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Effects of Anti-COVID Face Masks on Contagion Risk Evaluation: Wearing a Mask Intensifies Moral Judgments Towards Risky Behaviors

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Abstract

We investigated the effects of complying with measures aimed at offsetting the risks of spreading COVID-19 on the evaluation of risks themselves. We concentrated on the effects of wearing anti-COVID faces masks, representing one of the most widespread, effective, and debated preventive measures to deal with the pandemic. From the individual's perspective, wearing face masks should be justified as far as there are prudential or moral reasons to avoid the risks posed by COVID-19. Consequently, wearing masks without accepting these reasons is a condition that can trigger inconsistency. The attempt to prevent or reduce such inconsistency should thus promote attitude change with respect to the risks associated with the pandemic, including altering beliefs and emotions about the risks themselves or about the morally appropriate behaviors related to these risks. Based on cognitive dissonance theory (Festinger, 1957) and self-perception theory (Bem, 1967; 1972), we hypothesized and tested whether wearing an anti-COVID face mask causes people to be more sensitive to the risks of the pandemic, perceiving a higher risk of contagion and showing stronger respective emotions and cognitions. To test this prediction, an experiment (N = 118) measured the attitudes toward risks associated with COVID-19 of three randomized groups of participants: a group wore face masks, a second one received no specific instructions/requests, and a third one wore an item of clothing unrelated to the pandemic. Results showed an effect of mask-wearing on the moral judgments towards behaviors at risk of COVID-19 contagion, with no significant results for other morality-unrelated attitudes towards risks. Theoretical and practical implications of these results are discussed.

Keywords: COVID-19; cognitive dissonance; self-perception; risk perception; face masks; morality.

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> Is that which is holy loved by the gods because it is holy,
> or is it holy because it is loved by the gods?
> Plato, *Euthyphro* 10a

In 2020, during what has been described as "the largest psychological experiment ever" (van Hoof, 2020), face masks proved to be effective in limiting the spread of the coronavirus pandemic so that they were made mandatory in many countries (Eikenberry et al., 2020; van Doremalen et al., 2020; Leung, 2020). Surgical masks and other types of face masks therefore rapidly became a ubiquitous element in people's lives, to the point of emerging as a universal symbol of the fight against COVID-19 (Goh et al., 2020; Pestana & Pestana, 2020; Pushpa & Ravi, 2021), as well as an indicator of moral seriousness (Hamilton, 2020).

Behavioral science provides a multiplicity of insights into crucial issues related to the management of the pandemic, for example with regards to threat and risk perception and how social norms affect people's risky behaviors (Bavel et al., 2020). Since understanding what motivates people to adhere to anti-COVID public measures is fundamental for effective policymaking (Toxvaerd, 2020), several recent studies have tried to identify the psychological factors behind the compliance with such preventive measures, including the wearing of face masks capable of limiting the virus spreading (e.g., surgical masks, FFP2 masks, and N95 respirators). In addressing this question, scholars pointed out that the perception of the risk of contagion might be one of the main motivations to use anti-COVID masks (Brewer et al., 2007; Webster et al., 2020; Kamran et al., 2020; Shewasinad Yehualashet et al., 2021; Milad & Bogg, 2021). In so doing, however, while the hypothesis of a causal relationship from risk perception to wearing protective masks has been frequently explored, the opposite relationship has been neglected.

Based on cognitive dissonance theory (Festinger, 1957) and self-perception theory (Bem, 1967, 1972), we suggest that the adoption of preventive measures, such as the wearing of anti-COVID face masks, can cause people to be more sensitive to the pandemic's risks, thus perceiving a higher risk of contagion and showing respective emotions and cognitions. Can wearing a mask influence the perception of risks associated with the pandemic? What are the consequences of wearing a mask on people's attitude towards behaviors at risk of contagion? And, if proved to be true, what implications could this relationship have for public health?

The Psychological Effects of Wearing a Mask: Complying with Anti-COVID Measures Should Intensify Contagion Risk Perception to Maintain Consistency

According to cognitive dissonance theory (Festinger, 1957), inconsistency between relevant cognitions and/or behaviors causes the individual to experience an uncomfortable state of arousal that is called cognitive dissonance (i.e., cognitive dissonance state, CDS; see Vaidis & Bran, 2018). This goal-oriented state motivates the person towards reestablishing consistency. Therefore, when two actions or ideas are not psychologically consistent with each other, the person is expected to do all in their power to change cognitions and/or behaviors until they become consistent. Strategies for minimizing this negative affective state include—but are not limited to—*adapting cognitions to actions*. Thus, since people strive for consistency, we should expect that wearing a protective mask induces people to intensify their beliefs that there is a risk outside to avoid, increasing the perception of being exposed to this risk and respective cognitions (e.g., stronger moral judgments against behaviors exposed to that risk).

The idea of a large-scale wave of cognitive dissonance due to restrictive measures for COVID-19 has already been suggested by some authors (e.g., Schippers, 2020). If this involves risk perception, its consequences would be massive. For example, in a study on the topic (Kachanoff et al., 2021), it has been established that the perception of being threatened by the pandemic correlates with higher distress and lower well-being, greater negative affects, more intrusive thoughts about the pandemic, more anxiety, diminished life satisfaction, but also an increased self-reported adherence to nonrestrictive healthy behaviors (i.e., handwashing). However, no previous study has ever tested this hypothesis in experimental settings. By contrast, cognitive dissonance has been documented in a wide variety of cases, including medical ones (e.g., Ent & Gerend, 2016). Further, many experiments have confirmed one of the theory's main predictions for which cognitive dissonance reduction can be pursued by *adapting attitudes to behaviors* (for a review, see McGrath, 2017). In a frequently mentioned example, cognitive dissonance can draw a smoker who is aware of the risks of smoking cigarettes to the cessation of this unhealthy habit. This would be the most intuitive prediction, like that of coronavirus risks perception predicting people's compliance to anti-COVID measures. Still, smoking is not prevented by risk awareness alone. This is because cognitive dissonance can often be managed merely at the cognitive level, with *no need for behavior change*. In this sense, the person can reduce or prevent the occurrence of this negative affective state by simply changing one of the dissonant cognitions or by adding new cognitions that can accommodate the incoherence between preexisting thoughts and actions. In the case of nicotine addiction, for instance, a smoker who is currently smoking a cigarette can prevent or manage their cognitive dissonance by weakening their belief that smoking is harmful (Gibbons et al., 1997) or adopting a different discount rate to compare long-term harms (e.g., smoking causes cancer) to short-term rewards (e.g., smoking is relaxing).

Even though the literature on cognitive dissonance and risks has mainly focused on how risk awareness could be decreased to fit in with risky behaviors, cognitive dissonance reduction is not only elicited by the negative consequences of actions and habits. In many circumstances, the perceived value of an activity can also be increased to offset dissonance, as explained by the paradigm of effort justification. Individuals who, for instance, accept to incur a high cost to join a group will consequently increase the value they attribute to that group so that this effort will be coherent with their achieved goal (Aronson & Mills,

1959). Regarding behaviors aimed at preventing risks, those who engage in them should experience dissonance as far as they have reasons to believe that the risks do not justify their effort to reduce them. Wearing face masks is undoubtedly an effortful practice due to its intrinsic discomfort and unpleasant interference with everyday activities (e.g., Georgi et al., 2020; Cheok et al., 2021; Lloyd & Mansfield, 2021; for a systematic review, see Bakhit et al., 2021). This effort is justified to the extent that COVID-19 poses a substantial threat to our society and ourselves that we ought to counteract. Therefore, cognitive dissonance theory supports the prediction that wearing a mask will enhance people's psychological sensitivity to the dangers of the pandemic.

Self-perception theory (Bem, 1967, 1972) similarly emphasizes people's need for coherence between behaviors and cognitions. This theory is known for overturning the commonsense assumption that cognitions precede behavior and are transparent to the subjects that act on their basis. On the contrary, self-perception theory argues that people have only indirect access to their attitudes, which are instead *inferred from their own behavior*—similarly to how one can infer the mental states of others. This theory generated predictions in different domains and has been tested by numerous studies (e.g., Aronson & Carlsmith, 1963; Uranowitz, 1975; Egan et al., 2010). Moreover, the effect of self-perception is not confined to introspective reports, but it can influence actual behaviors or, at a deeper level, even the experience of emotions (Laird, 1974, 2007) and the weight of implicit biases (Ito et al., 2006).

To date, no experiment has applied self-perception theory to study the psychological effects of wearing medical face masks. However, the effects that the specific meaning of clothes has on how people behave—which can also be explained in terms of self-perception—have already been explored extensively. Research reported, for instance, that wearing a laboratory coat boosts selective attention in a Stroop task (Adam & Galinsky, 2012), formal clothes increase self-attribution of authoritativeness and competence (Karl et al., 2013), and luxury brand names can incline people toward more conservative political views (Wang & John, *working paper*). This strengthens our prediction that wearing a mask, in virtue of its symbolic value, can alter people's attitude toward risks in a way coherent with such behavior.

The Present Research

Based on cognitive dissonance theory (Festinger, 1957) and self-perception theory (Bem, 1967, 1972), we hypothesized that wearing an anti-COVID face mask causes people to be more sensitive to the risks of the pandemic, thus perceiving a higher risk of contagion and showing stronger respective emotions and cognitions. To test our hypothesis, we administered an online questionnaire about the risks related to the pandemic to a sample of adults. Specifically, we assessed how they evaluated the risk of COVID-19 contagion in three different experimental conditions: While wearing a mask (mask-up condition), while wearing nothing (no-instruction control), and while wearing something similar but different from a mask (comparable control). We expected participants in the mask-up condition to show higher levels of risk evaluation than all their counterparts (e.g., a stronger risk perception, tougher moral judgements towards risky behaviors).

Since risk evaluation is not a unitary construct, we developed a questionnaire that included five subscales of risk evaluation that were specific for the COVID-19 pandemic, in order to capture the most relevant dimensions of this concept within our specific context of interest. Based on previous literature on risk perception (e.g., Trumbo et al., 2016), what inspired these *ad hoc* scales were the distinction between a purely cognitive, an emotional, and a moral dimension of risk evaluation. We also differentiated the probability and magnitude of risks and distinguished between different targets of the potential damages (i.e., the participant vs. other people). The resulting subscales assessed the following five dimensions of risk evaluation: (a) risk magnitude (i.e., perceived magnitude of the consequences of contagion); (b) contagion probability (i.e., the perceived probability of getting infected); (c) collective risk (i.e., risks for society); (d) emotiveness (i.e., expected emotions in case of contagion); and (e) morality (i.e., moral judgments against behaviors at risk of contagion; see Table 1).

Method

Participants, Design, and Sensitivity Power Analysis

In early March 2021, 146 Italian adults[1] (76% females; *M*age = 28.47 years, *SD*age = 11.36) volunteered in a one-factorial between-subject experiment. Participants were recruited online through the publishing of brief invitation posts on several social media pages (e.g., Facebook pages/groups, Instagram profiles, and informal WhatsApp group chats). The wearing of an anti-COVID-19 face mask was manipulated among three experimental conditions, including a mask-up condition and two controls (*Manipulation of Face Mask Wearing*: mask-up vs. no-instruction control vs. comparable control). Participants' attitudes to risks related to the COVID-19 pandemic served as the dependent variable.

Prior to our data collection, we inserted a control question in our procedure intended to ensure that participants followed instructions, to exclude unreliable data before the analyses (*exclusion criterion*). At the end of the study, participants had to confirm whether they followed instructions or not.

[1] Unfortunately, since no previous studies ever investigated the effect we hypothesize in the present paper, we could not determine our sample size according to a critical effect to be included in an a priori power analysis. Thus, we simply planned to recruit a sample size of at least 40 participants per cell—i.e., a sample size adequate to conduct pilot experiments—to test our hypothesis for the first time and, at least, be able to guide future studies by providing new critical effect sizes for their a priori power analyses (e.g., Hertzog, 2008).

Those who responded to the control question with an answer incongruent with their condition were removed and excluded from the analyses (10 subjects from the mask-up group and 18 from the comparable control). With a final sample of 118 participants (73.7% females; *M*age = 28.94 years; *SD*age = 11.77), the study had 80% power to detect an effect size of at least $f = .29$ in omnibus tests in one-way ANOVAs (i.e., $\alpha = .05$; numerator df: 2; denominator df: 115; number of groups: 3; non-centrality parameter $\lambda = 9.89$; see G*Power 3.1; Faul et al., 2007).

Procedure and Materials

The research was introduced to participants as investigating people's sensations and opinions concerning the risks associated with the COVID-19 pandemic. Participants were asked to complete the questionnaire while being at home, to be sure that they were not wearing face masks by default since it was compulsory in most public places in Italy at the time of the study. After participants gave their informed consent, they filled out an anonymous online questionnaire. The questionnaire consisted of two parts. The first part entailed demographic questions and the instructions concerning the manipulation. Upon randomization, participants in the mask-up condition were asked to wear a mask for the entire duration of the survey (i.e., "*For the completion of this questionnaire, you are required to wear a mask, covering nose and mouth completely*"), that is, for around five minutes; participants in the no-instruction condition received no instruction about what to wear; lastly, participants in the comparable treatment condition were asked to wear a scarf, a hat or some other item of clothing related to the external environment, to mimic the condition of the mask-up condition at a superficial level (e.g., getting up and wearing something unusual).

The second part of the questionnaire consisted of five scales intended to assess different dimensions of people's evaluation of risks related to COVID-19. Although inspired by previous questionnaires on risk perception in general (e.g., Trumbo et al., 2016), these scales have been developed *ad hoc* since no similar study was present in the literature. The attitudes investigated by the questionnaire were organized according to the following subdimensions: (a) participants' expected harms if they would be infected by the virus ("risk magnitude" scale; 5 items; $\alpha = .88$); (b) participants' perceived likelihood of being infected in different social circumstances ("contagion probability" scale; 6 items; $\alpha = .70$); (c) participants' expected negative impact of the pandemic on society ("collective risk" scale; 5 items; $\alpha = .72$); (d) participants' expected negative emotional response in the case they or their close ones tested positive for COVID-19 ("emotiveness" scale; 5 items; $\alpha = .86$); (e) participants' moral judgment against behaviors with a high risk of spreading the virus ("morality" scale; 5 items; $\alpha = .82$).[2] Answers were provided on Likert-like scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). A total score of contagion risk evaluation was also computed. At the end of the survey, a control question asked the participants if they wore the item required at the beginning of the questionnaire. Finally, they were debriefed and thanked for their participation. Although a formal ethical approval was not requested to administer our online survey, our research was in full accordance with the APA ethical guidelines, the 1964 Helsinki declaration, and its later amendments.

Results

Results were in only partial accordance with our prediction. When considering the total score of contagion risk evaluation as the dependent variable, we found no significant difference between the three experimental groups (mask-up: $M = 5.02$, $SD = .81$; no-instruction control: $M = 4.71$, $SD = .93$; comparable control: $M = 4.85$, $SD = .90$), $F(2, 115) = 1.27$, $p = .286$, partial $\eta^2 = .022$. In accordance with our hypothesis, though, one of our dimensions of contagion risk evaluation reacted to the wearing of an anti-COVID mask (Table 2). A one-way ANOVA indeed revealed a significant difference between the groups in terms of morality scale levels, $F(2, 115) = 3.14$, $p = .047$, partial $\eta^2 = .052$. Planned contrasts revealed that the participants who wore a mask had significantly higher scores for the morality questionnaire than participants in both control groups, $t(115) = 2.50$, $p = .014$, $r = .23$ (see Figure 1). According to our predictions, we also found no difference between the two control conditions, with participants in the no-instruction condition and those in the comparable control condition showing similar levels of negative moral judgements, $t(115) = .009$, $p = .930$, $d < .01$. Against our hypotheses, however, the analyses showed no difference among groups in terms of risk magnitude, $F(2, 115) = .81$, $p = .446$, partial $\eta^2 = .014$, contagion probability, $F(2, 115) = .24$; $p = .790$, partial $\eta^2 = .014$, collective risk: $F(2, 115) = .33$, $p = .720$, partial $\eta^2 = .006$, and emotiveness, $F(2, 115) = .91$, $p = .406$, partial $\eta^2 = .016$.

Notably, most of the means tended to the expected direction and, in particular, the mask-up group showed higher scores than the no-instruction control group for the total score of risk evaluation and all the five subscales. In other words, the subjects wearing masks appeared to be more sensitive to COVID-related risks than the subjects that were not asked to wear anything. This result, however, was not significant and should thus be substantiated by future studies. The data file of the present research is available on Open Science Framework (OSF; Sciara & Perini, 2022).

[2] The following items (translated from Italian) represent an example for each one of the six scales: (a) risk magnitude scale: "*[In case I get COVID-19] I may have long-term health consequences*"; (b) contagion probability scale: "*[There is a significant risk of getting infected in case of] dinner at home with relatives (more than 8 people)*"; (c) collective risk scale: "*I think Covid-19 will continue to do damage [to my country] in the years to come*"; (d) emotiveness scale: "*[In case I or a close friend or family member of mine tested positive for COVID-19] I would feel frightened*"; (e) morality scale: "*Anyone who infects their relatives after contracting the virus through some causal sex is not excusable*". For the morality scale, the fact that the described behavior was at risk of spreading the contagion was explicitly stated. For the translation of all the items, see Appendix 1.

Tab. 1. Descriptive Statistics and Correlations for the Five Subscales of Contagion Risk Evaluation

	M	*SD*	1	2	3	4	5
1. Risk Magnitude	3.77	1.44	–				
2. Contagion Probability	5.04	.99	.38**	–			
3. Collective Risk	5.43	1.00	.31*	.46**	–		
4. Emotiveness	4.84	1.38	.54**	.39**	.36**	–	
5. Morality	5.14	1.33	.51**	.46**	.23*	.38**	–

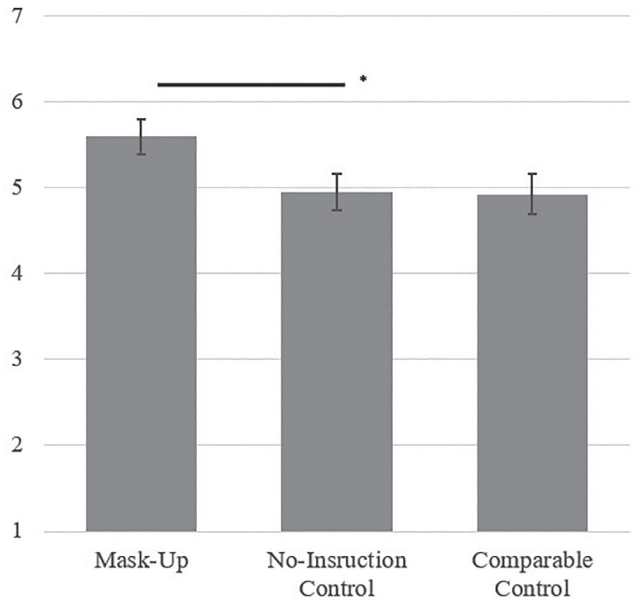
Note. *p < .05. **p < .01.

Tab. 2. Participants' Attitudes Toward Risks Related to COVID-19 According to Their Experimental Condition

	Condition				
	Mask-Up	No-Instruction Control	Comparable Control	$F(2, 115)$	p
Risk Magnitude *M(SD)*	3.94 (1.29)	3.56 (1.34)	3.87 (1.69)	.81	.446
Contagion Probability *M(SD)*	5.13 (.98)	5.02 (.95)	4.97 (1.07)	.24	.790
Collective Risk *M(SD)*	5.45 (.85)	5.34 (1.16)	5.52 (.93)	.33	.720
Emotiveness *M(SD)*	4.99 (1.37)	4.63 (1.37)	4.96 (1.32)	.91	.406
Morality *M(SD)*	5.59 (1.19)	4.95 (1.31)	4.92 (1.40)	**3.14**	**.047**
N	36	46	36		

Note. Means and standard deviations refer to the different dimensions of attitudes toward risk related to COVID-19 expressed by the participants. Answers' scales ranged from 1 *"strongly disagree"* to 7 *"strongly agree."*

Fig. 1. Participants' scores for the scale measuring the strength of moral judgements against behaviors at risk of COVID-19 contagion according to their experimental condition (mask-up vs. no-instruction control vs. comparable control).



Note. **Answers' scale ranged from 1** "*strongly agree*" **to 7** "*strongly agree.*" Error bars represent standard errors of the means. The asterisk indicates a significant difference between conditions (p < .05).

Discussion

Based on cognitive dissonance theory (Festinger, 1957) and self-perception theory (Bem, 1967, 1972), we hypothesized that wearing an anti-COVID face mask increases people's perception of being at risk of COVID-19 contagion, thus maintaining congruence between behavior (i.e., wearing a mask) and cognitions (i.e., believing there is a risk outside). Specifically, we expected that wearing a mask (and not wearing something in general, or nothing at all) could motivate our participants to increase their perceived risk magnitude, contagion probability, collective risk, expected negative emotions in case of contagion, as well as their moral judgments against behaviors at risk of contagion. The present results only partially sustain our hypothesis. Wearing a mask appears to influence some aspects of risk evaluation to reduce the cognitive dissonance, a negative state that, we argued, would arise in the case in which attitudes are inconsistent with behavior. However, we found this effect on one single subdimension of risk evaluation. In particular, we found that face masks exacerbate moral judgments against behaviors at risk of contagion (e.g., condemning social behaviors that put someone at risk of being infected by COVID-19).

Notably, the effect of anti-COVID masks on moral judgments against risky behaviors appeared to depend on specific features of anti-COVID face masks. We indeed asked a comparable control group to complete the survey while wearing a scarf or a similar item of clothing. Since we found no difference between the two control groups, we are able to conclude that the effect observed on morality was not due to the fact of being asked something unusual for an online survey, complying with a request in general, and/or wearing something associated with the external environment. Our result is also in line with the self-perception theory, which postulates a similar effect of behavior on cognitions.

A concern may arise as to why only the scale on morality—and not the other scales measuring cognitive and affective reaction to the risk—presented the expected result. There are two categories of cognitions that can be affected by cognitive dissonance reduction in relation to risks: *normative* vs. *descriptive* cognitions.[3] An explanation of why we have not observed any effect for the non-moral ("descriptive") scales may be that different groups of people have cognitions with different *resistance to change*, a notion used by Festinger (1957) to explain why certain cognitions have a lower probability of being altered to reduce dissonance. According to cognitive dissonance theory, an attitude can be more resistant because "(a) of reality constraints, (b) changing one cognition may produce dissonance among other cognitions, and/or (c) of the pain or effort required to change it" (McGrath, 2017, p. 8). A sample mainly composed of university students could be expected to be exposed to higher-quality information about COVID-19, then the descriptive attitudes would be better established and then more resistant changed by the manipulation. Consequently, the only dissonance reduction strategy available to them would have been to alter the normative cognition related to risk-taking (i.e., the beliefs about what behavior is morally correct

[3] This could be related to the distinction between prudential and properly moral reasons used in ethics (Crisp, 2018).

given a certain level of risk). Even if the risk is undeniable, one can still opt for looser and tighter moral attitudes toward risky behaviors to justify specific actions. These considerations suggest future research about cognitive dissonance and risk perception to investigate if the degree of certainty about risks moderates the effect of dissonance-inducing manipulations.

Our study has some limitations. The first one regards our testing of the basic predictions of cognitive dissonance theory (Festinger, 1957). We indeed assumed that people wearing an anti-COVID mask would have perceived more risk of contagion due to their need to psychologically justify their self-protective behavior and thus avoid experiencing cognitive dissonance (in this case, caused by the inconsistency between doing something to protect the self and the absence of a substantial, external risk). Based on this assumption, we expected our masked participants to avoid cognitive dissonance by adapting different aspects of their risk evaluation and adjusting relevant cognitions, such as by augmenting their perception of the risk of contagion or intensifying their judgments towards risky behaviors. This cognitive adaptation, according to the theory, should be functional to reduce cognitive dissonance. However, the reduction of inconsistency is not the only way people have to cope with a cognitive dissonance state. Other strategies include trivialization (Simon et al., 1995), denial of responsibility (Gosling et al., 2006), self-affirmation efforts (Steele & Liu, 1981), or value affirmations (Randles et al., 2015). Given the number of all the possible strategies available to deal with a cognitive dissonance state, assessing only one of these possibilities clearly limited the scope of our study, as well as its capacity to actually test the foundations of the theory. In other words, since we did not measure participants' dissonance but only inferred masked people would have shown a specific strategy to reduce inconsistency, and since this is only one of the many possible strategies to handle dissonance arousal, a strategy that could even depend on other phenomena (e.g., a *priming* effect; Doyen et al., 2014; Klauer, 1997), we cannot conclude that our participants did really experience a cognitive dissonance state. Most importantly, based on the present study's results, we are not able to assert that a process of cognitive dissonance reduction actually mediated the reported effect (see Vaidis & Bran, 2019, for the complete rationale). Future studies are therefore needed to shed light on this.

A second limitation regards the possibility to generalize this partial result to the real world since cognitive dissonance arises only when the effortful behavior is freely chosen by the individual (Festinger & Carlsmith, 1959), while face masks are compulsory in most countries. However, we believe that it overemphasizes the degree of control that governments have on individuals at least to some extent. There are certainly some cases where people's decision to wear a mask could be represented by sentences such as "I have to tolerate this mask, or I will get in trouble with the law." However, this kind of government's mandate still relies on individual independent responsibility of accepting to sharing the goal of the policymaker. If it is so, we are back to our starting point: the citizens' choice to share the goal of the government assumes that the pandemic is a serious threat that must be dealt with by any means necessary.

Additionally, it could be argued that unsupervised participants could not have complied with the condition required for the mask-up group (i.e., wearing the mask). For safety reasons, it was not possible to run our experiment in person, and the recruitment through social networks exposed us also to the limitation of having an unbalanced sample. The control question at the end of the survey was not an absolute guarantee, given that we cannot be sure of the participant's truthfulness. Nonetheless, this alleged weakness might prove to be a strength of our study. We want our experiment to represent the ecological condition, where people are relatively free to choose to use masks or not. This is important because, as mentioned above, effort justification does not work where compliance is forced. This is a feature of our experimental design that distinguishes it from all the other studies we reviewed on the behavioral effects of face masks, where no such relative freedom was contemplated (e.g., Luckman et al., 2020; Seres et al., 2020a; Seres et al., 2020b).

Even if previous research reported that wearing a face mask usually causes discomforts (e.g., impairment to breathing, communication difficulties, dermatological issues, sweating, ears discomfort; Cheok et al., 2021; Lloyd & Mansfield, 2021; Bakhit et al., 2021), these discomforts can be attenuated by habituation and other moderators (e.g., the comfort of the ear loops; general fitting, duration of use; Lloyd & Mansfield, 2021; Green et al., 2021). In some social circumstances, wearing a mask can even have positive effects on the person's psychology, such as an increased propensity towards spontaneity and ideas' expression (e.g., Perini & Sciara, 2022). In our study, however, we did not include control measures that could detect the perceived discomfort of our participants and thus ensure that they truly experienced discomfort due to wearing anti-COVID face masks. We then cannot be sure that an effect of justification of the effort actually mediated the hypothesized and reported effect. This represents another limitation of the present research that should be considered and addressed by future research.

Our paper casts doubt on the assumption that people have fixed attitudes toward risks, which has repercussions on the influential theory of risk compensation (Petlzman, 1975), already invoked to question the efficacy of COVID-19 measures (Luckman et al., 2020; Seres et al., 2020a). According to this theory, since people have a predetermined preference about which level of risk is acceptable, introducing new safety measures by law should cause people to adopt riskier behavior. This would happen because individuals have the tendency to bring back the overall risk to the level they freely chose previously, compensating for the positive effect of safety devices such as seatbelts or other measures. Risk compensation has also been observed in relation to contagious diseases (e.g., Toxvaerd, 2019; Talamàs & Vohra, 2020). To the extent that this phenomenon affects measures as anti-COVID-19 face masks, the efficacy of preventive policies is offset by behavioral adaptation to the new level of risk by, for instance, encouraging people to increase the frequency of in-person social interactions with vulnerable relatives.

Our results undermine the premise of the risk compensation theory since they show how the assumption of a rigid set of preferences concerning risks is unplausible. This entails that, whenever a measure involves subjects that take at least part of the responsibility of risk management, it can trigger cognitive

dissonance in the form of effort justification and, consequently, prevent risk compensation. In other words, the adoption of preventive measures against the spread of the coronavirus, rather than promoting risk-oriented behaviors as predicted by the risk compensation theory, can trigger a positive feedback loop between behaviors and cognitions that would reduce risk exposure even further.

In conclusion, wearing face masks can cause cognitive dissonance unless the person has reasons to avoid the risks posed by COVID-19. This would, in turn, make the person try to reduce or prevent this dissonance by increasing their commitment to the reasons for adopting preventive behaviors. If our model could inspire some confidence in the efficacy of certain public health measures, this is not true for every kind of restriction to individual freedom. If the fear of the government becomes the main reason to follow healthy practices, this will prevent effort justification from occurring among the citizens of a nation in what can be described as a case of motivational crowding out (e.g., Esteves-Sorenson & Broce 2020). On the contrary, in light of the positive value of effort justification in risk prevention, governments should opt for public policies that do not exceed people's willingness to freely comply with them and, at the same time, resist the temptation of excessive measures of law enforcement. To end the article with a further note of caution, it is not even guaranteed that exacerbating people's risk aversion is always desirable. If underestimating threats is certainly dangerous, "[h]istory suggests that we are actually at much greater risk of exaggerated fears and misplaced priorities" (Jones, 2020, p. 1683), and a political opinion too afraid of risks could favor closure reactions and the development of policies not based on evidence with many side effects (e.g., Shippers, 2020; see also Pica et al., 2019; Thórisdóttir & Jost, 2011).

Author Contributions
The authors contributed equally to this manuscript.

Compliance with Ethical Standards

Conflict of Interest
The authors declare that they have no competing interests.

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Ethical Approval
All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Availability of Data and Material. The data file of the present research is available on Open Science Framework (OSF): https://osf.io/ma6gj The authors are also willing to share their analytics methods and study materials with other researchers upon request.

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Appendix 1

Five subscales of contagion risk evaluation.

Five subscales:
1) Risk Magnitude
2) Contagion Probability
3) Collective Risk
4) Emotiveness
5) Morality

1. Risk Magnitude subscale

IT:
Pensando all'impatto del Covid-19 su di te nel caso in cui venissi contagiato, quanto ritieni probabili i seguenti scenari:
(1: Molto in disaccordo; 2: In disaccordo; 3: Abbastanza in disaccordo 4: Né d'accordo né in disaccordo; 5: Abbastanza in accordo; 6: D'accordo; 7: Molto d'accordo.)
Item 1: Potrei avere febbre e altri sintomi aspecifici.
Item 2: Potrei avere sintomi gravi.
Item 3: Potrei perdere diversi giorni di lavoro.
Item 4: Potrei avere conseguenze di salute a lungo termine.
Item 5: Potrei essere ricoverato in terapia intensiva.
Item 6: Penso che potrei perdere la vita.

EN:
Thinking about the impact of Covid-19 on you in case you were infected, how likely do you think the following scenarios are?
(1: Strongly disagree; 2: Disagree; 3: Somewhat disagree; 4: Neither agree nor disagree; 5: Somewhat agree; 6: Agree; 7: Strongly agree.)
Item 1: I may get a fever and have other nonspecific symptoms.
Item 2: I may have severe symptoms.
Item 3: I may miss several days of work.
Item 4: I may have long-term health consequences.
Item 5: I may be hospitalized in an intensive care unit.
Item 6: I may lose my life.

2. Contagion Probability subscale

IT:
Pensando alle diverse fonti di contagio, come valuteresti il rischio di contagiarti se ti trovassi in una delle seguenti situazioni:
(1: Molto basso; 2: Basso; 3: Moderatamente basso 4: Né basso né alto; 5: Moderatamente alto; 6: Alto; 7: Molto alto.)
Item 1: Cena a casa con parenti (più di 8 persone).
Item 2: Classe di liceo con 30 o più studenti.
Item 3: Mezzi pubblici moderatamente affollati.
Item 4: Festa all'aperto con più di 30 persone.
Item 5: Cinema senza distanziamento.
Item 6: Ricovero in ospedale.

EN:
Thinking about the different sources of contagion, how would you evaluate the risk of getting infected if you were in one of the following situations?
(1: Very low; 2: Low; 3: Moderately low; 4: Neither low nor high; 5: Moderately high; 6: High; 7: Strongly high.)
Item 1: Dinner at home with relatives (more than 8 people).
Item 2: High school class with 30 or more students.
Item 3: Moderately crowded public transport.
Item 4: Outdoor party with more than 30 people.
Item 5: Movie theater with no social distancing.
Item 6: Hospital recovery.

3. Collective Risk subscale

IT:
Le persone comprendono la pandemia in modi diversi. Pensando all'impatto del Covid-19 sul tuo paese, quanto sei d'accordo o in disaccordo con le seguenti affermazioni?
(1: Molto in disaccordo; 2: In disaccordo; 3: Abbastanza in disaccordo 4: Né d'accordo né in disaccordo; 5: Abbastanza in accordo; 6: D'accordo; 7: Molto d'accordo.)
Item 1: Penso che i danni del Covid-19 in termini di vite umane siano catastrofici.
Item 2: Penso che da qui all'arrivo della immunità di gregge i danni del Covid-19 saranno ancora enormi.
Item 3: Penso che il Covid-19 sia tutt'ora una grave minaccia per l'economia.
Item 4: Penso che i danni sociali del Covid-19 siano in genere sottovalutati.
Item 5: Penso che il Covid-19 continuerà a fare danni anche negli anni a venire.

EN:
People understand the pandemic in different ways. Considering the impact of Covid-19 on your country, how much do you agree with the following statements?
(1: Strongly disagree; 2: Disagree; 3: Somewhat disagree; 4: Neither agree nor disagree; 5: Somewhat agree; 6: Agree; 7: Strongly agree.)
Item 1: I think the damage caused by Covid-19 in terms of human life is catastrophic.
Item 2: I think that from now on to the arrival of herd immunity, the damage caused by Covid-19 will still be enormous.
Item 3: I think Covid-19 is still a major threat to the economy.
Item 4: I think the social harms of Covid-19 are generally underestimated.
Item 5: I think Covid-19 will continue to do damage in the years to come.

4. Emotiveness subscale

IT:
Le persone hanno diverse risposte emotive alla minaccia della pandemia. Immagina di venire a sapere che un tu o un tuo caro abbiate contratto il Covid-19, quanto sei d'accordo con le seguenti affermazioni?
(1: Molto in disaccordo; 2: In disaccordo; 3: Abbastanza in disaccordo 4: Né d'accordo né in disaccordo; 5: Abbastanza in accordo; 6: D'accordo; 7: Molto d'accordo.)
Item 1: Mi sentirei spaventato.
Item 2: Mi sentirei preoccupato.
Item 3: Mi sentirei intimorito.

Item 4: Mi sentirei depresso.
Item 5: Mi sentirei ansioso.

EN:
People have different emotional responses to the threat of the pandemic. Imagine learning that you or a dear one had been infected by Covid-19; how much do you agree with the following statements?
(1: Strongly disagree; 2: Disagree; 3: Somewhat disagree; 4: Neither agree nor disagree; 5: Somewhat agree; 6: Agree; 7: Strongly agree.)
Item 1: I would feel scared.
Item 2: I would feel worried.
Item 3: I would feel frightened.
Item 4: I would feel depressed.
Item 5: I would feel anxious.

5. Morality subscale

IT:
La pandemia ha costretto molti a fare grandi sacrifici. Quanto sei d'accordo con le seguenti affermazioni:
(1: Molto in disaccordo; 2: In disaccordo; 3: Abbastanza in disaccordo 4: Né d'accordo né in disaccordo; 5: Abbastanza in accordo; 6: D'accordo; 7: Molto d'accordo.)
Item 1: È immorale lamentarsi di non poter uscire la sera quando centinaia di persone muoiono ogni giorno per la pandemia.
Item 2: Non è mai legittimo anteporre il profitto economico alla tutela della salute.
Item 3: È doveroso fare tutto il possibile per ridurre il numero dei contagi.
Item 4: Chi contagiasse i propri parenti dopo aver contratto il virus per del sesso occasionale non è scusabile.
Item 5: I giovani dovrebbero fare di più per evitare di diffondere il Covid-19.

EN:
The pandemic has forced many people to make great sacrifices. How much do you agree with the following statements?
(1: Strongly disagree; 2: Disagree; 3: Somewhat disagree; 4: Neither agree nor disagree; 5: Somewhat agree; 6: Agree; 7: Strongly agree.)
Item 1: It is immoral to complain about not being able to go out at night when hundreds of people die every day from the pandemic.
Item 2: It is never legitimate to put economic profit before the protection of health.
Item 3: It is a duty to do everything possible to reduce the number of infections.
Item 4: Anyone who infects their relatives after contracting the virus through some causal sex is not excusable.
Item 5: Young people should do more to avoid spreading Covid-19.