

# Social Psychological Bulletin

Psychologia Społeczna

## Social Distancing From Foreign Individuals as a Disease-Avoidance Mechanism: Testing the Assumptions of the Behavioral Immune System Theory During the COVID-19 Pandemic

Aleksandra Szymkow<sup>1</sup>, Natalia Frankowska<sup>1</sup>, Katarzyna Gałasińska<sup>1</sup>

[1] *Center for Research on Biological Basis of Social Behavior, SWPS University of Social Sciences and Humanities, Warsaw, Poland.*

Social Psychological Bulletin, 2021, Vol. 16(3), Article e4389, <https://doi.org/10.32872/spb.4389>

Received: 2020-09-15 • Accepted: 2021-08-21 • Published (VoR): 2021-09-23



**Handling Editor:** Wijnand Van Tilburg, University of Essex, Colchester, United Kingdom

**Corresponding Author:** Aleksandra Szymkow, ul. Chodakowska 19/31, 03-815 Warszawa, Poland. E-mail: [aszymkow-sudziarska@swps.edu.pl](mailto:aszymkow-sudziarska@swps.edu.pl)

**Supplementary Materials:** Data, Materials [see [Index of Supplementary Materials](#)]



### Abstract

Topics of prejudice, discrimination, and negative attitudes toward outgroups have attracted much attention of social scientists during the COVID-19 pandemic, as the preference for social distancing can originate from the perception of threat. One of the theoretical approaches that offers an explanation for avoidance tendencies is the behavioral immune system theory. As a motivational system that aims to identify and avoid pathogens, the behavioral immune system has been shown to be triggered by various cues of a potential disease threat (e.g., the risk of contracting a virus), which further leads to negative social consequences such as xenophobia, negative attitudes toward various social groups, and distancing tendencies. We present a correlational study (N = 588; Polish sample) that was designed to test mediational models derived from the behavioral immune system theory, using the COVID-19 pandemic as a source of natural disease threat. In serial mediation analyses we show that the perceived threat of COVID-19 translates into greater preferred social distance from foreign individuals, and that this occurs in two ways: 1) via pathogen disgust (but not sexual or moral disgust), and 2) via germ aversion (but not perceived infectability). Both pathogen disgust and germ aversion further predict general feelings toward foreign individuals, which finally determine the preferred social distance from these individuals. The results support



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the behavioral immune system theory as an important concept for understanding social distancing tendencies.

## Keywords

disease, behavioral immune system, social distancing, COVID-19, disgust

### Highlights

- According to behavioral immune system theory, preference for social distancing can originate from a perception of threat.
- A correlational study (N = 588) tested mediational models derived from behavioral immune system theory, using the COVID-19 pandemic as a source of natural disease threat.
- Perceived threat of disease (both the perceived vulnerability to disease and the perception of the COVID-19 threat) is positively associated with specific domains of disgust.
- Disgust predicts general feelings toward foreign individuals, and these general feelings determine the preferred social distance from these individuals.

During the COVID-19 pandemic, topics of negative attitudes toward outgroups and the related social distancing tendencies have become important issues among scientists (e.g., Hromatko et al., 2021; Kramer & Bressan, 2021; Meleady et al., 2021; Sorokowski et al., 2020). One of the reasons for this intensified scientific interest is that social distancing, as well as the various factors that precede it, such as prejudices or xenophobic attitudes, have their origin in the perception of threat (Faulkner et al., 2004). The pandemic situation has provided an opportunity to test theoretical models that previously could only be verified using imagined rather than real disease-related threats. In the current paper, we focus on the theory of the behavioral immune system (BIS), which is a motivational system that aims to minimize infection risk by changing cognition, affect, and behavior in ways that promote pathogen avoidance (Ackerman et al., 2018; Murray & Schaller, 2016).

Along with the use of this theoretical framework, a number of significant factors impacting social attitudes as well as social distancing have been noted. First, it has been shown that disease-related cues evoke disgust (Curtis et al., 2004; Navarrete & Fessler, 2006) and that both disgust and disgust sensitivity play pivotal roles in shaping negative reactions toward outgroups (Giner-Sorolla & Russell, 2019). Second, affective reactions due to disease-related threats depend on the perceived seriousness of a given threat (Faulkner et al., 2004; Oaten et al., 2009). Additionally, it has been shown that both chronic and temporarily aroused feelings of vulnerability to disease contribute to negative attitudes toward foreign people (Faulkner et al., 2004). The chronic activation of

BIS is reflected in one's disgust sensitivity and perceived vulnerability to disease, with the latter being conceptualized as consisting of an affective component (germ aversion), as well as a cognitive one (perceived infectability; [Duncan, Schaller, & Park, 2009](#)).

However, so far, there has been hardly any research testing the interplay of these factors within a single study that would enable a more complete verification of the BIS theory. Moreover, the documented effects have been based on separate investigations of affective evaluations of outgroups (e.g., [Faulkner et al., 2004](#)) and behavioral avoidance tendencies (e.g., [Sorokowski et al., 2020](#)), while the BIS theory offers a foundation to suggest that affective evaluations of foreign individuals predict avoidant behaviors ([Faulkner et al., 2004](#)). Our study was designed to test mediational models derived from the theory of BIS, using the COVID-19 pandemic as the source of natural disease threat. Specifically, we tested whether the perceived threat of COVID-19 has an effect on preferences for social distancing from foreign individuals through disgust sensitivity and germ aversion separately, which should predict general feelings toward outgroup individuals and in turn predict a preference for social distancing.

## The Behavioral Immune System and Outgroup Evaluations

As humans, we take advantage of living in cooperative social groups. Such obligatory interdependence is perceived as one of the most important adaptations that protects an individual from various threats posed by the environment and that offers the opportunity to pursue individual goals more efficiently with group support ([Brewer & Caporael, 1990](#)). However, both living in a group and having contact with outgroups entail exposure to a variety of risks, from the risk of being exploited by “free riders”, through threats to physical safety and a risk of harm, to threats to physical health and a risk of infection ([Cottrell & Neuberg, 2005](#)). In light of these perceived substantial costs, people have evolved a broad range of affective and behavioral systems that enable all these potential threats to be avoided. In regard to threats to physical health, being in a group exposes an individual to contagious diseases, especially when in contact with members of outgroups. Outgroup members are likely to carry novel pathogens that can be highly infectious to ingroup members ([Diamond, 1997](#)), as organisms evolve resistance to local microbes ([Schaller & Murray, 2010](#)). The basic evolved device for dealing with pathogens is, obviously, the biological mechanism of the physiological immune system. However, as fighting against an ongoing infection is metabolically expensive ([Adelman & Martin, 2009](#)) and is likely to involve trade-offs with other energetically expensive activities, such as thermoregulation or reproduction ([Hawley et al., 2012](#)), it would be advantageous for an organism to develop another system that would mitigate the threat of disease before infection occurs and thus serve as a preventive tool. This tool is the behavioral immune system ([Ackerman et al., 2018](#); [Murray & Schaller, 2016](#)).

## The Role of BIS in Shaping Social Attitudes

The behavioral immune system comprises various disease-avoidance mechanisms that ensure effective pathogen prevention. A prerequisite for behavioral avoidance is the detection of threat-relevant cues in the environment, which can directly or only heuristically indicate the presence of contagious diseases (Ackerman et al., 2018). Since evolution of a system that precisely distinguishes between healthy and diseased people would not be possible due to the high and constant variability in pathogens, the BIS is prone to overgeneralization. Additionally, as misses are more costly than false alarms when it comes to matters of life and death (Haselton & Nettle, 2006), it is more beneficial to misjudge a healthy person as infected than to misjudge a contagious individual as healthy. Therefore, a number of non-infectious physical and mental abnormalities that are only heuristically associated with disease (such as disfigurements, disabilities or obesity) trigger the system (Miller & Maner, 2011; Park et al., 2003). Also, as Kramer and Bressan (2021) indicate, possibly because parasites make people look or behave unusually, people tend to perceive any atypical appearance as a possible sign of infection (see also Nussinson et al., 2018). Triggered reactions involve behavioral avoidance and are the same reactions that are elicited by people who are actually diseased (Snyder et al., 1979).

Importantly, the same mechanisms apply to cues indicating that an individual is foreign to one's own group. Indeed, people are highly sensitive to cues of group membership and the fact that they easily discriminate between familiar and foreign individuals has been extensively demonstrated in social psychology research (see Fiske, 1998). For the reason that having contact with outgroup members entails a heightened risk of infection (Schaller & Neuberg, 2012), it is plausible that we have evolved to prefer interacting with ingroups rather than outgroups (Fincher & Thornhill, 2012). Also, migrants may engage in specific social norms which are not adaptive for our community (e.g., food preparation techniques, hygiene practices; Schaller & Neuberg, 2008). However, recently some doubts have arisen as to whether the BIS is adapted to avoid outgroups or rather any infected individual (van Leeuwen & Petersen, 2018). As van Leeuwen and Petersen (2018) indicate, due to the low probability that ancestral humans have interacted regularly with individuals from outgroups very different from them and that interacting with outgroup individuals could be highly beneficial (e.g., mating), it is unlikely that there was selection for the BIS mechanisms specifically motivating outgroup avoidance. The results of their experiments demonstrate that feeling comfortable when in contact with target individuals was strongly influenced by whether the target had a conspicuous pathogen cue but not by whether the target was from an ingroup or outgroup (van Leeuwen & Petersen, 2018). It suggests that any links between outgroup prejudice and pathogen-avoidance motivations should therefore be treated as *byproducts* of the BIS (see also Aarøe et al., 2016). It is plausible that as outgroup members often deviate from the typical phenotype within a particular group, negative attitudes toward outgroup

individuals can emerge – but not because the BIS is designed to avoid outgroups in particular but rather because it is designated to avoid atypical humans in general (van Leeuwen & Petersen, 2018).

The reasoning by van Leeuwen and Petersen (2018) has been, however, challenged by Bressan (2021), who reanalyzed their data. She indicated that when defining outgroup membership as dissimilarity from individuals in the local community, the data confirm that the BIS serves as an adaptation to avoid outgroups. Specifically, the reanalysis showed that comfort when in contact with a stranger was a continuously increasing function of their similarity to locals and that people interpreted the same pathogen as more severe in outgroup than in ingroup members (Bressan, 2021). This reinterpretation is in line with the extensive literature linking pathogen avoidance with negativity toward foreign individuals. For instance, consumers choose domestic products because they perceive them as healthier and more natural than foreign-made food products (Gineikiene et al., 2016), negative affect increases when body malodors emanate from a stranger rather than oneself (Stevenson & Repacholi, 2005), and when a threat of disease is salient, people are less prone to accept immigrants (Faulkner et al., 2004), and less willing to affiliate with outgroup members (Millar et al., 2020). All these contributions make the biologically grounded unfamiliar-pathogen theory (Bressan, 2021) an important framework for explaining negative attitudes toward outgroups.

Interestingly, the activation of BIS can also be elicited via language. Common metaphors used to describe immigrants (e.g., “vermin”) can lead to feelings of disgust and anti-immigrant attitudes, especially among those expressing a strong national identity (Marshall & Shapiro, 2018). This could be more likely when the conceptualization of immigration relates directly to a disease and when it is literal rather than metaphorical (Brown et al., 2019).

When a threat is noticed, the next phase in the active BIS is the translation of the perception into action. This occurs via mechanisms through which the disease cues elicit specific affective reactions (especially disgust), as well as through relevant cognitive reactions (e.g., stereotypical beliefs) linking the perceptual object with disease-related semantic concepts (Ackerman et al., 2018). These mechanisms provide a foundation for the motivation to behaviorally avoid a perceived threat.

### The Role of Disgust in the BIS

Disgust has been suggested to play an important role in disease-avoidance strategies, functioning as the first line of defense against infection (Case et al., 2006; Żelaźniewicz & Pawłowski, 2015; see Oaten et al., 2009, for a review). Disgusting stimuli trigger disease-relevant emotional and cognitive responses, facilitating pathogen avoidance (Curtis et al., 2004). Indeed, as described above, humans prefer to distance themselves from those who are perceived as diseased and experience disgust toward them, even when there are no explicit physical symptoms of a disease. For example, people with hepatitis C tend

to be avoided because of the perceived “disgusting” nature of the illness (Golden et al., 2006).

Along with the logic that outgroup members may host novel diseases to which an individual has no immunity, people often exhibit disgust reactions when speaking about ethnic outgroups (Schiefenhövel, 1997). This so-called ‘source effect’ has been widely documented. For example, Case et al. (2006) demonstrated that the magnitude of disgust response is associated with the degree of familiarity with the source. Disgust sensitivity is substantially negatively associated with generalized social trust (Aarøe et al., 2016) and can predict personal space (Park, 2015). Also, given that accents can be a cue for group membership, Reid and colleagues showed (2012) that people high in pathogen disgust sensitivity felt less linguistically similar to outgroup speakers and more similar to ingroup speakers than those with lower levels of disgust sensitivity (see also Mentser & Nussinson, 2020). Similarly, the inclination to be disgusted is related to approval of limitations on immigration policies (Brenner & Inbar, 2015) and those who are more easily disgusted by body odor tend to exhibit prejudice to a higher extent than those not so easily disgusted (Zakrzewska et al., 2019).

Importantly, adaptationist perspectives accentuate the heterogeneity of disgust and point to three functionally specialized disgust domains: pathogen disgust, sexual disgust, and moral disgust (Tybur et al., 2009). While pathogen disgust motivates the avoidance of diseases, sexual disgust motivates the avoidance of sexual partners and behaviors that can be biologically costly (e.g., sex with genetic relatives). Moral disgust, which is distinct from the other two, drives avoidance of social norm violators (Oaten et al., 2009; Tybur et al., 2009).

### Functional Flexibility of the BIS

A specific feature of the BIS is its functional flexibility. Since not all disease-related threats are equally risky and since different individuals hold various levels of immunity and disease vulnerability, the BIS is supposed to react in accordance with these individual and contextual factors (Ackerman et al., 2018). Importantly, the cost/benefit problem must be adaptively solved by the system. When the perceived threat is high and/or one perceives their vulnerability to disease to be elevated, the threat-mitigating actions of the BIS will definitely outweigh the costs. Otherwise, activating avoidance mechanisms may be a waste of effort, as the costs of a defensive response may outweigh the benefits (Schaller & Neuberg, 2012).

One of the most empirically tested chronic factors moderating the behavioral outcomes of the BIS is perceived vulnerability to disease (PVD; Faulkner et al., 2004; Park et al., 2003). People differ in the way they perceive themselves to be susceptible to pathogens as a consequence of their genes and social-learning processes. This individual variability efficiently moderates perceptions and behaviors related to the avoidance of disease transmissions (Faulkner et al., 2004; Schaller, 2006). Previous research has

consequently shown that an individual's self-perceived disease vulnerability predicts negative reactions to others who actually are diseased or are characterized by features heuristically related to disease, such as physical disability (Park et al., 2003), obesity (Park et al., 2007) or old age (Duncan & Schaller, 2009). More importantly, people with higher PVD exhibit greater ethnocentrism (Navarrete & Fessler, 2006) and xenophobic reactions to foreign people (Faulkner et al., 2004). For instance, one study showed that individuals with higher PVD more strongly opposed immigration of a fictitious foreign group and drew the members of that group as less friendly-looking (Faulkner et al., 2004).

Perceived vulnerability to disease is typically assessed by a questionnaire with two internally consistent subscales (Duncan et al., 2009). The first subscale refers to one's beliefs about their susceptibility to infectious diseases (*perceived infectability*; PI), while the other assesses emotional discomfort in contexts connoting a high risk of pathogen transmission (*germ aversion*; GA). The germ aversion subscale reflects more emotion-based avoidant reactions (contrary to the more thoughtful considerations about disease susceptibility assessed by PI), and germ aversion tends to exert a stronger than PI or exclusive effects on xenophobic attitudes and prejudice (Faulkner et al., 2004; Park et al., 2003; for contrary results see Brown et al., 2017). Consequently, it is suggested that these negative attitudes are due less to a rational assessment of disease risk than they are to an automatically-activated aversion to threatening situations (Faulkner et al., 2004).

The functional flexibility principle is also used to explain how specific situational factors impact prejudicial reactions. Just as evolved mechanisms are responsive to individual differences, they are similarly responsive to input from temporary contextual variables (Schaller, 2006). Thus, situational cues, such as sneezing, disgusting smells or information about epidemic outbreaks, seem to be obvious triggers for the BIS, as they all signal the potential presence of pathogens in the immediate surroundings (Ackerman et al., 2018). Among the various effects in this area, making the threat of a pathogen infection temporarily salient was shown to lead to more negative perceptions of disabled people (Park et al., 2003). Likewise, watching a series of pictures that conveyed the ease with which bacteria and germs are transmitted in everyday life made people less likely to endorse immigration of foreign groups (Faulkner et al., 2004).

Experiencing disgust as a consequence of the BIS activation is also a flexible process. The clear prediction stemming from the BIS theory is that greater vulnerability to disease should be associated with increased sensitivity to disease-related cues, and hence with enhanced disgust sensitivity (Oaten et al., 2009). Thus, the same disease-related cue should evoke different responses in the same individual depending on their actual or perceived vulnerability to disease, which can change contextually. The change can be caused by biological reasons (e.g., temporary immunosuppression) or psychological reasons (e.g., imminent disease threat; see Oaten et al., 2009). Indeed, studies have indicated that experiencing disgust can be bolstered by the perceptions of vulnerability to disease. For instance, as Brown et al. (2017) showed, those who perceive themselves to be highly

vulnerable to disease tend to be more disgusted by and desire more social distance from criminal defendants than those with a lower perceived vulnerability to disease.

As both the perceived vulnerability to disease and disgust sensitivity display individual differences in avoiding pathogens, they are conceptualized as relatively stable characteristics, not so easily malleable to situational circumstances or pathogen avoidance motives (e.g., Tybur et al., 2009). However, empirical evidence indicates that certain ecological factors can temporally shift these qualities. For instance, as physical proximity plays a pivotal role in disease transmission, Brown and Sacco (2019) showed that crowd salience heightened state levels of both perceived infectability and germ aversion. Also, in line with the idea that in environments where survival is difficult, lower levels of disgust sensitivity should allow the consumption of available resources, Batres and Perrett (2020) demonstrated that an increase in the perceived harshness of the environment was associated with a decrease in pathogen disgust sensitivity. We might expect that an increase in disgust sensitivity would be possible when exposed to a highly salient disease threat (Stevenson et al., 2021). Indeed, recent natural circumstances related to the COVID-19 pandemic have let us observe such effects. And although we should be cautious in treating any pandemic situation as an immediate trigger for the BIS (see Ackerman et al., 2021), recent research indicates that facing the COVID-19 pandemic noticeably affected BIS-related factors. For instance, Stevenson et al. (2021) showed that students expressed higher levels of core disgust and germ aversion during the COVID-19 lockdown in Australia than before the COVID-19 pandemic. Similarly, Polish women reported higher levels of disgust sensitivity during the COVID-19 pandemic than during the pre-pandemic period (Miłkowska et al., 2021). Also, Croatians scored higher on PVD and pathogen disgust, as well as preferred greater interpersonal distances during the pandemic comparing to pre-pandemic samples, especially when living on the islands (Hromatko et al., 2021). Apparently, a highly salient disease threat (such as during a pandemic) has the power to increase the intensity of germ aversion and disgust sensitivity (see also Stevenson et al., 2021).

Recent theoretical developments and empirical evidence also point to the fact that pathogen avoidance behavior depends on the trade-off between the perceived costs of pathogen exposure and the perceived benefits of social contact (Brown et al., 2021; Sacco et al., 2014; Tybur et al., 2020). Disease concerns impose limitations on affiliative opportunities, thus satisfying the goal of disease avoidance comes at the expense of forming and maintaining valuable social interactions. What follows is the prediction that under the circumstances of a highly salient affiliative motive, the organism would down-regulate disease concerns (see Brown et al., 2021). Indeed, socially excluded participants indicated lower levels of PVD than control participants (Sacco et al., 2014), while the interpersonal value of an individual covaried with the participants' comfort with infection-risky acts with them (Tybur et al., 2020). These examples suggest that BIS reactions



are highly flexible and that they depend on ecological, situational circumstances, as well as on the intrapersonal trade-offs between various motives.

## What Is the Relation Between Affective and Behavioral Elements of Attitudes Toward Outgroups Shaped by the BIS Activation?

The vast majority of studies concerning the social consequences of the BIS activation in humans have focused on evaluative responses of participants toward different social groups—those heuristically associated with disease (e.g., disabled people) as well as outgroups (e.g., immigrants, foreign people). In such studies, researchers assessed the affective components of intergroup relations (e.g., *feeling thermometer* – Huang et al., 2011; Sorokowski et al., 2020; *ethnocentrism* – Navarrete et al., 2007), as well as antipathy (Park et al., 2007), trustworthiness (Aarøe et al., 2016), racism measures (Huang et al., 2011) or implicit associations with negative disease-connoting concepts (Duncan & Schaller, 2009; Faulkner et al., 2004; Park et al., 2007). Actual social distancing and behavioral avoidance tendencies have been less frequently examined. Dependent variables have included preferred personal space (Park, 2015), avoidant motor responses (Miller & Maner, 2011) and, most often, preferred social distance as measured by Bogardus-type scales which measure varying degrees of closeness among people towards other members of diverse social groups (e.g., Aarøe et al., 2016; Sorokowski et al., 2020). However, to our knowledge, although both types of measures— affective and behavioral—have sometimes been used within one study (Sorokowski et al., 2020; see also Hromatko et al., 2021), no study has examined the relation between them. Specifically, based on the BIS theory, it can be derived that behavioral tendencies toward individuals from specific social groups can be predicted by the affective responses toward them (Faulkner et al., 2004). In the models tested in this study, we investigated whether general feelings toward foreign individuals would predict preferences for behavioral avoidance.

## The Present Study

Our study was designed to verify the functioning of the BIS under COVID-19 pandemic conditions. In the first part of the study, we investigated the predictive indirect relation between a perceived threat of COVID-19 and preferred social distance from foreign individuals, and the mediating roles of disgust sensitivity and general feelings toward outgroups. A complete mediational path from perception of threat via disgust sensitivity and general affective reactions toward foreign individuals, including behavioral avoidance tendencies, has not been tested before within a single study. Crucially, we predicted that i) the perceived threat of COVID-19 would be positively associated with pathogen disgust (not sexual or moral disgust), ii) pathogen disgust would predict general feelings toward foreign individuals, and iii) general feelings would predict the preferred social distance from these individuals.

Additionally, we expected the same pattern of serial mediation for the germ aversion dimension of PVD as the first mediator. GA is conceptually closely related to pathogen disgust as they both focus on the affective and motivational responses to potential pathogens. On the contrary, we did not expect the perceived infectability dimension of PVD to significantly mediate the relation between COVID-19 threat and social distancing. Since negative attitudes are due less to a rational assessment of disease risk than they are to an automatically-activated aversion to threatening situations (Faulkner et al., 2004), PI does not fit well into the model as it constitutes more thoughtful considerations about disease susceptibility (see also Makhanova & Shepherd, 2020).

In line with the reasoning set out earlier in this paper, we suggest that the perceived threat of COVID-19 would augment both disgust sensitivity and germ aversion, as the pandemic situation has constituted a highly salient disease threat. Recent empirical evidence documenting the effects of the COVID-19 pandemic supports that line of reasoning (e.g., Hromatko et al., 2021; Miłkowska et al., 2021; Stevenson et al., 2021).

Additionally, as women tend to be more sensitive to disgust than men (Curtis et al., 2004; Tybur et al., 2011) and because disgust sensitivity declines with age (Fessler & Navarrete, 2005), we controlled for sex and age in all analyses. Also, taking into account the predictions coming from compensatory control theory (Kay & Eibach, 2013) we controlled for participants' sense of control.<sup>1</sup> All data are freely available (see Supplementary Materials).

## Method

### Participants

Respondents were recruited from the SWPS University of Social Sciences and Humanities (via SONA system) and a social media webpage ([www.facebook.com](http://www.facebook.com)). In total, 624 participants declared their consent to participate. However, 36 did not fill out the questionnaire. Thus, the final sample consisted of 588 (490 women and 98 men) Polish participants. Participation was voluntary or for credit points (when via SONA). The Ethical Review Board at SWPS University, Faculty of Psychology in Sopot, approved this study. Participants were informed that they were taking part in a study on current social attitudes and were asked to fill out a web-based survey via Qualtrics. All study materials were in Polish (see Supplementary Set of Questionnaires in the Supplementary

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1) Personal control is an important factor contributing to avoidance tendencies toward foreign individuals (Kay & Eibach, 2013). For instance, lower levels of personal control are related to negative intergroup beliefs and attitudes (e.g., Fritzsche & Jonas, 2009). The threat of the COVID-19 pandemic can significantly lower one's sense of control as a consequence of the potential or actual loss of valued resources. For this reason, we decided to include measures of personal control in our study to control for its influence. We elaborate more on personal control in the Supplementary Additional Analyses (see Supplementary Materials) presenting the results for alternative mediational models.

**Materials.** The mean age of the participants was  $M = 28.59$  ( $SD = 9.00$ ), and they had an age range of 19–61. Data collection started on March 18, 2020, after the government’s announcement of the first COVID-19 pandemic lockdown in Poland, and ended 3 weeks later, on April 9, 2020.

## Procedure and Materials

### Perceived Threat of COVID-19

To measure the perceived threat of COVID-19, participants indicated their agreement with eight statements on a 7-point scale (from 1 = *strongly disagree* to 7 = *strongly agree*; Szymkow et al., 2021). The scale included items measuring the extent to which participants perceived coronavirus to be a threat to their lives (e.g., “I think that coronavirus is a real threat to my life”, “I am convinced that the media are exaggerating the threat of coronavirus”). Ratings for these items were averaged to form an index of the perceived threat of COVID-19 ( $\alpha = .71$ ).

### Disgust Sensitivity

To measure disgust propensity, we used the Three Domain Disgust Scale (TDDS; Tybur et al., 2011). The questionnaire describes 21 situations that refer to three disgust domains: *moral disgust* (e.g., “Students cheating to get good grades”), *pathogen disgust* (e.g., “Standing close to a person who has body odor”) and *sexual disgust* (e.g., “Performing oral sex”). Participants rated each situation using a 7-point scale (from 1 = *it is not disgusting at all* to 7 = *it is extremely disgusting*). We averaged scores for three subscales separately: moral disgust ( $\alpha = .81$ ), pathogen disgust ( $\alpha = .70$ ) and sexual disgust ( $\alpha = .76$ ).

### Perceived Vulnerability to Disease

To measure subjective perceptions of susceptibility to disease, we used the Perceived Vulnerability to Disease Scale (PVD; Duncan et al., 2009). The scale consists of 15 statements that were assessed by respondents on a 7-point scale (from 1 = *strongly disagree* to 7 = *strongly agree*). The scale is composed of two subscales: perceived infectability (PI;  $\alpha = .80$ ) and germ aversion (GA;  $\alpha = .71$ ), which will be investigated separately.

### General Feelings Toward Outgroups

To measure affective evaluations of outgroups, we used affect-feeling thermometers (e.g., Hamilton & Zanna, 1972). Respondents were presented with a “feeling thermometer” to indicate how favorably or unfavorably (from 0°C to 100°C) they felt toward Germans, Ukrainians, Italians, the British, Lithuanians, and Finns.<sup>2</sup> The nationalities were chosen to include various European countries where the pandemic had developed quite strongly

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2) For exploratory purposes, we additionally asked respondents to evaluate Poles and Poles living abroad.

(Italy, Great Britain) and countries that are geographically close to Poland (like Germany or Lithuania), such that the probability of someone from that country coming to Poland was realistic<sup>3</sup>. We averaged the scores for all evaluations to compute an index of general feelings toward members of these outgroups ( $\alpha = .89$ ).

### Social Distancing

We measured an individual's readiness for social contact with foreign individuals using a Bogardus-type Social Distance Scale (Bogardus, 1925) following Sagiv and Schwartz (1995), who anchored the original statements on a Likert scale (from 1 = *I would definitely not accept* to 4 = *I would definitely accept*; see also Sorokowski et al., 2020). Our respondents were asked how willing they would be to have each of the following three types of contact with individuals from the presented nationalities (i.e., Germans, Ukrainians, Italians, the British, Lithuanians, and Finns). For example, the items considering German people were as follows: "To have a German man or woman as a neighbor on my street", "To have a German man or woman employed in my occupation", "To have a close kinship by marriage with a German man or woman". All measures were recoded so that higher values reflected greater social distancing preferences. As averaged responses for each outgroup constituted reliable indexes (all  $\alpha > .90$ ), we created an overall index of preferred social distance from outgroup individuals ( $\alpha = .97$ ).

### Sense of Control

To assess participants' general sense of control, we used the MIDI Sense of Control Scale (Lachman & Weaver, 1998). Respondents were asked to check the box corresponding to the answer that best represented their level of agreement with 12 statements on a 7-point scale (from 1 = *strongly disagree* to 7 = *strongly agree*). The scale is composed of two subscales, i.e., perceived constraints (PC;  $\alpha = .85$ ) and personal mastery (PM;  $\alpha = .83$ ), for which we calculated the sum of answers as two total scores.<sup>4</sup> We measured this variable to control its influence in our main analyses.

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3) To provide some context it should be indicated that all these groups (except Ukrainians) are evaluated positively in Poland and they do not trigger strong negative emotions. According to a report from a survey on a representative sample of Poles, groups of Germans, Italians, the British, Lithuanians, and Finns are more liked than disliked, whereas Ukrainians are more disliked than liked (CBOS, 2019). We included Ukrainians in our study as they are one of the most extensive minority groups in Poland, whose members frequently travel between Ukraine and Poland. Those six groups were expected to be perceived as nationally and culturally foreign to participants who were all Polish citizens. Importantly, in this study, all included groups were evaluated positively with all means above the mid-point of the scale.

4) We also had additional measures in the study (political beliefs, self-perceived religiosity, subjective well-being, agreement with the government's decisions concerning COVID-19, homonegativity toward homosexuals, system justification, information about sexual orientation, pregnancy, gestational age, fertility, last flu vaccination, education level, and earnings). We do not discuss them, as they served to verify hypotheses not related to the topic presented here.

Items for all scales are presented in the Supplementary Set of Questionnaires (see [Supplementary Materials](#)).

## Results

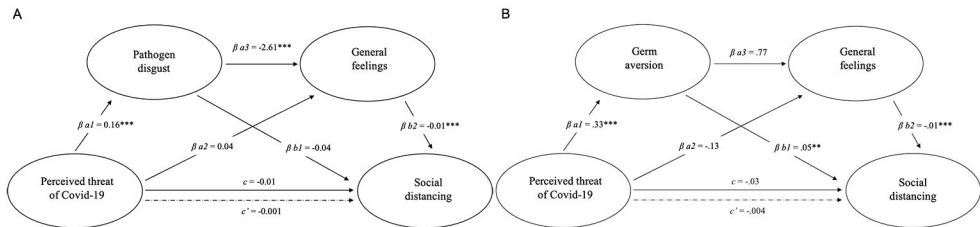
### Initial Analyses

We first computed correlations between the continuous variables. Descriptive statistics and correlations among items comprising all measured variables are presented in Table 1 in the [Supplementary Materials](#)). We examined the relation between the perceived threat of COVID-19 and social distancing in two independent series of sequential mediation analyses using Hayes's (2013) PROCESS macro with a bootstrapping procedure (5,000 resamples), once using the three facets of disgust as mediators and once using the subscales of PVD as mediators. We observed a moderate correlation between GA and PI scores ( $r = .27, p < .001$ ), similarly to Muggleton and Fincher (2017).

### The Mediating Role of Disgust Sensitivity

To determine the serial-multiple mediation of disgust (pathogen, sexual, and moral disgust separately) and general feelings toward outgroup individuals in the relationship between the perceived threat of COVID-19 and social distancing, we conducted three separate analyses using Model 6 PROCESS (Hayes, 2013). As recommended by Hayes (2013), the regression/path coefficients were unstandardized. All analyses were conducted with participants' sex, age, personal mastery, and personal constraints as covariates.

The results of the first analysis ( $N = 584$ ; Perceived threat of COVID-19  $\rightarrow$  Pathogen disgust  $\rightarrow$  General feelings  $\rightarrow$  Social distancing) are presented in Figure 1 (A). The indirect effect of the two-mediator sequential pattern was significant, as indicated by the fact that the 95% CI did not include zero,  $b = 0.005$ , 95% CI [0.002, 0.011]. This finding is consistent with the hypothesis that the higher the perceived threat of COVID-19 is, the higher the pathogen disgust sensitivity, which further predicts negative feelings toward outgroups, which in turn negatively predicts the preferred social distance. The mediation model also tested two single-mediator pathways. First, it tested whether the effect of perceived threat of COVID-19 on social distancing was mediated by pathogen disgust alone when general feelings were controlled. This indirect effect was not significant,  $b = -0.006$ , 95% CI [-0.017, 0.001]. Second, the model tested whether the effect of the perceived threat of COVID-19 on social distancing was mediated by general feelings toward foreign individuals alone when pathogen disgust was controlled. This effect was also not significant,  $b = -0.001$ , 95% CI [-0.021, 0.020]. The model overall reached statistical significance,  $F(7, 576) = 24.81, p < .001$ , and explained 23.17% of the total variance in social distancing (Table A, Appendix A).

**Figure 1***Serial-Multiple Mediation Analyses*

Note. Two-mediator sequential model depicting the relationship between the perceived threat of COVID-19 and social distancing, as mediated by pathogen disgust (A), and two-mediator sequential models depicting the relationship between the perceived threat of COVID-19 and social distancing, as mediated by germ aversion (B); with non-standardized beta values.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

The second analysis ( $N = 584$ ; Perceived threat of COVID-19  $\rightarrow$  Sexual disgust  $\rightarrow$  General feelings  $\rightarrow$  Social distancing) was conducted in the same way, except that the first mediator was replaced by sexual disgust. The indirect effect of the two-mediator sequential pattern was nonsignificant,  $b = 0.002$ , 95% CI [-0.001, 0.006]. In the analyses of two single-mediator pathways, the effect of the perceived threat of COVID-19 on social distancing was not mediated by sexual disgust,  $b = 0.005$ , 95% CI [-0.001, 0.015]. The model also did not confirm the effect of perceived threat of COVID-19 on social distancing mediated by general feelings toward outgroup members alone,  $b = 0.003$ , 95% CI [-0.016, 0.022]. The model overall was at a significant level,  $F(7, 576) = 26.81$ ,  $p < .001$  and explained 24.58% of the total variance in social distancing (Table 2, [Supplementary Materials](#)).

Finally, when we entered moral disgust as the first mediator in the model ( $N = 584$ ; Perceived threat of COVID-19  $\rightarrow$  Moral disgust  $\rightarrow$  General feelings  $\rightarrow$  Social distancing), the indirect effect of the two-mediator sequential pattern was not significant, as the 95% CI included zero,  $b = -0.001$ , 95% CI [-0.005, 0.000]. Similarly, testing two single-mediator pathways showed that the effect of the perceived threat of COVID-19 on social distancing was not mediated by moral disgust when general feelings toward foreign individuals were controlled,  $b = -0.004$ , 95% CI [-0.013, -0.001], or by general feelings when moral disgust was controlled,  $b = 0.006$ , 95% CI [-0.015, 0.026]. The model overall reached significance,  $F(7, 576) = 25.28$ ,  $p < .001$ , and explained 23.50% of the total variance in social distancing (Table 3, [Supplementary Materials](#)).

## Mediating Role of GA and PI

We conducted separate analogous serial-multiple mediation analyses with each of the subscales of PVD (i.e., germ aversion and perceived infectability) as the first mediator

and general feelings toward outgroup individuals as the second mediator, for the relationship between perceived threat of COVID-19 and social distancing.

The results of the first analysis ( $N = 584$ ; Perceived threat of COVID-19 → Germ aversion → General feelings → Social distancing) with GA as the first mediator are presented in Figure 1 (B). Unlike in the case of pathogen disgust, the indirect effect of the two-mediator sequential pattern was not significant, as the 95% CI included zero,  $b = 0.003$ , 95% CI  $[-0.002, 0.010]$ . Only when the two single-mediator pathways were tested was the effect of perceived threat on social distancing mediated by GA,  $b = 0.016$ , 95% CI  $[0.005, 0.029]$ , and not by general feelings toward foreign individuals,  $b = 0.002$ , 95% CI  $[-0.019, 0.021]$ . The model overall reached statistical significance,  $F(5, 578) = 13.87$ ,  $p < .001$  and explained 10.71% of the total variance in social distancing (Table B.1, Appendix B).

The second analysis ( $N = 584$ ; Perceived threat of COVID-19 → Perceived infectability → General feelings → Social distancing) was conducted with PI instead of GA as the first mediator. Again, the indirect effect of the two-mediator sequential pattern was not significant, as the 95% CI included zero,  $b = -0.007$ , 95% CI  $[-0.018, 0.010]$ . In the analyses of two single-mediator pathways, the effect of perceived threat on social distancing was not mediated by PI,  $b = -0.009$ , 95% CI  $[-0.033, 0.014]$ , or by general feelings toward outgroups alone,  $b = 0.012$ , 95% CI  $[-0.011, 0.034]$ . The model overall reached statistical significance,  $F(5, 578) = 52.60$ ,  $p < .001$  and explained 30.86% of the total variance in social distancing (Table B.2, Appendix B).

## Discussion

Results provided support for our hypotheses. Firstly, the perception of the COVID-19 threat predicted social distancing from foreign individuals indirectly through disgust sensitivity and further through general feelings toward those individuals. Importantly, the effect was significant only for pathogen disgust but not for sexual or moral disgust. This is what was directly derived from the concept of the BIS – people who perceive disease threat as high are more prone to react with disgust in the pathogen domain. And as COVID-19 is carried by respiratory droplet transmission, the threat of it should be related to neither sexual nor moral disgust (Oaten et al., 2009; Tybur et al., 2009).

Secondly, in the case of germ aversion and perceived infectability, our predictions were also supported. GA, as opposed to PI, was a significant mediator between the threat of COVID-19 and social distancing. However, the level of GA did not predict the preference for social distancing through general feelings toward foreign people, but only directly. This is a noticeable difference between the mediating role of pathogen disgust and GA. The theoretical foundation of the BIS indicates that noticing the threat is further translated into action through affective and/or cognitive reactions, which eventually trigger avoidant behavior (Ackerman et al., 2018). This is exactly what happened in our me-

diation model with pathogen disgust as the first mediator, but we failed to demonstrate the same result for GA. Apparently, GA need not be translated into action through affective reactions. This is in line with the evidence presented by [Makhanova and Shepherd \(2020\)](#), where GA was shown to be strongly associated with behaviors. Specifically, it was associated with fewer face-to-face interactions during social distancing and greater anxiety about social distancing during the COVID-19 pandemic. Additionally, we suggest that the reason for the difference between pathogen disgust and GA lies in the nature of the given constructs and the way they are measured. Despite their similarities, it should be emphasized that as the scale of pathogen disgust focuses solely on experiencing a repulsive state toward various factors, the GA scale consists of only a few items referring directly to emotional states (e.g., “It really bothers me when people sneeze without covering their mouths” or “It does not make me anxious to be around sick people”), including others more clearly related to behaviors (e.g., “I avoid using public telephones because of the risk that I may catch something from the previous user” or “I prefer to wash my hands pretty soon after shaking someone's hand”). As a consequence, it is plausible that experiencing disgust translates easily into general feelings toward foreign individuals (both operating on the affective level), while being germ-aversive is more action-oriented and thus prone to translating directly into distancing tendencies.

The results of our study positively verified the relevance of the BIS model. Previous research focused on testing isolated elements of this model, also proving their validity in experimental research. It also concentrated on one particular category of social consequences (namely affective or behavioral), not investigating their interplay (e.g., [Faulkner et al., 2004](#)). We have shown that all these elements worked together in the predicted way in the context of the COVID-19 pandemic. The perceived threat of COVID-19 is supposed to be translated into preference for distance through pathogen disgust, which induces affective reactions that eventually trigger avoidant behavior ([Ackerman et al., 2018](#)). But as our results of the mediating role of GA indicate, the indirect path is not a necessity – germ aversion translated into distancing tendencies directly, not through triggering general feelings toward foreign individuals.

The results of our study resonate with other studies investigating BIS during the COVID-19 pandemic. For instance, [Shook et al. \(2020\)](#) showed that both pathogen disgust and germ aversion were the two variables most consistently associated with COVID-19 concern and preventative health behavior in their study. Similarly, data collected from a sample of British adults showed that individual differences in both disgust sensitivity and intergroup disgust sensitivity significantly explained variability in outgroup distancing ([Meleady et al., 2021](#)). Also, in another study, participants presented with morbidity and mortality statistics concerning COVID-19 reported higher levels of the GA subdimension of PVD, but not PI ([Bacon & Corr, 2020](#)). Along with our expectations, PI did not fit well into the model, probably because it constitutes more thoughtful than affective considerations about disease susceptibility (e.g., [Makhanova & Shepherd, 2020](#)).



Those and our results confirm the significant role of both disgust and germ aversion in the disease-avoidance mechanisms (Ackerman et al., 2018; Faulkner et al., 2004; Oaten et al., 2009) and also point to the functional flexibility of the BIS (Ackerman et al., 2018), as the perceived threat of COVID-19 predicted a greater social distance from foreign people only via pathogen disgust (but not sexual or moral disgust). Like other evolutionary mechanisms, this one also proves its sensitivity to individual differences and temporary contextual variables (Schaller, 2006).

As mentioned in the introduction, recently some doubts have arisen as to whether the BIS is adapted to avoid outgroups or rather any infected individual (van Leeuwen & Petersen, 2018). Although our study cannot settle this dispute, the additional analyses (see Additional Analyses in the [Supplementary Materials](#)) indicated that the perceived threat of COVID-19 did not predict general feelings toward the ingroup (i.e., Polish individuals both living in Poland and abroad). We included this measure in our study, as given the fact that at the time we started data collection, COVID-19 was already salient in Poland, it was not very unlikely that the perceived threat of COVID-19 would be associated with negative attitudes toward the ingroup as well (via disgust or via GA). However, as mentioned, this was not the case.

Our results add to a growing number of studies that highlight how the COVID-19 pandemic situation translated into BIS activation (e.g., Bacon & Corr, 2020; Hromatko et al., 2021; Makhanova & Shepherd, 2020; Meleady et al., 2021; Miłkowska et al., 2021; Sorokowski et al., 2020; Stevenson et al., 2021; Szymkow et al., 2021). Again, we have shown the importance of pathogen disgust and germ aversion in shaping general evaluations of foreign individuals, and that these general feelings lead to the preferred social distance toward outgroups. Such mediational paths have been built on the assumptions of the behavioral immune system theory (e.g., Faulkner et al., 2004), and have proven their relevance in the studies of interpersonal and intergroup relations.

The apparent limitation of this study is its correlational design. Although the mediational analyses tested here were derived directly from the theory of the BIS and its single paths were tested experimentally in other studies (e.g., Faulkner et al., 2004), it would undoubtedly be reassuring to prove these relations within one experiment. In addition, as this was an online study relying on self-reporting, it is necessary to replicate it with more objective measures.

## Conclusion

Among the numerous threats indicated by social psychologists to play an important role in shaping prejudice, xenophobia, and social distancing toward outgroup members (e.g., Stephan et al., 1999), there are those which are related to disease. During pandemics, including the COVID-19 pandemic, when the threat to our lives becomes real, investigating the consequences of disease threats on social cognition and behavior is highly important. The research on the BIS has evidenced its connections to diverse social psychological

phenomena, including negative evaluations of outgroup individuals and social distancing. In the study presented here we have shown that the model of disease-avoidance derived from the BIS theory significantly explains the preferred social distance from foreign individuals during the COVID-19 pandemic. Although we are careful in giving priority to this idea, as social attitudes toward outgroups have been shown to have various origins, our results suggest that in times of elevated disease threat, the behavioral immune system can be an important framework for understanding social distancing tendencies.

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**Funding:** This work was supported by the Ministry of Science and Higher Education in Poland under the 2019-2022 program „Regional Initiative of Excellence”, project number 20/2020/RID.

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**Acknowledgments:** The authors have no additional (i.e., non-financial) support to report.

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**Competing Interests:** The authors have declared that no competing interests exist.

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**Data Availability:** For this article, a dataset is freely available (Szymkow, Frankowska, & Gałasińska, 2021).

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## Supplementary Materials

All data and study materials for this paper are available via the OSF repository (for access see [Index of Supplementary Materials](#) below).

### Index of Supplementary Materials

Szymkow, A., Frankowska, N., & Gałasińska, K. (2021). *Supplementary materials to "Social distancing from foreign individuals as a disease-avoidance mechanism: Testing the assumptions of the behavioral immune system theory during the COVID-19 pandemic"* [Dataset file, set of questionnaires, tables, additional analyses]. OSF. <https://osf.io/bg5t/>

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# Appendices

## Appendix A

**Table A**

*Coefficients for Direct and Indirect Effects of Serial-Multiple Mediation Analysis of the Model: Perceived Threat of COVID-19 → Pathogen Disgust → General Feelings Toward Foreign Individuals → Social Distancing, With Control Variables, N = 584*

Variable	Pathogen disgust (M1)					General feelings (M2)					Social distancing (Y)					Indirect effects coefficients				
	b	SE	t	p	95% CI <sup>a</sup>	b	SE	t	p	95% CI <sup>a</sup>	b	SE	t	p	95% CI <sup>a</sup>	b	SE	LL	UL	
<b>Direct effects paths</b>																				
Perceived threat of COVID-19 (X)	0.162	0.041	0.062	.041	0.081	0.242	0.042	0.784	0.054	.957	-1.498	1.583	-0.004	0.021	-0.176	.860	-0.044	0.037		
Pathogen disgust						-2.612	0.789	-3.312	.001	-4.162	-1.063	-0.039	0.021	-1.842	.660	-0.080	0.003			
General feelings											-0.013	0.001	-0.001	-11.845	<0.001	-0.015	-0.001			
Gender	-0.070	0.092	-0.761	.447	-0.251	0.111	-5.374	1.750	-3.071	.002	-8.811	-1.934	0.079	0.046	1.705	.089	-0.012	0.170		
Age	-0.008	0.004	-2.024	.043	-0.016	-0.000	0.206	0.075	2.736	.006	0.058	0.353	0.005	0.002	2.330	.020	0.001	0.009		
Perceived constraints	-0.016	0.006	-2.717	.007	-0.028	-0.004	-0.046	0.113	-0.408	.683	-0.267	0.175	-0.003	0.003	-0.968	.333	-0.009	0.003		
Personal mastery	0.040	0.012	3.270	.001	0.016	0.065	0.746	0.236	3.158	.002	0.282	1.210	-0.010	0.006	-1.530	.127	-0.022	0.023		
Total effect X → Y											-0.005	0.023	-0.218	.827	-0.049	0.040				
<b>Indirect effects paths</b>																				
Perceived threat of COVID-19 → Pathogen disgust → Social distancing																	-0.006	0.004	-0.017	0.001
Perceived threat of COVID-19 → General feelings → Social distancing																	-0.001	0.010	-0.021	0.020
Perceived threat of COVID-19 → Pathogen disgust → General feelings → Social distancing																	0.005	0.002	0.002	0.011
Total indirect effect																	-0.001	0.011	-0.023	0.020

<sup>a</sup>95% CI is presented as bias-corrected and accelerated 5,000 bootstrapping.

Appendix B

**Table B.1**  
*Coefficients for Direct and Indirect Effects of Serial-Multiple Mediation Analysis of the Model: Perceived Threat of COVID-19 → Germ Aversion → General Feelings Toward Foreign Individuals → Social Distancing. With Control Variables, N = 584*

Variable	Germ aversion (M1)					General feelings (M2)					Social distancing (Y)					Indirect effects coefficients				
	b	SE	t	p	95% CI <sup>a</sup>	b	SE	t	p	95% CI <sup>a</sup>	b	SE	t	p	95% CI <sup>a</sup>	b	SE	LL	UL	
<b>Direct effects paths</b>																				
Perceived Threat of COVID-19 (X)	0.328	0.047	6.958	< .001	0.236 0.421	-0.126	0.813	-0.155	.877	-1.722 1.470	-0.026	0.021	-1.234	.218	-0.067 0.015					
Germ Aversion						-0.772	0.688	-1.123	.262	-2.123 0.579	0.050	0.018	2.780	.006	0.015 0.085					
General feelings											-0.013	0.001	-11.604	< .001	-0.015 -0.010					
Gender	-0.152	0.107	-1.427	.154	-0.362 0.057	-5.308	1.767	-3.004	.003	-8.778 -1.838	0.091	0.046	1.978	.048	0.001 0.182					
Age	0.009	0.005	2.036	.042	0.000 0.018	0.234	0.076	3.083	.002	0.085 0.383	0.004	0.002	2.209	.028	0.001 0.008					
Perceived constraints	-0.013	0.007	-1.891	.059	-0.026 0.001	-0.014	0.113	-0.124	.901	-0.236 0.208	-0.002	0.003	-0.546	.585	-0.007 0.004					
Personal mastery	0.030	0.014	2.068	.039	0.002 0.058	0.664	0.237	2.800	.005	0.198 1.129	-0.013	0.006	-2.078	.038	-0.025 -0.001					
Total effect X → Y											-0.005	0.023	-0.218	.827	-0.049 0.040					
<b>Indirect effects paths</b>																				
Perceived Threat of COVID-19 → Germ Aversion → Social distancing																0.016	0.006	0.005	0.029	
Perceived Threat of COVID-19 → General feelings → Social distancing																0.002	0.010	-0.019	0.021	
Perceived Threat of COVID-19 → Germ Aversion → General feelings → Social distancing																0.003	0.003	-0.002	0.010	
Total indirect effect																0.021	0.012	0.001	0.044	

<sup>a</sup>95% CI is presented as bias-corrected and accelerated 5,000 bootstrapping.

**Table B.2**

*Coefficients for Direct and Indirect Effects of Serial-Multiple Mediation Analysis of the Model: Perceived Threat of COVID-19 → Perceived Infectability → General Feelings Toward Foreign Individuals → Social Distancing, With Control Variables, N = 584*

Variable	Perceived Infectability (M1)					General feelings (M2)					Social distancing (Y)					Indirect effects coefficients				
	b	SE	t	p	95% CI <sup>a</sup>	b	SE	t	p	95% CI <sup>a</sup>	b	SE	t	p	95% CI <sup>a</sup>	b	SE	LL	UL	
<b>Direct effects paths</b>																				
Perceived Threat of COVID-19 (X)	0.623	0.043	14.360	< .001	0.538 0.708	-0.913	0.909	-1.004	.316	-2.698 0.873	-0.001	0.024	-0.046	.964	-0.048 0.046					
Perceived Infectability						0.855	0.748	1.143	.254	-0.614 2.325	-0.014	0.020	-0.710	.478	-0.052 0.025					
General feelings											-0.013	0.001	-11.627	< .001	-0.015 -0.011					
Gender	-0.066	0.098	-0.676	.499	-0.259 0.126	-5.134	1.764	-2.910	.004	-8.599 -1.668	0.082	0.046	1.775	.077	-0.009 0.173					
Age	-0.004	0.004	-0.914	.361	-0.012 0.004	0.230	0.076	3.041	.003	0.081 0.378	0.005	0.002	2.419	.016	0.001 0.009					
Perceived constraints	-0.014	0.006	-2.216	.027	-0.026 -0.002	0.008	0.133	0.069	.945	-0.215 0.230	-0.002	0.003	-0.824	.410	-0.008 0.003					
Personal mastery	-0.007	0.013	-0.526	.599	-0.033 0.019	0.647	0.236	2.739	.006	0.183 1.110	-0.011	0.006	-1.841	.066	-0.024 0.001					
Total effect X → Y											-0.005	0.023	-0.218	.827	-0.049 0.040					
<b>Indirect effects paths</b>																				
Perceived Threat of COVID-19 → Perceived Infectability → Social distancing																-0.009	0.012	-0.033	0.014	
Perceived Threat of COVID-19 → General feelings → Social distancing																0.012	0.013	-0.011	0.034	
Perceived Threat of COVID-19 → Perceived Infectability → General feelings → Social distancing																-0.007	0.006	-0.018	0.005	
Total indirect effect																-0.004	0.015	-0.033	0.026	

<sup>a</sup>95% CI is presented as bias-corrected and accelerated 5,000 bootstrappings.



*Social Psychological Bulletin* (SPB) is an official journal of the Polish Social Psychological Society (PSPS).



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