperscript{43}, measuring how much people identify themselves in relation to the group, and the 15-item shortened Empathy Quotient\textsuperscript{44}, measuring people’s ability to understand others’ emotions and mental states. All non-English versions of the vertical
collectivism scale and the Bangla version of the EQ scale were translated and back-translated by native speakers proficient in English before use.

**A) CLOSE SOCIAL CIRCLE SIZE**

*Would you turn to these people if you wanted to seek advice or comfort if you had a major personal problem?*

<table>
<thead>
<tr>
<th>Name</th>
<th>I would turn to this person for comfort/advice</th>
<th>I would NOT turn to this person for comfort/advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>John</td>
<td>✔</td>
<td>☐</td>
</tr>
<tr>
<td>Anne</td>
<td>✗</td>
<td>☐</td>
</tr>
<tr>
<td>Jo</td>
<td>☐</td>
<td>✔</td>
</tr>
<tr>
<td>Alice</td>
<td>☐</td>
<td>✔</td>
</tr>
</tbody>
</table>

**B) FUSION WITH COUNTRY**

*Please answer the below questions based on how you think and feel GENERALLY.*

If you feel that answering the following questions may compromise your privacy, please feel free to choose the "prefer not to answer" option.

How close or distant do you feel to the COUNTRY YOU ARE CURRENTLY LIVING IN? Choose one of the 5 options below.

- [ ] Prefer not to answer

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**Figure 5.** Two user interfaces from the online survey.

A. Survey item assessing the size of participants’ close social circle. In a previous step, participants had entered the names of those they had interacted with in the last seven days. On the screen shown here, they classed each name according to whether they would seek advice or comfort from that person or not. The size of participants’ close circle is the number of people whom they would turn to for comfort or advice.

B. Survey item assessing identity fusion with country, following Swann et al. (2009).

5 (Fusion with the country) Participants rated their degree of fusion with their country on the 5-point pictorial scale (Figure 5B) showing two circles representing self and country in gradually increasing degrees of overlap. Participants were ‘fused’ if they selected the total overlap option, and ‘not fused’ if they selected any other choice in line with previous research. Acknowledging the potential concerns that people may have had about indicating negative opinions about their country, we offered our participants the option to opt-out of the fusion question if they wanted.
6 (Demographics) Participants provided their age, gender ("man", "woman", "non-binary", "prefer not to say"), highest completed education ("No schooling completed", "Primary education (age: 5-10)", "Secondary education (age: 11-17)", "University undergraduate degree/professional equivalent", "Postgraduate degree"), current student and employment status, and whether they are studying/working from home ("yes", "sometimes", "no"). Participants were also asked their country of residence at the time of answering, which was used to obtain the stringency of lockdown measures in that country using the OxCGRT database⁴².

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Description/Sample item and scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close social circle size</td>
<td>Number of people the participant would turn to for advice or comfort among the people they indicated having a voluntary contact within the past week.</td>
</tr>
<tr>
<td>Adherence (sub-categories: self, close circle, country, world)</td>
<td>&quot;I have been following this general advice where I live&quot; 100-point scale from 0= &quot;not been following this advice at all&quot; through 50= &quot;Been following the advice exactly&quot; to 100= &quot;Been doing more than what is advised&quot;</td>
</tr>
<tr>
<td>Approval (sub-categories: self, close circle, country, world)</td>
<td>&quot;Most people in my country think that it is wrong not to follow this general advice&quot; 100-point scale from 0= &quot;Not following the advice is completely ok&quot; to 100= &quot;Not following the advice is completely wrong&quot;</td>
</tr>
<tr>
<td>Vulnerability (sub-categories: self, others)</td>
<td>100-point scale from 0= &quot;Not vulnerable at all&quot; through 50= &quot;As vulnerable as an average person&quot; to 100= &quot;Extremely vulnerable&quot;.</td>
</tr>
<tr>
<td>Collective responsibility</td>
<td>&quot;At times like this, it is essential that people work in solidarity to look after each other&quot; 0= &quot;Completely disagree&quot; to 100= &quot;Completely agree&quot;</td>
</tr>
<tr>
<td>Collective efficacy</td>
<td>&quot;I believe my actions are having a positive impact&quot; 0= &quot;Completely disagree&quot; to 100= &quot;Completely agree&quot;</td>
</tr>
<tr>
<td>Fusion to country</td>
<td>1 if self and country completely overlap, 0 otherwise</td>
</tr>
<tr>
<td>Vertical collectivism</td>
<td>&quot;I usually sacrifice my self-interest for the benefit of my group&quot; 1= &quot;Never&quot; to 10= &quot;Always&quot;</td>
</tr>
<tr>
<td>Empathy Quotient</td>
<td>&quot;I tend to get emotionally involved with a friend’s problems&quot; 1= &quot;Strongly disagree&quot; to 4= &quot;Strongly agree&quot;</td>
</tr>
</tbody>
</table>

**Statistical Analysis**

All analyses were conducted using open-source R software version 1.3.959.⁵⁵ Bootstrap simulations were done using the boot package version 1.3-24⁵⁶,⁵⁷ and for the Vuong’s test, nonnest2 package version 0.5-3⁵⁸ was used. The variables were scaled and therefore the reported β coefficients are standardised coefficients.

To control for the stringency of lockdown measures in our participants’ country of residence, we obtained the “stringency” index of that country from the OxCGRT database⁴²; the average
stringency index score of the 15 days preceding the day participants filled out the survey were used.

In total, we received 6674 responses of the survey. Some of our variables had missing data, which resulted in us working on two datasets with different numbers of participants. Namely, we had missing values for the following variables: stringency index (n= 70), fusion with country (n= 213), and close social circle size, which affected the variables adherence, approval (n= 1199). The regression models reported in Results section 1 had the most reduced sample of 5312 people. The regression models reported in Results section 2 did not include fusion with country as a predictor, and hence were conducted on a slightly larger sample of 6604 people. We conducted all analyses using both datasets, and the findings remained unchanged. In the main text, we are thus reporting the results with the largest dataset possible for any given regression model. The same tests conducted with the alternative dataset, as well as full demographic information of both datasets can be found in the SI Table S1 (demographics) and Table S2 (regression model results).
References


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Data and code availability

The raw data and scripts used for the statistical analyses will be made available on our OSF project link upon publication of all pre-registered aims. The OSF repository includes other pre-registered aims not covered in this paper; sister-papers are currently in progress for reporting on those aims. Should other researchers request access to the data before it is made publicly available, please contact the lead author to gain access.
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