



Contamination fear in the time of the COVID-19 pandemic: A moderated mediation quasi-experimental model of the effect of disgust on outgroup bias towards diaspora

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Abstract

Disgust sensitivity plays a key role in generating and maintaining outgroup biases. To test our hypotheses, we used a quasi-experimental between-subjects design, in which participants were randomly assigned to a disgust induction condition ($N = 102$) or a non-induction neutral group ($N = 92$). The induction scenario featured the return of the diaspora to their home country due to COVID-19 concerns. In one scenario, the diaspora lied about the country they arrived from, and in the other, there was no moral transgression. We hypothesized that the effect of disgust sensitivity on dehumanization and aggressive tendencies passed through contamination fear and the moderated mediation model indicated that this indirect effect was stronger for participants in the disgust-induction than in the non-induction group. This effect was found for biological dehumanization and passive aggression outcomes, both related to outgroup bias. Consistent with the role of disgust as a disease-avoidance mechanism, our results suggest that disgust could facilitate stronger outgroup bias in the context of a high health threat, such as the COVID-19 pandemic.

Keywords Disgust sensitivity · Moral disgust · Dehumanization · Aggression · COVID-19;

Introduction

In the last two centuries, we have witnessed a large-scale migration, which is impacting the social identity and behavior of individuals. An important focus is represented by the diasporic identities that are simultaneously local and global, leading to transnational identifications (Binks & Ferguson, 2014). During global situations, such as the one related to the COVID-19 pandemic, the social identity becomes salient, which might lead to a phenomenon named *outgroup bias*, represented by prejudice against outgroups (Jacoby-Senhor et al., 2015; Ratliff & Nosek, 2011).

The symbolic ideations about specific outgroups could shape social relations leading to intergroup conflict (Hodson et al., 2013). In the current paper, we particularly targeted the outgroup bias towards the return of the diaspora to their home country in the context of the COVID-19 pandemic, a return that was often mediatized and villainized by the press. In the process we looked at *dehumanization* - the idea that people are deprived of their proper humanity (Haslam, 2006) – and *aggressive tendencies* towards others – as outgroup manifestations can lead to serious consequences, such as genocides or wars (Giner-Sorolla et al., 2011; Haslam & Loughnan, 2014; Viki et al., 2013).

Additionally, dehumanization is highly related to the concept of intergroup violence due to altering the perception of the victims. To understand outgroup bias, we must understand the way morality, dehumanization, and aggression are intertwined.

Nowadays, when the threat of disease is more salient than ever, it is paramount to understand the role of specific emotions, such as *disgust* and *contamination fear* (i.e., increased contamination concerns; Rachman, 2004) on outgroup perceptions, being two mechanisms highly associated to disease-avoidance (Olatunji et al., 2004, 2005). We particularly refer here to two forms of disgust, that is *induced disgust* or

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state-disgust and *disgust sensitivity* otherwise known as trait-disgust, the relatively stable predisposition to experience state-disgust recurrently (DS; Haidt et al., 1994; Olatunji et al., 2007; Petrowski et al., 2010).

Over time, researchers proposed several taxonomies of disgust, one of the most popular being the eight-domains (food, sex, body products, envelope violations, socio-moral violations, animals, hygiene, and death) structure proposed by Haidt et al. (1994) divided into four factors, *Core Disgust* (i.e., serving primarily as a food rejection response and centered on oral defense against germ stimuli), *Sociomoral Disgust* (i.e., disgust related to the violation of moral and social values), *Animal-Nature Disgust* (i.e., disgust elicited by stimuli that remind humans of their animal origins) and *Interpersonal Disgust* (i.e., disgust elicited by direct or indirect contact with other people) (Haidt et al., 1994; Rozin et al., 1999). Later on, this taxonomy was refined by Olatunji et al. (2007) into three distinct factors (i.e., DS-R; Disgust Scale-Revised), *Core Disgust Sensitivity*, *Animal-Reminder Disgust Sensitivity* (see Rozin et al., 2005), and *Contamination-Based Disgust Sensitivity* (i.e., “disgust reactions based on the perceived threat of transmission of contagion”) (Olatunji et al., 2007). A different conceptualization is the one proposed by Tybur et al. (2009), who reexamined disgust and proposed the following types of disgust sensitivity: *Pathogen Disgust* (i.e., disgust elicited by objects likely to contain infectious agents), *Sexual Disgust* (i.e., disgust elicited by sexual behavior), and *Moral Disgust* (i.e., disgust that pertains to social transgressions) (see Haidt et al., 1994; Tybur et al., 2009).

A large number of researches have investigated the role of disgust in preventing the viral spread of immoral social ideas and protecting social order by deterring counter-normative behaviors (Rozin et al., 2005). Thus, disgust elicited by immoral behavior, or breaking socio-moral rules – also known as *moral disgust* – is associated with more severe moral condemnation (Chapman & Anderson, 2013; Giner-Sorolla & Chapman, 2017; Haidt et al., 1997; May, 2014; Russell & Giner-Sorolla, 2011; Schnall et al., 2008), including those towards outgroups. Tapias et al. (2007) stated that outgroups may elicit emotion by activating appraisals related to either a basic appraisal theme (e.g. contagion eliciting disgust) or a socio-moral theme (e.g. violations of community norms). Supporting this theory, Fincher and Thornhill (2012) point that outgroup members are seen as more likely to violate the local norms. Considering these results, the outgroup study opportunity created by the COVID-19 pandemic in regard to the diaspora gives the current research the impetus to induce moral disgust and verify its impact on the outgroup manifestations mentioned earlier, that is *dehumanization* and *aggressive tendencies*.

Numerous studies connect both state and trait disgust with higher *dehumanization* (Buckels & Trapnell, 2013; Choma et al., 2012; Haslam, 2006; Hodson et al., 2013; Hodson &

Costello, 2007; Navarrete & Fessler, 2006) and *aggressive tendencies* (Mackie & Smith, 2015; Valtorta & Volpato, 2018) towards specific outgroups perceived as deviant, such as immigrants (Hodson & Costello, 2007; Karinen et al., 2019) or foreigners (Navarrete & Fessler, 2006).

Evidently, we intend to look at the bigger picture adding to the research disgust sensitivity and contamination fear, a variable that is highly important given the pandemic context. Contamination is frequently related to disgust and refers to “an intense and persisting feeling of having been polluted or infected or endangered as a result of contact, direct or indirect, with a person/place/object that is perceived to be soiled, impure, infectious or harmful” (Rachman, 2004).

The strong relationship between disgust and contamination fear was demonstrated by a wealth of studies, and the pathogen avoidance mechanism of disgust supports the idea that contamination fear could play a mediation role in outgroup bias (Matchett & Davey, 1991; Mitte, 2008). To our knowledge, this is the first study to investigate the role of both disgust sensitivity and induced moral disgust concerning contamination fear, on outgroup bias, in the context of the global pandemic.

Previous results demonstrated a positive association between disgust and fear of being contaminated (Deacon & Olatunji, 2007; Mitte, 2008; Olatunji et al., 2004), and also the relation between disgust, fear, and outgroup dehumanization, due to threats posed to one’s health (Giner-Sorolla & Russell, 2019). Additionally, disgust sensitivity was related to specific phobias (Matchett & Davey, 1991; Tolin et al., 1997; Thorpe & Salkovskis, 1998; Witcraft et al., 2020), and obsessive-compulsive disorder (OCD; Olatunji et al., 2011; Tolin et al., 2006). Intriguingly, in a recent study connected to the current research domain, pathogen disgust sensitivity was negatively related to the decision to allow entry to both origin-unspecified immigrants and immigrants from a pathogen-rich ecology (Ji et al., 2019).

In given circumstances, moral behavior might represent a source of information for our disease-avoidance mechanism. As the virus cannot be recognized through racial elements, nor through visible symptoms – given that some of the persons infected are asymptomatic – all these elements would lead to a different kind of ‘otherness’, recently named “*invisible other*”, manifested among others through objectification (i.e. transforming the abstract into an image, materializing the ‘invisible enemy’) (de Rosa & Mannarini, 2021).

Considering the particularities of the current context, we introduce here the idea that disgust sensitivity may be influencing outgroup bias via a disease avoidance mechanism, such as contamination fear. Previous research (Cisler et al., 2009; Olatunji et al., 2004, 2005) suggested that contamination fears result from a fear of responding to negative disgust-related experiences, which supports the idea that contamination fear could mediate the effect of disgust sensitivity on

outgroup bias. In other words, people with higher disgust sensitivity are more concerned with disease contamination and more likely to convert their aversive reactions into negative outgroup attitudes (Hodson et al., 2013).

Disgust has been studied in association with different types of dehumanizing perceptions, such as *biologization* – the association of humans with viruses – and *animalization* – associating animal-like features to humans (Valtorta & Volpato, 2018) or *mechanization* – in which humans are likened to objects or automata (Haslam, 2006), as well as to different types of aggression, like *passive aggression* – distancing from – or *active aggression* – insulting or publicly condemning (Valtorta & Volpato, 2018). However, the literature is scarce concerning the effect of disgust sensitivity subdomains on these phenomena, and whether context may influence this relationship.

Notwithstanding, recent work demonstrated that disgust is associated with lower-cost, indirect aggressive motives (e.g. gossip and social exclusion) (Tybur et al., 2019), hence, it becomes salient to explore the relationship of disgust with different types of aggression, namely passive and active aggression respectively, in a context where social distancing became the norm and the costs of approaching others were significantly increased.

Overview of the Current Study

Prominently, while it was suggested that mechanisms related to disease-avoidance could mediate the relationship between disgust sensitivity and dehumanization (Faulkner et al., 2004; Laakasuo et al., 2018; Valtorta et al., 2019), how disgust and contamination fear are interrelated is less clear. People with higher disgust sensitivity, interpret state disgust experiences more negatively and may perceive the contextual stimuli such as outgroup members in a more threatening manner, therefore avoiding these stimuli and attributing them more virus-like characteristics.

Previous research linked intergroup disgust sensitivity to negative attitudes toward outgroups and suggested that one of the mechanisms by which disgust is associated with outgroup bias might be related to disease-avoidance (Hodson et al., 2013). However, to our knowledge, no study explored contamination fear as a specific mediator on the relationship between disgust sensitivity and dehumanizing and aggressive tendencies, two outgroup manifestations.

Nevertheless, the pursuit of this intriguing mediation was not out of context. As previously mentioned, we were interested to use the current COVID-19 context as an ecological pretext for inducing disgust towards moral transgressions (i.e., lying). Our approach was based on the previous literature

showing that outgroups breaking local sociomoral norms are perceived as a greater threat and people tend to avoid or have other negative attitudes toward them (Riek et al., 2006). During the first stage of the global pandemic, the outsiders were already portrayed, by the media, as a source of contamination to the local population, intensified by the unwillingness to follow the local restriction rules, which intensified the fear of negative consequences following contamination.

Considering these applications, the idea of moral disgust influencing outgroup bias via a disease avoidance mechanism may be supported. Additionally, our moderation hypothesis is supported by studies showing that induced disgust holds a functional role in contributing to contamination fear (Olatunji and Armstrong, 2009).

Our premises were that **H1**: Disgust sensitivity will be positively related to both dehumanizing perceptions (H1a) and aggression tendencies (H1b) through contamination fear. **H2**: The effect of disgust sensitivity on dehumanizing and aggressive tendencies passes through contamination fear and this indirect effect is stronger for the participants in the disgust-induction than for the non-induction group for both dehumanization (H2a) and aggressive tendencies (H2b).

The current quasi-experimental study was conducted online, during the state of emergency due to the COVID-19 pandemic, an important period that strongly influenced precautions in virus spreading and which made our research and vignettes highly ecological. Although the literature is sparse on the topic, results suggested that exposure to media messages could affect attitudes towards one's ingroup or various outgroups (Vergeer et al., 2000). During the period that we conducted our study, numerous members of the diaspora returned to their home country due to COVID-19 concerns, being portrayed by the media as an outgroup and a possible source of contamination.

To manipulate state disgust induced by immoral behavior, we adapted real-life media news into vignettes presenting a group of people from diaspora reaching the border, where they must declare the country they come from, following COVID-19-related measures. In the disgust induction condition, the group committed a moral transgression, namely hiding the truth of their arrival, and they did not comply with the quarantine rules. In the non-induction condition, the group of people declared the truth and were compliant with the rules.

The participants in the study were randomly assigned to one of the two conditions – moral disgust induction and non-induction neutral. Disgust sensitivity and trait contamination fear were assessed before the experimental manipulation and the level of induced disgust was measured right after presenting the scenario before participants answered the questions regarding dehumanization and aggressive tendencies towards the diaspora outgroup.

Materials and Methods

Participants

We collected data from 236 participants using the Survey Anyplace online platform, 42 responses were excluded due to providing wrong answers to the verification questions. The final sample was composed of 194 participants (82.7% female) randomly assigned through the platform to the disgust induction group ($N=102$), respectively to the neutral, non-induction group ($N=92$). The mean age was 28.07 ($SD=.42$) for female participants and 27.32 ($SD=.89$) for male participants. All volunteers were recruited using convenience sampling.

A power analysis using MedPower (Kenny & Judd, 2014) revealed the need for a minimum of 189 participants in order to achieve .80 power for a small to medium standardized value of the direct effect ($c'=.2$) (Miočević et al., 2017). Similarly, according to the Percentile Bootstrap test of mediation a minimum sample size of $N=162$ is required for a small to medium effect size of the conditional indirect effect (Fritz & MacKinnon, 2007).

The study was approved by the Research Ethics Committee of the University and all participants were informed and consented prior to taking part in our study.

Instruments

Below we render the instruments used in the current study. Noteworthy, trait anger was added to the research in order to control for the effect of trait anger on aggression tendencies (Wang et al., 2018) and prejudice towards the outgroup. As previous research proved that trait anger could lead to potentially morally dysfunctional cognitions and judgment, such as hostile attributional biases, irrational thinking, and distorted appraisals of the events (Steiger & Reyna, 2017; Tafra et al., 2002).

Disgust Sensitivity To assess trait disgust, participants completed the 25-item version of *Disgust Scale-Revised* (DS-R; Olatunji et al., 2007) and the 7-item Moral Disgust subscale of the *Three Domains Disgust Scale* (TDDS; Tybur et al., 2009). The DS-R is a validated measure of three domains of disgust sensitivity: *Core Disgust*, *Animal-Reminder Disgust*, and *Contamination-Based Disgust* (Deacon & Olatunji, 2007; Olatunji et al., 2007, 2008, 2009; van Overveld et al., 2010); first 13 items ranging from 0 (i.e., *Strongly disagree*) to 4 (i.e., *Strongly agree*) and the following 12 items range from 0 (i.e., *Not disgusting at all*) to 4 (i.e., *Extremely disgusting*) respectively.

The DS-R had good overall reliability in the current sample, $\alpha=.85$, in line with previous studies ($\alpha=.84$; David & Olatunji, 2011), with acceptable reliability for the subscales,

consistent with previous research (Aarøe et al., 2017; Crawford et al., 2014; Robinson et al., 2019; Stevenson et al., 2021). The TDDS - Moral Disgust Subscale demonstrated a good internal reliability in the current sample ($\alpha=.80$), consistent with previous literature ($\alpha=.89$) (Tybur et al., 2009).

State Disgust To assess state disgust, participants answered a single-item measure: „*How disgusted does [agent's] behavior make you feel?*” on a 10-point scale from 1 (i.e., *Not at all disgusted*) to 10 (i.e., *Extremely disgusted*).

Trait Anger Individual differences in trait anger were measured with the *State-Trait Anger Expression Inventory-2* (STAXI-2; Spielberger, 2010). STAXI-2 includes a 10-item trait anger subscale varying from 1 (i.e., *Almost never*) to 4 (i.e., *Almost always*) on the Likert scale and which recorded an acceptable .81 Cronbach's alpha in the current study, comparable with previous reports ($\alpha=.88$; Lievaert et al., 2016).

Contamination Fear *The Padua Inventory Contamination Subscale* (PI; Burns et al., 1996) is a 10-item self-report scale designed to assess fear of contamination. Items are scored on a 5-point scale, ranging from 0 (i.e., *Not at all*) to 4 (i.e., *Very much*). Higher scores on this inventory indicate more contamination fear. In the present sample, the PI was found to have good internal consistency ($\alpha=.83$), in line with previous literature ($\alpha=.85$) (Sawchuk et al., 2000).

Procedure

Volunteers consenting to take part in the study first filled out the DS-R, TDDS, STAXI-2, and PI scales, then were randomly assigned the disgust induction group or to the non-induction neutral group. Details on the vignettes used for the induction procedure are provided below. After reading their randomly assigned vignette, the participants responded to a manipulation check of their state disgust towards the situation presented and then proceeded with answering questions in regard to dehumanizing perceptions and aggressive tendencies toward the characters in the vignettes.

Disgust Induction

State disgust was induced via a scenario adapted from the news regarding the incoming diaspora returning from abroad due to COVID-19 concerns. By adapting authentic news, we aimed to ensure ecological validity in our study and emotional immersion for the participants. The source of the scenario was a local newspaper presenting a group of citizens from the diaspora who lied to avoid the quarantine rules.

The description of the situation was standardized for the two conditions (see Appendix 1), the only difference being the moral transgression in the disgust induction condition.

Dehumanization

The dehumanization phenomenon toward the target-outgroup was assessed using a measure adapted from Valtorta and Volpato (2018), by employing words that recalled the two forms of dehumanization considered in the study (biologization and animalization).

Items were scored on a 10-point Likert scale, ranging from 1 (i.e., *Not at all*) to 10 (i.e., *Extremely*). The scale was represented by four virus-related words (*virus*, *contamination*, *filth*, and *contagion*, $\alpha = .83$) and four animal-related words (*animal*, *savage*, *primitive*, and *beast*, $\alpha = .88$) respectively. These words were extracted from previous work in the field of dehumanizing attitudes (Tipler & Ruscher, 2014; Valtorta & Volpato, 2018). Participants' responses to the 4-word scales were summed up.

Aggressive Tendencies

The participants' aggressive tendencies assessment was adapted from Valtorta and Volpato (2018), using a single-item assessment of passive and active aggression respectively, previously validated in another study (Cuddy et al., 2007). Participants were asked to rate the extent to which they would be inclined to distance from (i.e., *passive aggression*) or publicly condemn (i.e., *active aggression*) the target group. Both items were scored on a 10-point scale, ranging from 1 (i.e., *Not at all*) to 10 (i.e., *Extremely*).

Data Analysis

We proposed a first order moderated mediation model exploring the conditional indirect effect of disgust sensitivity on dehumanization and aggression towards outgroup (through contamination fear), with induced moral disgust modulating the effect of disgust sensitivity on contamination fear.

We tested out the study hypotheses in two interlinked steps. First, we examined a simple mediation model (Hypotheses 1a-b). Second, we integrated the proposed moderator variable into the model, and we empirically tested the overall moderated mediation hypothesis (Hypothesis 2a-b).

Hypotheses were tested using the PROCESS macro for SPSS (Hayes, 2013) utilizing bias-corrected bootstrapping with 5000 resamples (to account for the non normal distribution in the outcome variables). All hypothesis testing included trait anger as covariate.

Results

Preliminary Analyses

As depicted in Table 1, results indicated a lack of association between disgust sensitivity and both animalistic dehumanization and active aggression therefore, we excluded these outcomes from any further analysis. This result is consistent with previous research, which suggested that physical disgust is associated more with biologization and passive harm intentions (Valtorta & Volpato, 2018).

The descriptive statistics, independent t-test results and effect sizes for all outcome variables by condition can be found in Table 2.

To control for the influence of trait anger, we conducted ANCOVA analyses for each of the outcome variables, comparing the means between the conditions, with trait anger as a covariate. The results indicated a significant effect of the experimental group on biologization ($F(1,193) = 6.85$, $p = .01$, $\eta_p^2 = .03$), animalization ($F(1,193) = 12.15$, $p = .001$, $\eta_p^2 = .06$), passive aggression ($F(1, 193) = 20.47$, $p < .001$, $\eta_p^2 = .09$) and active aggression ($F(1, 193) = 90.58$, $p < .001$, $\eta_p^2 = .32$).

Manipulation Check

Induced moral disgust. Independent t-test results revealed that participants in the non-induction condition ($M = 2.11$, $SD = 1.87$) compared to the participants from the disgust induction condition ($M = 7.83$, $SD = 2.62$) demonstrated a significantly lower level of induced moral disgust ($t(192) = -17.32$, $p < .001$, *Cohen's d* = 2.51).

Testing for the Proposed Model

The main results for Hypothesis 2 are presented in Table 3. Our hypothesis testing consists of three parts: mediator and dependent variable model, conditional direct effect analysis and conditional indirect effect analysis.

Mediation Analysis

As shown in Table 3, the difference between conditional indirect effects (the Index of Moderated Mediation; Hayes, 2015), as per our proposed moderated mediation model, is significant only with contamination-based disgust sensitivity as predictor. Therefore, we excluded overall disgust sensitivity, core-disgust sensitivity, and animal-reminder disgust sensitivity from further analysis.

Contamination-Based Disgust Sensitivity The total effect of contamination-based disgust sensitivity (c path) on both biologization ($b = .40$, $SE = .16$, $R^2 = .06$, $p = .01$,

Table 1 Descriptive Statistics and Study Variables Intercorrelations

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Contamination fear	16.22	8.31	–										
2. CB-DS	7.85	4.06	.39**	–									
3. Core-DS	26.92	7.84	.40**	.41**	–								
4. AR-DS	16.06	6.83	.28**	.47**	.62**	–							
5. M-DS	19.46	5.58	.11	.25**	.13	.14	–						
6. Biologization	22.06	9.23	.27**	.19**	.18*	.15*	.02	–					
7. Animalization	9.69	7.86	.13	.09	–.01	–.02	.02	.43**	–				
8. Passive aggression	6.29	2.78	.34**	.18*	.17*	.19*	–.03	.59**	.31**	–			
9. Active aggression	4.03	3.04	.12	.06	.04	–.01	.12	.44**	.50**	.50**	–		
10. DS-T	50.82	15.63	.42**	.67**	.88**	.87**	.19**	.21**	.01	.21**	.03	–	
11. Trait anger	23.12	5.48	.16*	.09	.12	.08	–.06	.17*	.06	.19**	.16*	.12	–

N = 194; **p < .01; *p < .05

Note. M = Mean. SD = Standard Deviation. CB-DS = Contamination-Based Disgust Sensitivity. Core-DS = Core Disgust Sensitivity. AR-DS = Animal-Reminder Disgust Sensitivity. M-DS = Moral Disgust Sensitivity; DS-T = Disgust Sensitivity Total

CI95% [.08, .71]) and passive aggression ($b = .12, SE = .05, R^2 = .06, p = .02, CI95\% [.02, .21]$) was significant.

Results indicated a significant effect of contamination-based disgust sensitivity on contamination fear (a path), controlling for trait anger ($b = .78, SE = .14, R^2 = .17, p < .001, CI95\% [.52, 1.05]$) and a significant effect of contamination fear on biologization (b path; $b = .24, SE = .08, p = .004, CI95\% [.08, .41]$), and the mediation model explaining 10% of the total biologization variance ($R^2 = .10$).

Contamination-based disgust sensitivity was found to have a significant indirect effect on biologization, through contamination fear, which was positive (ab path; $b = .19, SE = .08, 95\% Bca CI [.04, .36]$), as hypothesised (Hypothesis 1a). The direct effect of contamination-based disgust sensitivity on biologization (c' path) was not significant ($b = .21, SE = .17, p = .23; CI 95\% [–.13, .54]$), resulting in a full mediation.

The positive effect of contamination fear on passive aggression, was significant (b path; $b = .10, SE = .02, p < .001, CI95\% [.05, .15]$), the mediation model explaining 14% of the total passive aggression variance ($R^2 = .14$). The direct effect of contamination-based disgust sensitivity on passive

aggression (c' path) was not significant ($b = .04, SE = .05, p = .47, CI95\% [–.06, .14]$), while the indirect effect on passive aggression; through contamination fear (ab path) was significant ($b = .08, SE = .02, 95\% Bca CI [.04, .13]$) indicating a full mediation.

Tests of Moderated Mediation

With regard to Hypothesis 2, we predicted that the positive indirect effect of disgust sensitivity on biologization, and passive aggression respectively, will pass through contamination fear, and will be weaker for the non-induction group than for the disgust-induction group.

Results indicated that the cross-product term between contamination-based disgust sensitivity and experimental group was significant ($b = .58, SE = .27, t = 2.12, \Delta R = .02, p = .03$; see Table 4), the moderation model explaining 19% of the total variation of contamination fear ($R^2 = .19$). We applied conventional procedures for plotting simple slopes (see Fig. 1) for each of the conditions. As for the results shown

Table 2 Descriptive Statistics according to experimental group

Variable	Non-induction (N=92) M(SD)	Disgust-induction (N= 102) M(SD)	Independent t-test (t(192))	Cohen’s d (d)
Biologization	20.10 (8.96)	23.84 (9.15)	–2.87**	.41
Animalization	7.63 (6.28)	11.55 (8.67)	–3.57***	.51
Passive aggression	5.33 (2.82)	7.15 (2.47)	–4.78***	.68
Active aggression	2.20 (1.84)	5.69 (2.96)	–9.74***	1.42

***p < .001; **p < .01; *p < .05;

Note. M = Mean. SD = Standard Deviation

Table 3 Unstandardized Index of Moderated Mediation Estimates for different disgust sensitivity domains

Condition of dehumanization and aggression		Index	(boot) SE	BootLLCI	BootULCI
Outcome	Biologization				
	CB-DS	.14	.09	.006	.35
	Core-DS	-.02	.04	-.10	.06
	AR-DS	-.03	.04	-.12	.07
	DS-T	-.002	.02	-.04	.03
Outcome	Passive aggression				
	CB-DS	.06	.03	.003	.13
	Core-DS	-.01	.07	-.04	.02
	AR-DS	-.01	.02	-.04	.02
	DS-T	-.001	.007	-.01	.01

N = 194

Note. Table reports the unstandardized estimates from PROCESS (Hayes, 2013). BootLLCI = bootstrapped lower limit confidence interval. BootULCI = bootstrapped upper limit confidence interval. CB-DS = Contamination-Based Disgust Sensitivity. Core-DS = Core Disgust Sensitivity. AR-DS = Animal-Reminder Disgust Sensitivity. M-DS = Moral Disgust Sensitivity. DS-T = Disgust Sensitivity Total

in Fig. 1, the form of this interaction should conform to the hypothesized pattern. Consistent with our expectations, the conditional effect of the relationship between contamination-based disgust sensitivity and contamination fear was relatively strong (and positive) for the participants in the induced-disgust group ($b = 1.11$, $SE = .20$, $t = 5.46$, $p < .001$, $CI95\% [.71, 1.52]$), whereas the conditional effect was lower for the participants in the non-induction group ($b = .53$, $SE = .18$, $t = 2.98$, $p = .003$, $CI95\% [.18, .88]$).

The moderated mediation model tested whether the conditional indirect effect of contamination-based disgust sensitivity on biologization (see Fig. 2) and passive aggression (see Fig. 3) (through contamination fear) is different for the

participants in the induced disgust group as compared to those in the non-induction group.

The results indicated a positive significant relationship between contamination-based disgust sensitivity and contamination fear (a path; $b = .53$, $SE = .18$, $t = 2.98$, $R^2 = .19$, $p = .003$, $CI95\% [.18, .88]$) as well as a significant interaction between contamination-based disgust sensitivity and experimental group ($b = .58$, $SE = .27$, $t = 2.15$, $p = .03$, $CI95\% [.05, 1.12]$) when controlling for trait anger, meaning that the effect of path a was contingent on feeling induced disgust or not. To determine whether the indirect effect was also contingent on the experimental group, the index of moderated mediation (Hayes, 2015) was calculated.

Table 4 Moderated mediation model of contamination-based disgust and contamination fear predicting biologization and passive aggression (model 7 of PROCESS macro)

	Explained variables					
	Contamination fear		Biologization		Passive aggression	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Constant	7.68**	2.69	11.48***	2.96	2.76**	.87
CB-DS	.53***	.18	.21	.17	.04	.05
Experimental group	-4.77	2.39				
Contamination fear			.24**	.08	.10***	.02
CB-DS x Experimental group	.58*	.27				
Trait anger	.20	.10	.22	.12	.07	.03
R^2	.19		.10		.14	
$F(df)$	F(4,189)= 11.21***		F(3,190)= 7.01***		F(3,190)= 10.17***	

N = 194; *** $p < .001$; ** $p < .01$; * $p < .05$;

Note. CB-DS = Contamination-Based Disgust Sensitivity

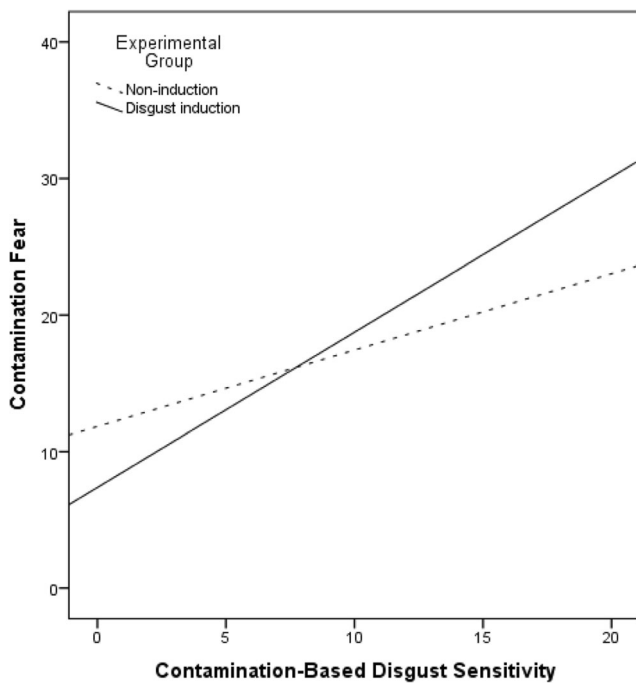


Fig. 1 Interaction effect of Contamination-Based Sensitivity and experimental condition on Contamination Fear

We found that the index of moderated mediation was significant ($b = .14, SE = .09, 95\% BCa CI [.006, .35]$), suggesting that feeling induced disgust, or not, moderates the indirect effect of contamination-based disgust sensitivity on biologization.

We then investigated the conditional indirect effects for the two experimental conditions, results indicated that the indirect effect of contamination-based disgust sensitivity via contamination fear existed for both groups, however it was higher for those in the induced disgust group (ab path; $b = .27, SE = .12, 95\% Bca CI [.07, .54]$) than for those in non-induction group (ab path; $b = .13, SE = .06, 95\% Bca CI [.02, .27]$).

For passive aggression as outcome, we found that the index of moderated mediation was significant ($b = .06, SE = .03, 95\% BCa CI [.003, .13]$). We then investigated the conditional indirect effects for the two experimental groups. Results

indicated that the indirect effect of contamination-based disgust sensitivity via contamination fear existed for both experimental groups, however it was higher for those in the induced-disgust group (ab path; $b = .11, SE = .04, 95\% Bca CI [.05, .19]$), than for those in non-induction group (ab path; $b = .05, SE = .02, 95\% Bca CI [.02, .10]$) (see Table 5).

Discussion

The current study sought to explore the role of *disgust* - both as trait and state - and *contamination fear* on two specific phenomena related to *outgroup bias*, namely *dehumanizing* and *aggressive tendencies*. The main purpose was to understand the mechanisms related to the negative attitudes towards modern-day outgroups, i.e., a country’s incoming diaspora in the context of the COVID-19 pandemic.

Consonant with our heuristic mediation model, the results suggested that the effect of contamination-based disgust sensitivity on biological dehumanization and passive aggression passed through contamination fear. Moreover, the moderated mediation model indicated that this indirect effect was stronger for participants in the disgust-induction than in the non-induction group. Notwithstanding the aforementioned indirect effect on *biological dehumanization* and *passive aggression* through contamination fear, this effect was not extended to *animalistic dehumanization* and *active aggression* outcomes.

Nonetheless, the results indicated a direct effect of the experimental manipulation on all our outcome variables - including animalistic dehumanization and active aggression -, even after controlling for trait anger.

The relationship between one particular type of disgust sensitivity (i.e., contamination-based disgust sensitivity) and biologization and passive aggression respectively, may be explained by the fact that contamination-based disgust sensitivity - of all the investigated disgust sensitivity domains - has an interpersonal component and represents the reaction to the threat of being contaminated by others (i.e., objects and

Fig. 2 The moderated mediation statistical model in which the simple mediation is moderated by state moral disgust (coded as 1 = disgust induction condition and 0 = non-induction condition). The path coefficients are included for the direct and indirect effects. *** $p < .001$; ** $p < .01$; * $p < .05$. Note.CB-DS = Contamination-based disgust sensitivity

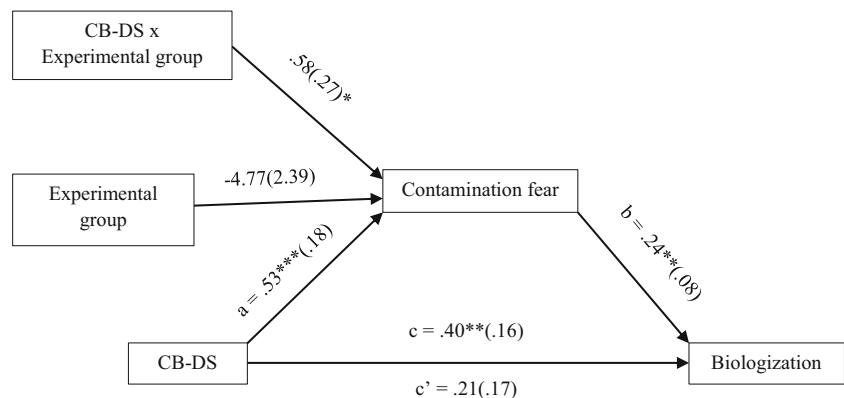
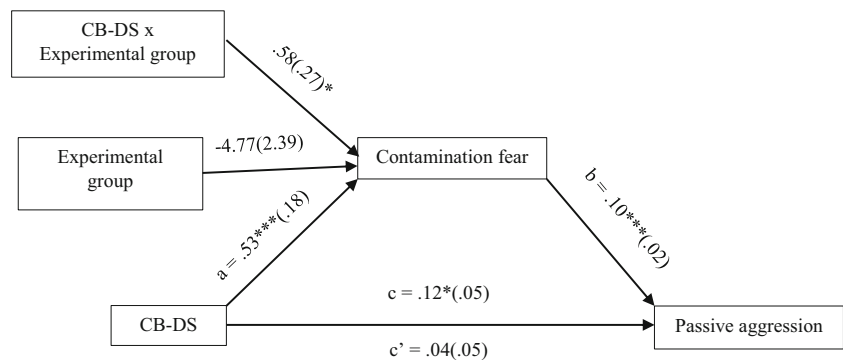


Fig. 3 The moderated mediation statistical model in which the simple mediation is moderated by state moral disgust (coded as 1 = disgust induction condition and 0 = non-induction condition). The path coefficients are included for the direct and indirect effects. *** $p < .001$; ** $p < .01$; * $p < .05$. Note. CB-DS = Contamination-based disgust sensitivity



humans) and to the interpersonal transfer of substances (Olatunji et al., 2008).

During the COVID-19 global pandemic, higher contamination-based disgust sensitivity may lead to an increase in the perceived danger of contamination from others, which in turn is associated with higher fear towards negative consequences of being contaminated. This mechanism might be related to the higher association of others with virus-like attributes – biological dehumanization – and avoidance behavior toward them – passive aggression –, especially to others who pose a threat by breaking sociomoral rules.

Further supporting this argument, disgust was associated with the tendency towards passive harm and withdrawing from the possibly contaminated stimuli that pose high costs to health due to its role in regulating our interaction with stimuli perceived as potential threats (Johnston & Glasford, 2014). Moreover, the effect of disgust on passive aggression is supported by previous work showing that disgust was positively associated with low-cost indirect aggression (Molho et al., 2017) and negatively associated with intimate partner violence (e.g., active violence; Pond et al., 2012). However, recent research indicated that a combination of disgust and anger might be implicated in more severe intergroup aggression (Mackie & Smith, 2015), suggesting that further research may explore the effect of both disgust and anger on outgroup bias.

As recent studies suggested that the COVID-19 pandemic posed a particular contamination threat, given the lack of visible symptoms in many cases (de Rosa & Mannarini, 2021) this further supports our results on passive aggression, rather than active aggression, and the social representation of “others” as a representation of the virus itself.

The significant results on biological dehumanization rather than animalistic dehumanization could be explained by the evolutionary role of contamination-based disgust as a disease-avoidance mechanism, strongly related to avoidance behaviors towards stimuli perceived as potentially contaminated (Olatunji et al., 2004). During the pandemic context, this role was strengthened by media representations on the outgroup as a possible contamination threat in the given context, accentuating participants’ reactions.

Interestingly, this particular result may build upon a sociofunctional threat approach to prejudice. According to it, qualitatively distinct intergroup threats can lead to functionally unique emotional responses (Cottrell & Neuberg, 2005), for example, on one hand, contamination threat (e.g., to cultural values) may elicit disgust, on the other hand, perceiving a safety threat (e.g., to physical well-being) may elicit fear.

Thus, the media representations could become triggers for pathogen-related cognitions (especially for those with high trait contamination fear), which in turn relate to biological dehumanization and passive aggression. This relation sug-

Table 5 Unstandardized Indirect Effect Estimates at varying conditions of dehumanization and passive aggression

Condition of dehumanization and aggression		Effect	(boot) SE	BootLLCI	BootULCI
Outcome	Biologization				
	Disgust-induction	.27	.12	.07	.54
	Non-induction	.13	.06	.02	.27
Outcome	Passive aggression				
	Disgust-induction	.11	.04	.05	.19
	Non-induction	.05	.02	.02	.10

$N = 194$

Note. Table reports the unstandardized estimates from PROCESS (Hayes, 2013). BootLLCI = bootstrapped lower limit confidence interval. BootULCI = bootstrapped upper limit confidence interval

gests that people may tend to dehumanize and withdraw from allegedly disgusting others due to feeling intense fear of contamination and threat to their health.

It may be that disgust elicited by immoral actions is a form of protecting one's social group against individuals breaking the social norms (Hanah A. Chapman & Anderson, 2013; Kusche & Barker, 2019; Rozin et al., 1999; Tybur et al., 2009). Alternatively, it may be that both disgust sensitivity and contamination fear became more salient following induction with a present-day contamination issue and evidently, it was easier for the disgust induction group than for the non-induction group to tap into dehumanizing and aggressive tendencies.

This would explain why we have significant results particularly for contamination-based disgust sensitivity and why the mediation results are accentuated in the disgust induction group. Although this idea did not remain unchallenged (Jones, 2007), previous theories of disgust have proposed that moral disgust is indeed highly related to contamination-based disgust, yet distinctive from the physical forms of disgust (Chapman et al., 2009; Haidt et al., 1994). Though both forms of disgust are likely candidates to trigger diseases-avoidance responses (Navarrete & Fessler, 2006), as suggested by the current results as well.

Study Implications

The data from this study reveal several practical implications that would be worthy of supplementary investigation. *Firstly*, the results add further knowledge to the importance of understanding how morality, in the form of moral disgust elicited by a perceived outgroup, interferes with different types of dehumanization and aggression. *Secondly*, this study can have further implications for understanding how transgressions of health recommendations may pose a contamination threat and influence disgust experience and social prejudice processes, – such as outgroup bias – during a global health crisis. *Thirdly*, yet importantly, the current results further contribute to understanding the role of media in outlining modern days' outgroups, a social phenomenon strongly related to prejudice.

Limitations and Future Directions

The empirical results reported here should be considered in light of some limitations. First, the nature of our design, though quasi-experimental and ecological, did not allow any inference of causality (Cook & Campbell, 1979; Stone-Romero & Rosopa, 2004, 2008). Future studies may address this limitation through a longitudinal experimental study where the mediator can be manipulated ahead of measuring a change in outcome.

Second, another limitation was represented by the posttest assessment of induced moral disgust. Although randomization

helps in distributing any possible pre-existing individual differences between the two groups, an initial assessment of induced moral disgust, would have informed us further on the nature of our selected sample. However, previous studies in the field did use a similar manner to check for disgust induction (e.g., Giner-Sorolla & Russell, 2019).

Third, and connected to the second limitation, an additional drawback could have been a difference between participants who might have relatives or friends among the incoming diaspora, that could have influenced their responses. Again, the use of randomization helped to disperse this variable across the two groups. Nevertheless, it would have been advisable for the current paper to check whether members of the diaspora were within a participant's close social network.

Fourth, a potential limitation could be represented by an unintended effect of the scenarios upon the participants' attitudes – such as induced physical disgust or contamination elicitors –, beyond the intended induced moral disgust manipulation. However, the standardization of the vignettes across the experimental conditions and the lack of salient contamination elicitors significantly decreased this probability.

Fifth, considering the debate in the literature regarding the connection between disgust and anger, as well as previous research which suggests that there might be a moral anger component to the neural activation of moral disgust (Oaten et al., 2018), we can not discard that some of the dehumanization and aggression responses could have been motivated by both disgust and anger. Though statistically controlling for latent or trait anger in our analyses did not alter the results, statistical control isn't the same as procedural or methodological control and future research should take this into account and ensure an experimental procedure which singles out anger from disgust.

Lastly, gender differences may pose a possible limitation, as our study had a small proportion of male participants. Future studies should control for gender differences by adding a comparable number of male participants as some studies indicate that females report higher disgust sensitivity than men (Al-Shawaf et al., 2018; Sarsony, 2018; Tybur et al., 2011).

Noteworthy, the cognitive mechanisms by which trait-disgust affects social attitudes, such as outgroup bias, are not yet well understood and further research is needed. It is possible that prior exposure to media content created some form of receptiveness to negative content about the diaspora which helped some of our participants to be more susceptible to the disgust induction condition. A recent study (Aquino et al., 2020) highlights that the neural level areas such as the ventromedial prefrontal cortex, posterior cingulate cortex, and cerebellum are more strongly activated when a persuasive message content, either affective or cognitive, matches the recipient's individual affective or cognitive orientation on the topic – known as the “*structural matching effect*” (Aquino et al.,

2020). This pathway might represent a future direction of research for the neural bases of disgust sensitivity and how individual orientations - for either affective or cognitive processing - may be influenced by a matching in the message content read, influencing susceptibility to feel disgust.

Conclusion

In summary, the results from this study support previous findings which show that disgust is an emotion that can play a key role in intergroup dynamics, such as outgroup bias. Moreover, our findings suggest that the effect of contamination-based disgust sensitivity on biological dehumanization, and passive aggression, (totally) passed through contamination fear and that this indirect effect was stronger for participants in the disgust induction, compared with the non-induction group.

This is a particularly interesting finding cueing that nowadays, outgroup bias is a macro-level issue triggered not only by geopolitical reasoning (e.g., the recent immigrant crisis) but also by the current health crisis generated by the COVID-19 pandemic and – as our results indicate – specifically by fear of contamination.

An interesting idea elicited by the current research is the fact that moral transgressions, particularly lying and refusing to follow local rules, might tap into the same type of contamination disgust as potential toxins and disease agents (Chapman et al., 2009), especially when it comes to people perceived as outgroup. This is particularly noteworthy since society has proven to be quite easily polarized by the media in the context of the COVID-19 pandemic (e.g., wearing vs. not wearing masks, getting vaccinated or not, etc.).

In conclusion, the current findings cue to how easily one can be polarized by the media on matters of health and how easily fear of contamination can be projected onto one particular group. We remind that at the time of the implementation of the study there was a state of lockdown, the first such set of measures in the country, and with each incoming member of the diaspora, there was a growing state of apprehension and more news titles to cover the topic. Importantly, more outgroup biases are emerging in the context of the COVID-19 pandemic, such as mask wearers vs. anti-maskers, pro-vaccinators vs anti-vaccinators and their dividing effect on society will be equally interesting to investigate in the future.

Appendix 1. Experimental vignettes

Disgust induction condition

„Today, around 4 p.m., at the Border Crossing Point, 12 romanian citizens showed up at the entrance to the country, traveling in three cars registered in Italy. On the occasion of the

formalities, the people told the border police that they come from Torino, Italy, and that they want to get home to Romania. At the human sanitary control, the representative of the Public Health Directorate informed them that they must enter the quarantine regime for a period of 14 days. *The citizens changed their initial statement, this time claiming that they are returning to the country from Montenegro.*”

Non-induction condition

„Today, around 4 p.m., at the Border Crossing Point, 12 romanian citizens showed up at the entrance to the country, traveling in three cars registered in Italy. On the occasion of the formalities, the people told the border police that they come from Torino, Italy, and that they want to get home to Romania. At the human sanitary control, the representative of the Public Health Directorate informed them that they must enter the quarantine regime for a period of 14 days. *The citizens agreed to complete the declaration according to the law.*”

Code Availability Not applicable.

Funding No funding was received for conducting this study.

Data Availability Statement The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval All procedures performed in studies 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.

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent to Publish Not applicable.

Animal rights No animal studies were carried out by the authors for this article.

Conflicts of Interest/Competing Interests The authors have no relevant financial or non-financial interests to disclose. On behalf of all authors, the corresponding author states that there is no conflict of interest.

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