Social and behavioral consequences of mask policies during the COVID-19 pandemic

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Mandatory and voluntary mask policies may have yet unknown social and behavioral consequences related to the effectiveness of the measure, stigmatization, and perceived fairness. Serial cross-sectional data (April 14 to May 26, 2020) from nearly 7,000 German participants demonstrate that implementing a mandatory policy increased actual compliance despite moderate acceptance; mask wearing correlated positively with other protective behaviors. A preregistered experiment (n = 925) further indicates that a voluntary policy would likely lead to insufficient compliance, would be perceived as less fair, and could intensify stigmatization. A mandatory policy appears to be an effective, fair, and socially responsible solution to curb transmissions of airborne viruses.

COVID-19 | policy | face masks | pandemic

Since June 2020, World Health Organization has recommended that healthy people wear nonmedical masks to control the spread of COVID-19, for example, in settings where physical distancing cannot be achieved (1). Countries increasingly require masks in closed public spaces such as supermarkets. Evidence has accumulated that strategies targeting the susceptible population can effectively contribute to the containment of the outbreak (2). As even nonmedical masks reduce the spread of droplets and infectious aerosols (3, 4), mask wearing can protect others from contracting the virus (5) even though they do not prevent the mask-wearing person from infection. As high compliance is needed for effectiveness (4), policies that encourage or enforce mask wearing need to be in place. Yet, little is known about the behavioral consequences of voluntary vs. mandatory mask policies and of the social evaluation processes that take place under either policy (6). Therefore, we report data assessed to support the German government and other regulatory bodies to gain insights into public opinion and acceptance of measures and policies during the COVID-19 pandemic (7). The study obtained ethical clearance from the University of Erfurt's Internal Review Board (#20200302/20200501), and all participants provided informed consent prior to the data collection.

Results

Fig. 1 shows data from a weekly cross-sectional survey with n = 6,973 German participants [approximately n = 1,000 per week; online sample, quota–representative for age × gender and federal state in Germany, April 14 to May 26, 2020; for details, see R markdown file (8)] (9). At the onset of the COVID-19 outbreak, mask-wearing behavior was minimal (Fig. 1*A*). It increased steeply when a mandatory policy was enforced. Moreover, contrary to negative expectations (10), individuals wearing masks exhibited other protective behaviors more often (Fig. 1*B*). Given the moderate degree of acceptance (Fig. 1*C*) but apparent effectiveness of a mandatory policy, and the high public awareness of the social implications of mask wearing (Fig. 1*D*), it is necessary to explore the social consequences of mask policies, such as stigmatization [i.e., negative emotional responses, social labeling, or prejudicial attitudes (11)] toward people with and without masks (12), and perceived fairness.

Therefore, we conducted an experiment included in the weekly survey on May 26/27, 2020. A total of n = 925 participants faced a realistic scenario in which they had to imagine being in the fruit department of their local grocery store with one other person. We randomized whether there was a mandatory or voluntary mask policy in place, and whether or not the other person was wearing a face mask. In sum, we found that, independent from the policy, others wearing masks were perceived as more prosocial (13) (Fig. 2*A*); mask wearing was perceived as a social contract, as those who complied with it socially "rewarded" each other but "punished" others who did not wear a mask (12) (Fig. 2*B*). Compliance was lower under a voluntary policy. Only when mask wearing was voluntary did it partially affect stigmatization (others wearing a mask were judged as belonging to the risk group [Fig. 2*C*], but not as sick [Fig. 2*D*]). The voluntary mask policy was judged as less fair (14), especially by risk groups (Fig. 2*E*).

The experiment was preregistered (https://aspredicted.org/sp9un.pdf); we report tests of all preregistered hypotheses and flag additional analyses as exploratory. The reported test statistics are accompanied by effect sizes [see R markdown file (8)]; $P < 0.05$ is considered statistically significant. In detail, the results demonstrate that individuals with greater prosocial concerns (13) reported wearing masks in their everyday lives more frequently, $r_s = 0.15$, $P < 0.001$. In the hypothetical scenario, however, prosociality did not predict future mask wearing (odds ratio [OR] = 1.01, SE = 0.01 P = 0.343) under either policy (interaction policy by prosociality: OR = 1.03, SE = 0.02, P = 0.074). However, participants perceived others with face masks as more prosocial than those without, irrespective of mask policy [Fig. 2*A*; main effect others' mask wearing behavior: $F(1, 921) = 98.66$, $P < 0.001$, $\eta_p^2 = 0.097$; interaction policy by others' mask-wearing behavior: $F < 1$, not significant]. Relatedly, participants who reported wearing a mask frequently in their everyday life perceived greater warmth toward others who also wear a mask than toward others who do not (Fig. 2*B*; interaction participant's mask-wearing behavior by others' mask-wearing behavior: $\beta = 0.25$, $P < 0.001$). This indicates that people who adhere to the social contract of wearing a mask tend to socially "reward" each other but "punish" others who do not wear a mask, irrespective of the mask policy in place. As more people reported being unwilling to wear a mask

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The authors declare no competing interest.

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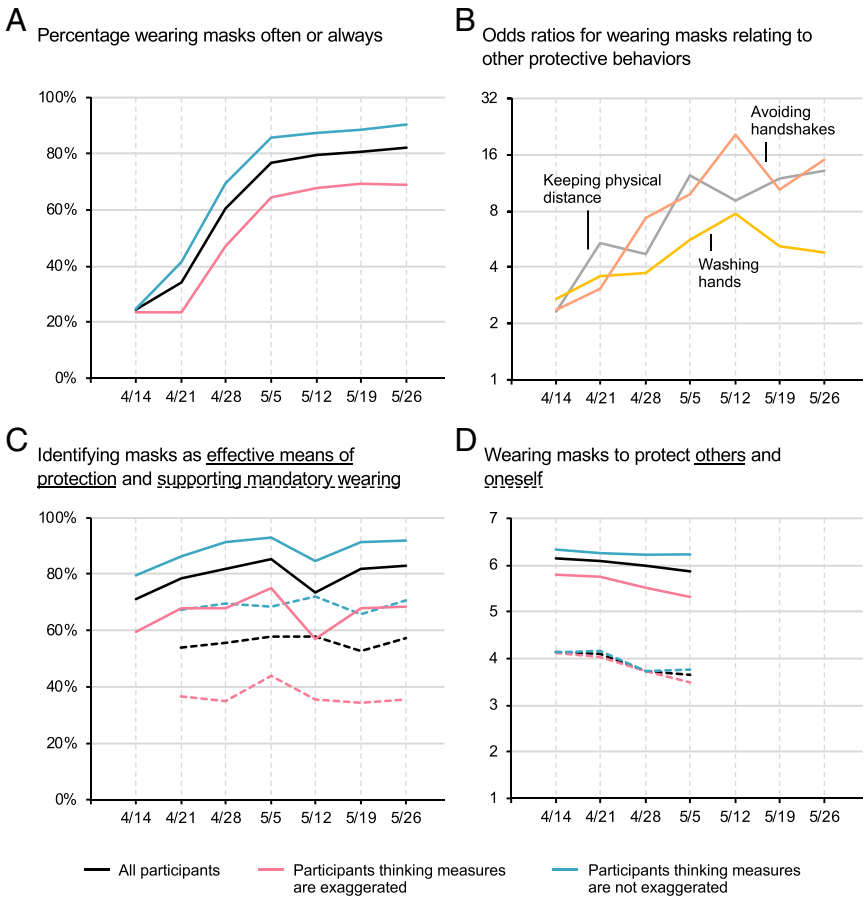

Fig. 1. Behavior, knowledge and attitudes related to wearing masks in Germany during the COVID-19 pandemic. Mask wearing became mandatory in public transport and shops starting on April 27, 2020 and increased steeply (*A*). For people wearing masks, the probability of hand washing was between 2.71 and 7.73 times greater than for people not wearing masks; for handshakes, the probability was between 2.37 and 20.50 times greater; and, for physical distancing, odds were between 2.32 and 13.13 times greater (*B*). Despite increasing compliance with mask-wearing requirements and widespread agreement that wearing masks is effective, support for mandatory policies remained at a moderate level throughout and largely differed between people who fully agreed with all measures and those who rejected them (*C*). Finally, knowledge that fabric masks do not protect the wearer but do protect others became common among the public (*D*). Perceived exaggeration of policy measures based on median-split at each data collection is shown by red vs. blue lines. *B* displays odds ratios from binary logistic regressions, in which mask wearing predicted other behaviors. $n_{04/14} = 1032$, $n_{04/21} = 1006$, $n_{04/28} = 1018$, $n_{05/05} = 1007$, $n_{05/12} = 1013$, $n_{05/19} = 972$, $n_{05/26} = 925$.

under a voluntary policy [77% compliance compared to 96% under a mandatory policy, $\chi^2(1, n = 925) = 71.97$, $P < 0.001$, $V_c = 0.279$], more people may be subject to negative social evaluation under a voluntary policy (i.e., stigmatization could increase). In line with this, social labeling partially increased, as another person wearing a mask was more likely perceived as belonging to a risk group under a voluntary as opposed to a mandatory policy [Fig. 2*C*; interaction policy by others' mask-wearing behavior: $F(1, 921) = 8.88$, $P = 0.003$, $\eta_p^2 = 0.010$); however, they were not regarded as more likely to be infected with COVID-19 (Fig. 2*D*; $F < 1$, not significant)].

Finally, participants perceived a mandatory mask policy as fairer than a voluntary mask policy [paired t test; $t(923) = 12.59$, $P < 0.001$, $d_c = 0.414$]; explorative analyses suggested that this was especially pronounced for participants belonging to a risk group [Fig. 2*E*; interaction risk group by mask policy: $F(1, 922) = 13.55$, $P < 0.001$, $\eta_p^2 = 0.014$)]. Contrary to what was expected, the risk group's perceived susceptibility did not increase compared to a priori susceptibility, given either policy [policy by risk group: $F(1, 913) = 2.87$, $P = 0.091$, $\eta_p^2 = 0.003$]; instead, both groups felt more susceptible when the other person did not wear a mask [exploratory main effect others' mask-wearing behavior: $F(1, 913) = 33.05$, $P < 0.001$, $\eta_p^2 = 0.035$].

Discussion

The results from both data analyses indicate that, independent from policies, wearing masks is a social contract wherein compliant people perceive each other more positively, and noncompliance is socially punished. Mask wearing is also related to adhering to other protective behaviors, and it signals prosocial concerns. This is consistent with previous work from the severe acute respiratory syndrome pandemic demonstrating that more empathic people are more likely to wear masks (15) and that empathy can be regarded as a prerequisite for prosocial behavior (16). The results are based on self-reported survey data, not real-life observations. Thus, the answers may only approximate actual behavior under different policies. Nevertheless, they provide a useful estimate of the policies' potential social and behavioral consequences. Modeling results suggest that "universal (80%) adoption of moderately (50%) effective masks could prevent on the order of 17–45% of projected deaths over two months" (calculated for New York state) (4). While uptake under a voluntary policy is reasonably high, it is still not sufficient to meet these required thresholds (4). Importantly, since mask wearing is a social contract (12), high uptake is necessary to prevent stigmatization. While this social dynamic can, in fact, increase mask wearing under a voluntary policy as well, it comes at the cost of

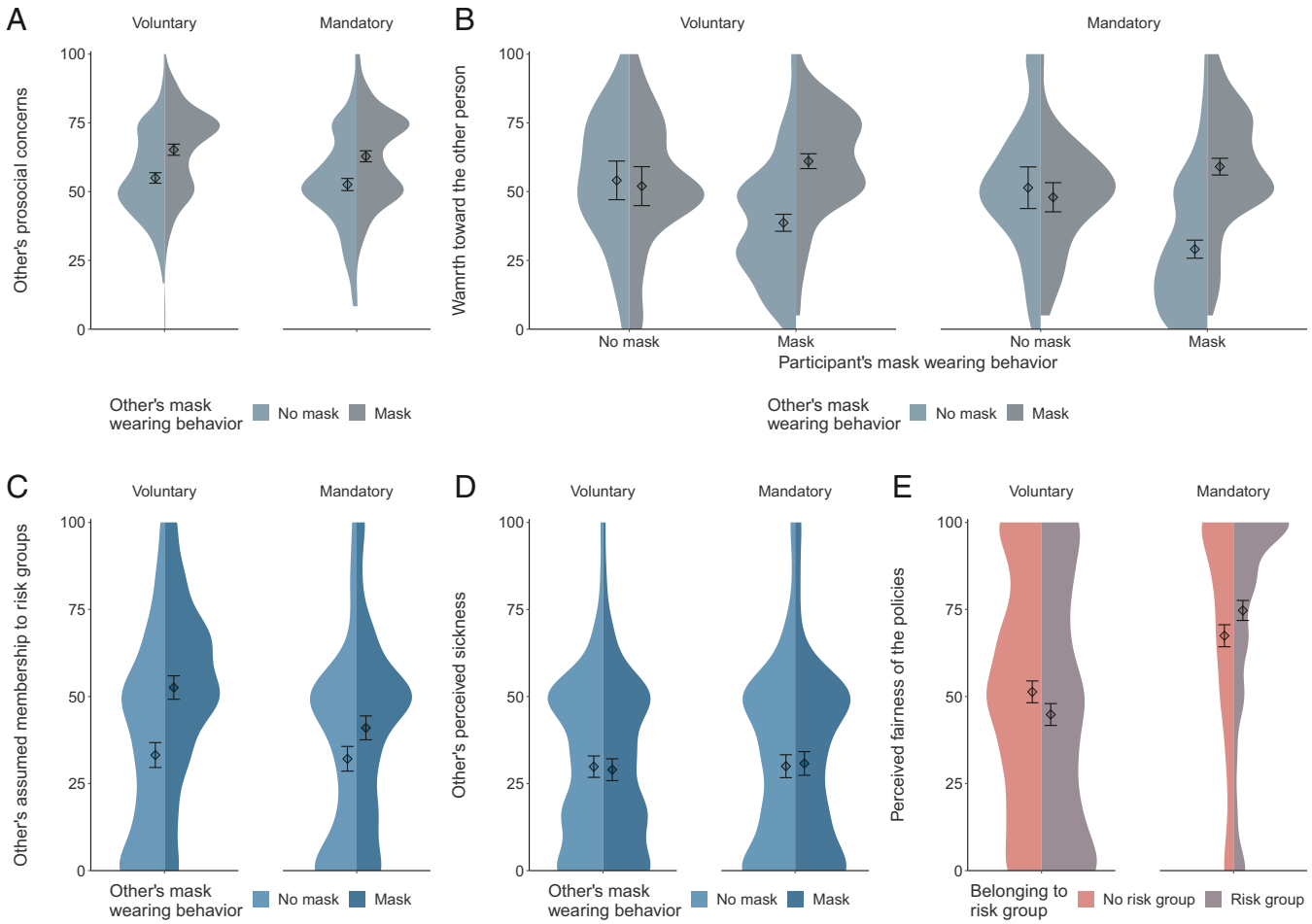

Fig. 2. Experimental evidence shows that, independent from policies, mask wearing signals prosocial concerns (*A*), and is a social contract where noncompliant others are negatively evaluated (*B*); voluntary policies can increase stigma (*C* and *D*) and are perceived as less fair (*E*). Note that $n_{05/26} = 925$ (9). Points represent mean values, and error bars represent 95% CIs. The colored areas represent rotated kernel density distributions of individual responses. All dependent variables were normalized to a range from 0 to 100.

social pressure, and it could increase the potential for polarization (e.g., when not wearing masks becomes a social sign of rejecting measures; see Fig. 1*A*).

In conclusion, should countries or communities want people to wear masks (e.g., to curb local outbreaks or to reduce transmission in future waves of the pandemic), introducing a mandatory policy along with explicit communication of the benefits of mask wearing (risk reduction, mutual protection, positive social signaling) and the benefits of the mandatory policy (fairness, less stigmatization, higher effectiveness) appears advisable.

Materials and Methods

Materials, data, and analysis code (R markdown) are available at https://osf.io/dvbrn/ (8).

Data Availability. Data and analysis code have been deposited in Open Science Framework [https://osf.io/dvbrn/, (8)]. All study data is included in the article.

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