Current Psychology (2026) 45:884
https://doi.org/10.1007/s12144-026-09290-4

Metaphors matter: The effect of biological dehumanizing language on indirect aggression

Roberta Rosa Valtorta[1] · **Cristina Baldissarri**[1] · **Chiara Volpato**[1]

Received: 9 June 2025 / Accepted: 10 March 2026

Abstract

Biologization – a form of dehumanization in which others are considered as disease carriers rather than humans – is common in the political debate; however, its effects have been understudied. To fill this gap, we conducted three preregistered experimental studies in which biological language was manipulated through vignettes. We found that using disease metaphors (vs. negative but non-dehumanizing language) to describe others increased biologization, indirect (vs. direct) aggression, and exclusionary intentions. Study 1 (N=201) provided initial evidence of these associations. Study 2 (N=204) and Study 3 (N=248) deepened these results, indicating that the effect of biological language on indirect aggression via biologization (Study 2) and accessibility of aggressive thoughts (Study 3) was bigger and significant for participants with high and medium (vs. low) levels of disgust sensitivity. This research highlights how framing groups as biological threats can intensify aggression and exclusion, shedding light on this dehumanizing rhetoric.

Keywords Biologization · Dehumanization · Metaphors · Aggression · Disgust · Exclusion

Introduction

Metaphors are powerful tools in human communication, shaping perceptions and influencing how we conceptualize the world, especially when drawn from sensitive domains such as those related to disease (Maass et al., 2014). In the political debate, immigrants are the prime targets of this rhetoric (Brown et al., 2019). Since the early 1900s, immigrants have often been depicted as invaders or diseases in the American propaganda, a representation that persists today through metaphors portraying immigrants as viruses or pollutants (Cisneros, 2008). In Italy – the context of the present research – biological rhetoric has become very common. The political lexicon concerning immigration abounds in "disease carriers" and "noxious elements" (De Leonardis, 2008; Valtorta, 2020), further amplified by journalistic discourse (e.g., Feltri, 2017) that strengthens the association between foreign groups and disease imagery.

From a sociopsychological perspective, perceiving or regarding individuals or groups as more similar to disease carriers than to humans represents a form of dehumanization known as "biologization" (or "biological dehumanization"; Volpato & Andrighetto, 2015). Dehumanization broadly refers to perceiving or treating others as less than fully human, thus denying them the characteristics that define humanity. Scholars have identified multiple forms of dehumanization sharing the common feature of excluding others from the moral circle of humanity, yet they differ in their underlying metaphors and motivational bases (Volpato & Andrighetto, 2015). Within this framework, biologization represents a specific form of dehumanization rooted in the disease domain, where individuals or groups are conceptualized as biological threats rather than human beings. Unlike animalistic dehumanization, which depicts others as instinct-driven or uncivilized, and mechanistic dehumanization, which portrays them as cold, passive, or object-like, biologization emphasizes contamination and threat. Focusing on this process is theoretically and practically important because it captures a unique dimension of sub-human dehumanization – one that frames others in terms of biological threat – thereby highlighting a mechanism distinct from those underlying animalistic or mechanistic forms.

✉ Roberta Rosa Valtorta
roberta.valtorta@unimib.it

[1] Department of Psychology, University of Milano-Bicocca, Piazza dell'Ateneo Nuovo 1, Milano 20126, Italy

Despite these considerations, only a few studies have experimentally investigated the effects of biologization on people's feelings and attitudes (e.g., Utych, 2018). Importantly, none of them has focused on aggressive conduct. To fill this gap, we conducted three experimental studies to test whether using biological language to describe others could affect people's perceptions and motivate indirect aggression, namely behaviors planned to harm someone in a subtle way such as avoiding and excluding them from a group or society (e.g., Forrest et al., 2005). Furthermore, we aimed to extend prior work on biological dehumanization by examining the moderating role of individual differences in disgust sensitivity. Drawing on the behavioral immune system framework (e.g., Ackerman et al., 2018), which posits that pathogen-avoidance mechanisms shape social cognition and intergroup responses, we proposed that biologization may activate disease-avoidance concerns that, in turn, facilitate indirect aggressive tendencies. Across studies, we tested whether exposure to biological dehumanizing language increases indirect aggression and whether this effect is amplified among individuals higher in disgust sensitivity.

Theoretically, this work integrates dehumanization research with the behavioral immune system literature, highlighting pathogen-avoidance motives as a psychological mechanism underlying biologization effects. Practically, it contributes to understanding how dehumanizing language may foster socially harmful outcomes in contemporary discourse.

Biologization and indirect aggression

Much research (e.g., see Pecini et al., 2023) has shown that dehumanizing others often precedes harm. For instance, Vasquez et al. (2014) demonstrated that animalistic metaphors describing crimes increase retaliation. Also, previous research has indicated that "black ape" metaphors to describe African Americans are linked to harsher judicial decisions (Goff et al., 2008). Rudman and Mescher (2012) found that dehumanizing women as animals or objects correlates with a higher propensity for sexual violence, while Tipler and Ruscher (2019) noted that animal-related language about women fosters hostile sexist attitudes.

While this evidence highlights the role of animal- and object-related metaphors in triggering direct aggression (i.e., behaviors causing direct harm through face-to-face confrontation), research on biological language and its link to hostile behaviors remains limited. Scholars (Neuberg & Cottrell, 2002; Neuberg et al., 2011; Tipler & Ruscher, 2014) suggest that disease-related metaphors promote indirect aggression, namely any "behavior where individuals were hurt (or hurt another person) in more covert and manipulative ways" (Forrest et al., 2005, p. 87). Within this framework, indirect aggression encompasses a range of covert, socially mediated behaviors, including interpersonal exclusion, which operates through avoidance or rejection rather than through manipulative acts such as gossiping or social trickery.

The connection between biological dehumanization and indirect aggression is also backed up by the literature on the behavioral immune system, namely a motivational system that helps minimize infection risk by changing cognitions and behaviors to promote pathogen avoidance (Ackerman et al., 2018; Murray & Schaller, 2016). If the risk of contamination is salient (even abstractly through disease rhetoric), individuals exhibit a heightened motivation to prevent exposure to pathogens by harboring negative attitudes and intentions that involve the exclusion of various outgroups, such as illegal immigrants (Faulkner et al., 2004).

Although research (e.g., Neuberg & Cottrell, 2002; Neuberg et al., 2011; Tipler & Ruscher, 2014) suggested the link between disease metaphors and indirect aggression, the connection to direct aggression is less clear. Some studies have speculated about this relationship; however, the evidence remains inconclusive. For instance, research analyzing Nazi rhetoric or immigration debates (Musolff, 2007) often examined materials that combine disease, animal, and demon metaphors (Jewish people were "viruses," "snakes," "rats," and "evil spirits" in Hitler's *Mein Kampf*; see Capozza & Volpato, 2004), making it difficult to isolate the specific role of biological metaphors in triggering direct aggression. A first indication was given by the correlational data provided by Valtorta et al. (2024), according to which biological representations are specifically associated with indirect (and not direct) aggression.

Combining all these aspects, the aim of the current research is twofold. On the one hand, we intended to demonstrate the link between biological metaphors, dehumanizing perceptions, and indirect (vs. direct) aggression – including its manifestation through interpersonal exclusion – using an experimental design. On the other hand, we aimed to deepen the analysis of these associations by considering other mechanisms potentially involved in the process, namely disgust sensitivity and accessibility of aggressive thoughts.

The role of disgust sensitivity and accessibility of aggressive thoughts

Disgust sensitivity refers to an individual's predisposition to become disgusted in response to stimuli perceived as harmful or aversive (Cisler et al., 2009). Initially evolved as a defense against pathogens, disgust sensitivity extends to social and moral dimensions, influencing behaviors like food avoidance, moral judgment, and social interactions (Tybur et al., 2009). More broadly, disgust sensitivity has been conceptualized as a multidimensional construct encompassing several domains related to contamination, bodily processes, decay, and reminders of animality (Haidt et al., 1994; Tybur et al., 2009). These components reflect distinct elicitors of disgust, ranging from spoiled food and bodily products to perceptions of impurity and degradation. Although they may be differentially activated depending on the context, they converge on a shared underlying sensitivity to contamination-related stimuli and violations of physical and symbolic boundaries.

Like biologization and indirect aggression, disgust sensitivity is linked to the behavioral immune system, which triggers heightened vigilance and avoidance of pathogenic threats (Schaller et al., 2015). Disgust, as a key emotion within this system, promotes avoidance of potentially contaminating stimuli or groups (Curtis et al., 2011). In line with these considerations, Ackerman et al. (2018) documented various triggers for pathogen-avoidance behaviors, including disease anxiety and disgust sensitivity. Research shows that individuals with higher disgust sensitivity tend to avoid contamination-related stimuli (Deacon & Olatunji, 2007) and exhibit stronger avoidance (van Leeuwen et al., 2023). These findings underscore the role of disgust sensitivity in shaping avoidance-related cognitions and its broader implications for social interactions.

Beyond its pathogen-avoidance function, disgust also serves as a powerful moral and social emotion that influences how people evaluate and treat others. When elicited in social contexts, disgust is not limited to protecting the self from physical contamination but extends to the symbolic domain of moral and social impurity (Rozin et al., 2009). Individuals or groups perceived as violating moral or social norms, such as those related to purity, order, or social cohesion, can evoke feelings of disgust similar to those triggered by physical contaminants (Chapman & Anderson, 2014). This "moralized" form of disgust motivates psychological and behavioral distancing, often manifesting as avoidance, exclusion, or condemnation of the perceived source of impurity (Buckels & Trapnell, 2013).

Importantly, this emotional mechanism has been closely linked to processes of dehumanization and moral exclusion (Hodson & Costello, 2007; Harris & Fiske, 2006). Viewing others through the lens of disgust can strip them of human qualities, framing them as contaminants that must be avoided rather than as moral agents deserving empathy or inclusion (Volpato & Andrighetto, 2015). Accordingly, individuals with higher disgust sensitivity may be particularly reactive to disease-related metaphors, as such language symbolically activates contamination concerns. This activation can, in turn, strengthen biologizing perceptions of the target and foster exclusionary intentions.

Through this research, we aimed to explore how disgust sensitivity moderates the relationship between disease rhetoric, biologization, indirect aggression, and interpersonal exclusion, while also considering aggressive cognitions, defined as the ease with which aggressive thoughts become accessible. Of relevance to the present research, Pond et al. (2012) adopted the General Aggression Model (GAM; Allen et al., 2018) – a framework that explains how situational and personal factors interact to influence aggressive tendencies – and found that disgust sensitivity predicted less aggressive thoughts and physical aggression. According to the authors, people who are more sensitive to disgust exhibit more avoidant-related cognitions and behaviors rather than violent ones when a situational trigger activates the knowledge structures of disgust and their related components (e.g., those concerning the disease domain).

Building from these arguments, we assumed that people exposed to biological language (situational factor) with high and medium levels of disgust sensitivity (personal factor) could acquire dehumanizing perceptions, aggressive cognitions, and ultimately express aggressive intentions. Importantly, in line with the literature mentioned above, we hypothesized that these associations might be true for indirect but not for direct aggression.

Overview of the studies

Our assumptions were tested in three pre-registered experimental studies in which biological language was manipulated through vignettes describing a fictitious population called "Vabals." In all studies, we involved different participants, who were randomly divided into two groups and presented with a text containing biological metaphors (e.g., "A Vabal is a typical parasite") or negative but non-dehumanizing metaphors (e.g., "A Vabal is a typical villain"). Since our focus was on biological language, we used a negative, non-dehumanizing control condition to isolate the specific impact of this rhetoric, without introducing the potential confound of other dehumanizing metaphors.

In Study 1, after reading the vignette, participants had to report their dehumanizing perceptions, aggressive intentions, and interpersonal exclusion directed toward Vabals. While the measure concerning aggressive intentions captures a range of covert (indirect) and explicit (direct) aggressive behaviors, interpersonal exclusion focuses specifically on exclusionary actions, such as social distancing. This distinction allowed us to examine both broad and specific expressions of indirect aggression and to verify whether biological language affects overall hostility as well as targeted exclusion. Through this study, we wanted to test whether using biological language to describe others led to higher levels of biologization (H1), indirect (vs. direct) aggression (H2), and interpersonal exclusion (H3) of the target. We also tested the indirect effects of biological language on indirect aggression (H4a) and interpersonal exclusion (H4b) via biologization (see Fig. 1A).

In Study 2, we wanted to further investigate these associations by examining the role of disgust sensitivity. In addition to retesting H1, H2, and H3, we assumed a moderating role of disgust sensitivity, with a stronger effect of biological language on indirect aggression (H5a) and interpersonal exclusion (H5b) via biologization for the participants with high and medium (vs. low) levels of sensitivity to disgust (see Fig. 1B).

Through Study 3, we aimed to confirm the links tested in the first two studies by examining accessibility of aggressive thoughts. In this study, we retested H1, H2, and H3. Then, we assumed that the participants who read the text with biological metaphors would report more accessibility of indirect (vs. direct) aggression thoughts (H6). Also, we predicted that this variable could serve as a second-level mediator of the moderated mediation model depicted in Fig. 1C (H7a and H7b).

In all studies, in addition to measuring biologization, we also assessed animal-like perceptions as dependent variable. This allowed us to include a theoretically meaningful comparison between two conceptually related forms of dehumanization (i.e., biologization and animalization) both rooted in the living sub-human domain. Considering animal-like perceptions provided a useful contrast for isolating the specific effects of biological language. All studies were conducted after receiving ethical approval from the Commission of the Department of Psychology for minimal risk studies at the University of Milano-Bicocca (Approval No. RM-2022-497). Participation was voluntary, and informed consent was obtained before each data collection. Measures and data relevant to the three studies are available through the project's Open Science Framework (OSF) webpage: https://osf.io/ywm9d/.

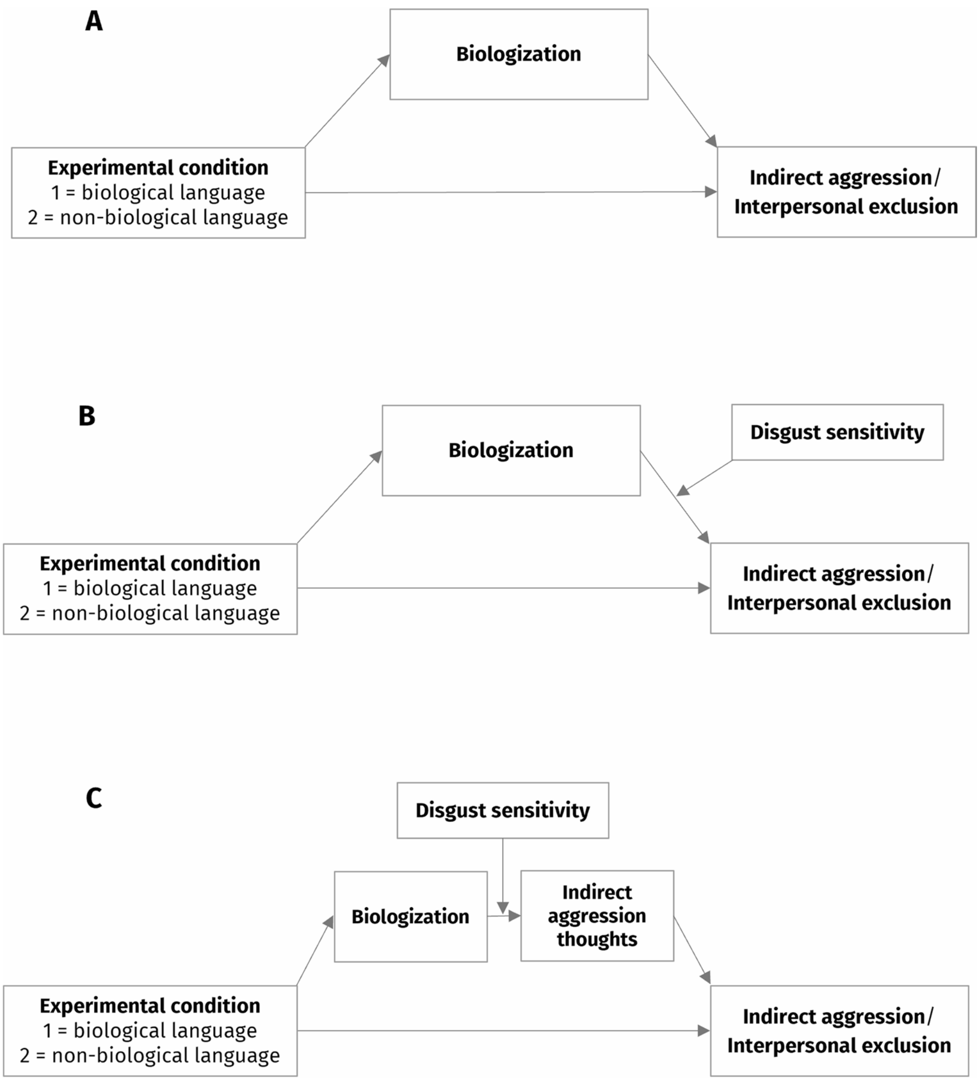

Fig. 1 Models tested in Study 1 (**A**), Study 2 (**B**), and Study 3 (**C**)

Study 1

Method

Participants and procedure

All aspects of this study were preregistered (https://osf.io/7db6y/). Data were collected after preregistration using the Qualtrics survey web system (https://www.qualtrics.com). Participants were recruited through a snowball sampling strategy. We performed a Monte Carlo power analysis for indirect effects and found that at least 160 participants are needed to reach a power of 0.80 (alpha = 0.05; bootstrapping = 5,000; r = .30) in a model with one mediator (Schoemann et al., 2017). We collected a sample of 218 Italian respondents. Of these, we excluded those who failed the attention check item (n = 17; eight in the condition involving biological language, nine in the condition involving non-biological language). The final sample comprises 201 participants (55% women, 44% men, 1% other; M_{age} = 35.32, SD = 13.00; age range: 18–70).

After confirming their consent, participants were randomly assigned to read one of two texts about a fictitious group (i.e., "Vabals"). The first text described the target using disease-related metaphors (i.e., biological language condition). In the second text, some words were changed so that the description was negative but not dehumanizing (i.e., non-biological language condition). After reading the vignette, participants were asked to rate their agreement with a series of questions about dehumanizing perceptions, aggressive intentions, and interpersonal exclusion directed toward the fictitious group described in the text.[1] Then, they were asked to answer the attention check item, indicated their demographic information, and were thanked and fully debriefed.

Experimental Manipulation

To manipulate biological language, participants were randomly assigned to read one of two scenarios. Participants first read: "In a distant galaxy, the inhabitants of planet RC8986 are witnessing the settlement in their territory of a new population named Vabals." The subsequent paragraph varied depending on the experimental condition.

For the biological language condition (the corresponding text for the non-biological language condition is shown in brackets), participants read: "The planet's president pointed out the difficulties associated with their integration, stating that RC8986 is plagued [negatively impacted] by Vabals, and that this disease [situation] will get worse in no time. A Vabal is a typical parasite [villain] who will continue to spread [move] among the inhabitants of RC8986 and absorb [take advantage of] their resources as long as they have the opportunity. According to the president, offering help will not eradicate [solve] this toxic [controversial] issue. Only increased border security will make it possible to quarantine the poison of [control] this new population."

Measures

After reading the text, participants were asked to answer the following questions, which are presented here in the order they were in the questionnaire. Items' order within each scale was randomized. The responses were given on a 5-point scale from 1 = *not at all* to 5 = *very much*. The complete list of the items is available on the OSF webpage (see the "Coding Scheme" document).

Dehumanizing perceptions Participants were asked to indicate the degree to which they thought Vabals (i.e., the target described in the text) could be considered human-, virus-, and animal-like. Perceptions as animal-like (i.e., animalization) were included as a contrasting variable to examine the specificity of the tested associations. Overall, we used 12 items from Valtorta et al. (2019). In particular, the perception of the target as a human being was measured by employing four human-related words (e.g., *person*, *human being*; $\alpha = 0.89$). The perceptions of the target as a virus and an animal were measured using, respectively, four virus-related nouns (e.g., *disease*, *virus*; $\alpha = 0.95$) and four animal-related nouns (e.g., *animal*, *beast*; $\alpha = 0.87$). Results of the Confirmatory Factor Analysis (CFA) indicated that the scale fitted the hypothesized structure, with each item loading on the corresponding subscale ($\chi^2[51] = 71.20$, p = .032; RMSEA = 0.044, 95% CI [0.000, 0.071]; CFI = 0.989; TLI = 0.986; SRMR = 0.036). We computed two scores to obtain a different index for each dehumanizing perception following the scoring procedure of Andrighetto et al. (2017). The biologization score resulted from the difference between the virus- and the human-related words, and the animalization score resulted from the difference between the animal- and human-related words. Higher scores indicate stronger perceptions of the target as virus-like or animal-like than a human being.

Aggressive intentions Aggressive intentions toward Vabals were measured using 20 items assessing the extent to which the participants would be tempted to engage in various

---

[1] As indicated in the preregistration of Study 1, at the end of the questionnaire of this study, we collected additional data on agency attributions for exploratory purposes. Since this analysis is irrelevant to the question under investigation in the current manuscript, we reported more details on this variable only in the "Supplementary Material" document on the project's OSF webpage: https://osf.io/ywm9d/.

behaviors. Ten items measured indirect aggression (e.g., *excluding Vabals from society*; $\alpha = 0.97$; adapted from Forrest et al., 2005), and 10 items assessed direct aggression (e.g., *throwing something at Vabals*; $\alpha = 0.98$; adapted from Richardson & Green, 2003). Results from a CFA confirmed that the items saturated on two dimensions ($\chi^2[169] = 349$, $p < .001$; RMSEA = 0.073, 95% CI [0.060, 0.086]; CFI = 0.967; TLI = 0.963; SRMR = 0.051). Higher scores indicate more indirect and direct aggression, respectively.

Interpersonal exclusion We adapted the Social Exclusion Bench Tool (SEBT; Mazzoni et al., 2021) to measure participants' interpersonal exclusion directed toward Vabals. In the original SEBT, two figures were presented at opposite ends of a bench (an ingroup and an outgroup member). We adapted the images to include only a single figure representing the target group and presented them with brief captions that described two situations: "The figure below is a Vabal waiting for the bus at the bus stop" (see Fig. 2A) and "The figure below is a Vabal watching a tennis match in a park playground" (see Fig. 2B). Participants were asked to indicate the position they would want to occupy on the bench by clicking on it. The images were included in the questionnaire using the Qualtrics Heat Map function, which allowed us to record the coordinates of the position taken by each participant, thus making inferences on the distance between them and the target. Qualtrics recorded the click coordinates in pixels relative to the image itself, which are consistent across devices, so no device-specific adjustments were necessary. The variable corresponding to Fig. 2B was reversed to have, for both variables, higher values corresponding to a higher distance from our target.

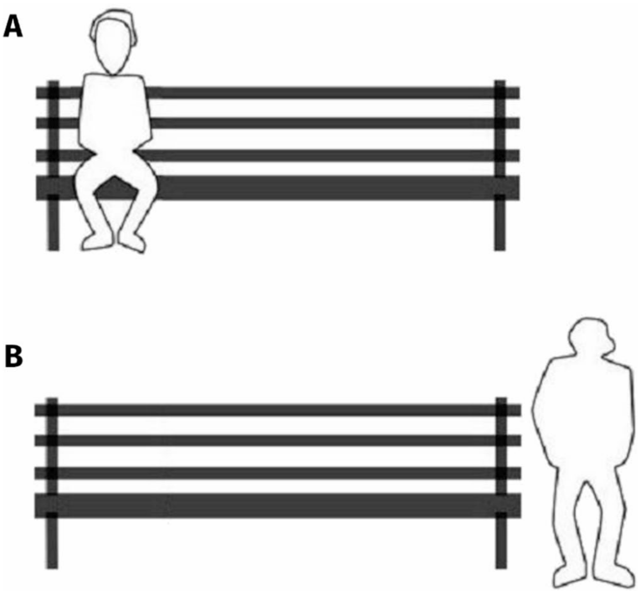

Fig. 2 Images used for the SEBT

A mean index of the two images was used in the analyses ($r[199] = 0.64$, $p < .001$).

Attention check Participants were asked to indicate which vignette they had read by selecting one of three responses: (1) "A Vabal is a typical parasite," (2) "A Vabal is a typical villain," (3) "I do not remember."

Results

Dehumanizing perceptions

Before testing the main effects of the experimental manipulation on the differential scores of biologization and animalization, we report descriptive statistics for the ratings of each perception, namely of virus-like, animal-like, and human-like variables (for additional analyses with these scores, see the "Supplementary Material" document on OSF). The participants in the biological language condition rated Vabals as more virus-like ($M = 3.52$, $SD = 1.36$) and less human-like ($M = 2.95$, $SD = 1.21$) compared to the non-biological language condition ($M = 1.70$, $SD = 0.99$ for virus-like and $M = 3.77$, $SD = 0.95$ for human-like), whereas animal-like ratings were relatively lower in both conditions ($M = 1.74$, $SD = 0.78$ for the biological and $M = 2.36$, $SD = 1.24$ for the non-biological language condition). This pattern suggests that the manipulation primarily influenced biologization rather than animalization, providing context for interpreting the subsequent difference-score analyses.

A 2 (condition: biological language vs. non-biological language) × 2 (type of dehumanization: animalization, biologization) repeated measures ANOVA with condition as between-subjects factor was conducted.[2] Levene's test was significant for both biologization and animalization (all *p*s < 0.001), revealing violations of homogeneity. As indicated by Pallant (2020; see also Stevens, 1996), analysis of variance is robust to violations of this assumption, provided the size of the groups is reasonably similar (e.g., largest/smallest = 1.50). Since our sample sizes were roughly equal (i.e., $n = 100$ for the biological language condition and $n = 101$ for

---

[2] In the preregistrations of all three studies, we mistakenly indicated that we would conduct MANOVAs to test the effect of the experimental manipulation on dehumanizing perceptions (Study 1, Study 2, and Study 3), aggressive intentions (Study 1, Study 2, and Study 3), and accessibility of aggressive thoughts (Study 3). However, since ourhypotheses (as reported in the preregistrations) also involved within-subject comparisons among these variables (i.e., biologization vs. animalization for dehumanizing perceptions; indirect vs. direct aggression for aggressive intentions; indirect vs. direct aggression thoughts for accessibility of aggressive thoughts), we performed repeatedmeasures ANOVAs with the experimental manipulation as between-subjects factor.

the non-biological language condition), we proceeded with and interpreted the results of the following analysis.

We found a significant main effect of condition, $F(1, 199) = 37.71$, $p < .001$, $\eta_p^2 = 0.16$, 95% CI [0.08, 0.25], indicating that the participants in the biological language condition ($M = -0.32$, $SD = 1.76$) dehumanized Vabals more than those in the non-biological language condition ($M = -1.74$, $SD = 1.53$). In the same vein, the main effect of type of dehumanization was significant, $F(1, 199) = 26.36$, $p < .001$, $\eta_p^2 = 0.12$, 95% CI [0.05, 0.20]. Participants dehumanized Vabals more biologically ($M = -0.76$, $SD = 2.38$) than animalistically ($M = -1.31$, $SD = 1.70$).

We observed that condition × type of dehumanization interaction was significant, $F(1, 199) = 124.08$, $p < .001$, $\eta_p^2 = 0.38$, 95% CI [0.28, 0.47]. Simple effects showed that when participants were presented with the biologized scenario, they perceived Vabals as more similar to viruses ($M = 0.57$, $SD = 2.31$) than animals ($M = -1.21$, $SD = 1.45$), $F(1, 199) = 131.75$, $p < .001$, $\eta_p^2 = 0.40$, 95% CI [0.30, 0.48]. A significant result also emerged for the non-biological language condition, $F(1, 199) = 18.12$, $p < .001$, $\eta_p^2 = 0.08$, 95% CI [0.02, 0.16]. The participants who read the text with non-biological language perceived Vabals as more similar to animals ($M = -1.42$, $SD = 1.91$) than viruses ($M = -2.07$, $SD = 1.46$).

Crucially, we found that when participants biologized Vabals, the effect of condition was significant, $F(1, 199) = 93.95$, $p < .001$, $\eta_p^2 = 0.32$, 95% CI [0.22, 0.41], revealing that those in the biological language condition biologized Vabals more than the participants in the non-biological language condition. The effect of condition was not significant when participants animalized the target group, $F(1, 199) = 0.76$, $p = .385$, $\eta_p^2 = 0.004$, 95% CI [0.00, 0.04]. These results supported H1.

Aggressive intentions

We performed a 2 (condition: biological language vs. non-biological language) × 2 (type of aggression: indirect, direct) repeated measures ANOVA with condition as between-subjects factor.[3] Levene's test was significant for both indirect and direct aggression (all ps < 0.001). In line with the above-mentioned considerations, we decided to proceed with and interpret the results of our repeated measures ANOVA.

The main effect of condition was not significant, $F(1, 199) = 3.60$, $p = .059$, $\eta_p^2 = 0.02$, 95% CI [0.00, 0.07] ($M = 2.09$, $SD = 0.94$ for the biological language condition; $M = 1.85$, $SD = 0.85$ for the non-biological language condition). We found a significant main effect of type of aggression, $F(1, 199) = 41.09$, $p < .001$, $\eta_p^2 = 0.17$, 95% CI [0.09, 0.26], indicating that participants reported more indirect ($M = 2.24$, $SD = 1.19$) than direct ($M = 1.70$, $SD = 1.04$) aggression.

We observed that condition × type of aggression interaction was significant, $F(1, 199) = 48.45$, $p < .001$, $\eta_p^2 = 0.20$, 95% CI [0.11, 0.29], providing initial support for H2. When participants were presented with the biologized scenario, they reported more indirect ($M = 2.66$, $SD = 1.41$) than direct ($M = 1.53$, $SD = 0.66$) aggression against Vabals, $F(1, 199) = 88.95$, $p < .001$, $\eta_p^2 = 0.31$, 95% CI [0.21, 0.40]. A non-significant result emerged for the non-biological language condition ($M = 1.83$, $SD = 0.74$ for indirect aggression; $M = 1.88$, $SD = 1.30$ for direct aggression), $F(1, 199) = 0.15$, $p = .697$, $\eta_p^2 = 0.001$, 95% CI [0.00, 0.03].

Also, we found that when participants reported indirect aggression, the effect of condition was significant, $F(1, 199) = 27.36$, $p < .001$, $\eta_p^2 = 0.12$, 95% CI [0.05, 0.21], revealing that these intentions were higher for the participants in the biological (vs. non-biological) language condition. In the same vein, the effect of condition was significant when participants reported direct aggression, $F(1, 199) = 5.79$, $p = .017$, $\eta_p^2 = 0.03$, 95% CI [0.001, 0.09], indicating that direct intentions were greater for those in the non-biological (vs. biological) language condition. H2 was thus supported.

Interpersonal exclusion

We conducted a one-way ANOVA (condition: biological language vs. non-biological language) to test whether the experimental manipulation affected the exclusion intentions reported by participants through the SEBT. Levene's test was not significant ($p = .178$). We found that the effect of condition was significant, $F(1, 199) = 19.05$, $p < .001$, $\eta_p^2 = 0.09$, 95% CI [0.03, 0.17] (see the "SEBT Results" document on OSF for the Qualtrics Heat Maps). In line with H3, the participants in the biological language condition ($M = 313.10$, $SD = 66.96$) placed themselves further away from the target on the bench than those in the non-biological language condition ($M = 270.20$, $SD = 72.24$). Importantly, we confirmed these results by excluding the respondents ($n = 7$) who clicked slightly outside the bench on Qualtrics, demonstrating that the participants who read the text

---

[3] In the preregistrations of all three studies, we mistakenly indicated that we would conduct MANOVAs to test the effect of the experimental manipulation on dehumanizingperceptions (Study 1, Study 2, and Study 3), aggressive intentions (Study 1, Study 2, and Study 3), and accessibility of aggressive thoughts (Study 3). However, since ourhypotheses (as reported in the preregistrations) also involved within-subject comparisons among these variables (i.e., biologization vs. animalization for dehumanizingperceptions; indirect vs. direct aggression for aggressive intentions; indirect vs. direct aggression thoughts for accessibility of aggressive thoughts), we performed repeatedmeasures ANOVAs with the experimental manipulation as between-subjects factor.

describing Vabals with biological metaphors (M=308.07, SD=62.86) reported higher levels of exclusion intentions than those who read the negative but non-dehumanizing scenario (M=268.97, SD=70.83), $F(1, 192)=16.51$, $p <$ .001, $\eta_p^2=0.08$, 95% CI [0.02, 0.16].

The role of biologization

We tested two models using Hayes' (2018) PROCESS macro (Model 4) and the bootstrapping method (5,000 resamples; see Fig. 1A). In both models, we considered the experimental condition as the independent variable, coded as 1=biological language condition, 2=non-biological language condition. Accordingly, negative regression coefficients indicate higher scores for the biological language condition. Biologization was entered as the mediator, and indirect aggression and interpersonal exclusion were separately entered as outcome variables.

Reading the text containing biological language was associated with greater biologization of the target, β = -1.13, SE=0.12, $t(199)$ = -9.69, $p <$ .001, 95% CI [-1.36, -0.90]. Moreover, biological dehumanization was a significant predictor of indirect aggression β=0.63, SE=0.07, $t(198)=9.37$, $p <$ .001, 95% CI [0.50, 0.76]. The direct effect of the experimental manipulation on indirect aggression became non-significant, β=0.02, SE=0.13, $t(198)=0.14$, p = .890, 95% CI [-0.25, 0.28]. Crucially, the proposed model and H4a were confirmed by the significance of the indirect effect via biologization, β = -0.71, SE=0.11, 95% CI [-0.95, -0.50].

The same relationships were tested by entering the model interpersonal exclusion instead of indirect aggression. Biological dehumanization was a significant predictor of interpersonal exclusion, β=0.23, SE=0.08, $t(198)=2.89$, p = .004, 95% CI [0.07, 0.39]. The direct effect of the experimental manipulation on interpersonal exclusion was significant, β = -0.33, SE=0.16, $t(198)$ = -2.03, p = .044, 95% CI [-0.64, -0.01]. More importantly, the indirect effect via biologization emerged as significant, β = -0.26, SE=0.10, 95% CI [-0.46, -0.08], thus confirming H4b.

Discussion

Through this study, we provided the first evidence of the relevant role of biological language in eliciting indirect aggression and interpersonal exclusion. In line with our assumptions, we found that using disease metaphors (vs. negative but non-dehumanizing language) to describe others leads to higher levels of biologization (H1), indirect aggression (H2) and exclusion (H3), and that biological dehumanization is an important underlying mechanism of these associations (H4a and H4b).

Study 2

Study 2 was a replication of Study 1 except for a measure of sensitivity to disgust that we included at the beginning of the study. We aimed to verify whether the observed effects of biological language on dehumanizing perceptions, indirect aggression and interpersonal exclusion were consistent, and to explore how disgust sensitivity might moderate these relationships.

We tested the same hypotheses as in Study 1 (i.e., H1, H2, and H3). In addition, we assumed a stronger effect of biological language on indirect aggression (H5a) and interpersonal exclusion (H5b) via biologization for the participants with high and medium (vs. low) levels of sensitivity to disgust.

Method

Participants and procedure

Study 2 was preregistered (https://osf.io/97x64/). Data were collected after preregistration following the same procedure adopted in Study 1. Since, to our knowledge, there are no tools to adequately estimate the sample size for the moderated mediation model tested in this study (see Fig. 1B), we performed the same power analysis performed for Study 1. Two hundred twenty-six Italian respondents took part in this study. Of these, we excluded those who failed the attention check item (n=22; 11 in each condition). The final sample comprises 204 participants (68% women, 31% men, 1% other; M_{age} = 29.18, SD=12.02; age range: 18–73).

We adopted the same method used in Study 1, except for a measure of disgust sensitivity (i.e., the Disgust Scale Questionnaire by Haidt et al., 1994 in its Italian version by Giampietro et al., 2019; DSQ) that we included at the beginning of the study, ahead of the experimental manipulation. Before reading the scenario describing Vabals, participants were asked to indicate how much they agreed with 13 statements (e.g., “If I see someone vomit, it makes me sick to my stomach”) and to qualify how disgusting they found 12 situations (e.g., “You see maggots on a piece of meat in an outdoor rubbish skip”) on a scale ranging from 0 (*Strongly disagree/Not disgusting at all*) to 4 (*Strongly agree/Very disgusting*). All the items were presented in randomized order. We computed a single score of disgust sensitivity by summing the 25 items (for a similar procedure, see Giampietro et al., 2019). The final score ranges from 0 to 100, with higher ratings indicating more sensitivity to disgust. The fit of the model was acceptable ($\chi^2[275]=627$, $p <$ .001; RMSEA=0.079, 95% CI [0.069, 0.089]; CFI=0.833; TLI=0.818; SRMR=0.064) and the reliability of the scale was excellent (α=0.93).

After the DSQ, participants were randomly presented with one of the two scenarios (biological language vs. non-biological language) adopted in the previous study, and they were asked to answer the same measures used in Study 1, namely dehumanizing perceptions ($\chi^2[51]=87$, $p = .001$; RMSEA = 0.059, 95% CI [0.031, 0.083]; CFI = 0.980; TLI = 0.975; SRMR = 0.051; $\alpha_{\text{humans}}=0.92$; $\alpha_{\text{viruses}}=0.96$; $\alpha_{\text{animals}}=0.78$), aggressive intentions ($\chi^2[169]=401$, $p < .001$; RMSEA = 0.082, 95% CI [0.070, 0.094]; CFI = 0.965; TLI = 0.961; SRMR = 0.033; $\alpha_{\text{indirect}}=0.99$; $\alpha_{\text{direct}}=0.98$), interpersonal exclusion ($r[202] = 0.70$, $p < .001$), and the attention check item. Finally, participants indicated their demographic information, were thanked and fully debriefed.

Results

We conducted the same analyses performed in Study 1.[4] Levene's test was not significant for animalization ($p = .841$) and interpersonal exclusion ($p = .133$). The test emerged as significant for biologization, indirect aggression, and direct aggression (all *p*s < 0.001). Since our sample sizes were roughly equal (i.e., $n=101$ for the biological language condition and $n=103$ for the non-biological language condition), we proceeded with our analyses.

Dehumanizing perceptions

Descriptive statistics for the ratings of virus-like, animal-like, and human-like perceptions indicated that the participants in the biological language condition perceived Vabals as more virus-like ($M=3.64$, $SD=1.39$) and less human-like ($M=2.67$, $SD=1.25$) compared to those in the non-biological language condition ($M=2.10$, $SD=1.13$ for virus-like and $M=3.71$, $SD=0.95$ for human-like), whereas animal-like ratings remained relatively low across conditions ($M=1.98$, $SD=0.78$ for the biological and $M=2.38$, $SD=0.97$ for the non-biological language condition). These patterns reinforce that the manipulation specifically affected biologization rather than animalization (for additional analyses with these scores, see the "Supplementary Material" document on OSF).

As shown in Table 1, we replicated the findings of Study 1. As for dehumanizing perceptions, we found a significant main effect of condition ($M=0.14$, $SD=1.96$ for the biological language condition; $M = -1.46$, $SD=1.43$ for the non-biological language condition) and type of dehumanization ($M=-0.33$, $SD=2.42$ for biologization; $M=-1.01$, $SD=1.65$ for animalization). Importantly, we found a significant interaction effect condition × type of dehumanization, indicating that the participants in the biological (vs. non-biological) language condition perceived Vabals as more similar to viruses than animals (see Fig. 3A), thus confirming H1.

Aggressive intentions

Regarding aggressive tendencies, we found a non-significant main effect of condition ($M=2.08$, $SD=0.86$ for the biological language condition; $M=2.15$, $SD=0.76$ for the non-biological language condition) and a significant main effect of type of aggressive intentions ($M=2.56$, $SD=1.33$ for indirect aggression; $M=1.66$, $SD=0.87$ for direct aggression). Crucially, we found a significant interaction effect condition × type of aggressive intentions (see Table 1). As shown in Fig. 3B, the participants who read the text describing the target with biological (vs. negative but non-dehumanizing) metaphors reported more indirect than direct aggression, providing support for H2.

Interpersonal exclusion

We confirmed that using biological (vs. negative but non-dehumanizing) language to describe others led to higher levels of interpersonal exclusion, $F(1, 202)=6.01$, $p = .015$, $\eta_p^2=0.03$, 95% CI [0.001, 0.09] (see the "SEBT Results" document on OSF for the Qualtrics Heat Maps). In line with H3, the participants in the biological language condition ($M=391.23$, $SD=78.64$) placed themselves further away from the target on the bench than those in the non-biological language condition ($M=366.64$, $SD=63.99$). The same was confirmed by excluding the respondents ($n=12$) who clicked slightly outside the bench on Qualtrics, demonstrating that the participants who read the text describing Vabals with biological metaphors ($M=386.40$, $SD=65.05$) reported higher levels of exclusion than those who read the negative but non-dehumanizing scenario ($M=363.73$, $SD=62.20$), $F(1, 190)=6.09$, $p = .014$, $\eta_p^2=0.03$, 95% CI [0.001, 0.09].

The role of disgust sensitivity

We tested two moderated mediation models using Hayes' (2018) PROCESS macro (Model 14) and the bootstrapping method (5,000 resamples; see Fig. 1B). In both models, we considered the experimental condition as the independent

---

[4] In the preregistrations of all three studies, we mistakenly indicated that we would conduct MANOVAs to test the effect of the experimental manipulation on dehumanizingperceptions (Study 1, Study 2, and Study 3), aggressive intentions (Study 1, Study 2, and Study 3), and accessibility of aggressive thoughts (Study 3). However, since ourhypotheses (as reported in the preregistrations) also involved within-subject comparisons among these variables (i.e., biologization vs. animalization for dehumanizingperceptions; indirect vs. direct aggression for aggressive intentions; indirect vs. direct aggression thoughts for accessibility of aggressive thoughts), we performed repeatedmeasures ANOVAs with the experimental manipulation as between-subjects factor.

Table 1 Repeated measures ANOVAs for dehumanizing perceptions and aggressive intentions (Study 2)

Dehumanizing perceptions

	F	df	*p*	η_p^2	95% CI	
					Lower	Upper
Main effect of condition	44.40	202	< .001	.18	0.09	0.27
Main effect of type of dehumanization	51.47	202	< .001	.20	0.11	0.30
Interaction effect	101.06	202	< .001	.33	0.23	0.42

Simple effects

	F	df	*p*	η_p^2	95% CI	
					Lower	Upper
Effect of type of dehumanization						
Biological language	146.95	202	< .001	.42	0.32	0.50
Non-biological language	4.18	202	.042	.02	0.00	0.07
Effect of condition						
Biologization	79.99	202	< .001	.28	0.18	0.38
Animalization	7.82	202	.006	.04	0.003	0.10

Aggressive intentions

	F	df	*p*	η_p^2	95% CI	
					Lower	Upper
Main effect of condition	0.37	202	.542	.002	0.00	0.03
Main effect of type of aggressive intentions	83.25	202	< .001	.29	0.19	0.38
Interaction effect	42.29	202	< .001	.17	0.09	0.26

Simple effects

	F	df	*p*	η_p^2	95% CI	
					Lower	Upper
Effect of type of aggressive intentions						
Biological language	120.92	202	< .001	.37	0.27	0.46
Non-biological language	3.47	202	.064	.02	0.00	0.07
Effect of condition						
Indirect aggression	9.94	202	.002	.05	0.01	0.11
Direct aggression	41.05	202	< .001	.17	0.08	0.26

variable, coded as 1=biological language condition, 2=non-biological language condition. Accordingly, negative regression coefficients indicate higher scores for the biological language condition. Biologization was entered as the mediator and disgust sensitivity as the moderator of the link between biologization and the outcome variable. Indirect aggression and interpersonal exclusion were separately entered as outcome variables.

As shown in Table 2 (Panel A), reading a text containing biological metaphors predicted biologization, which was positively related to indirect aggression. Crucially, biologization × disgust sensitivity interaction was significant in predicting indirect aggression. High biologization accompanied by high and medium disgust sensitivity was associated with increased indirect aggression when compared with low disgust sensitivity (for the slopes, see the "Supplementary Material" document on OSF). The 95% confidence interval for the index of moderated mediation (IMM) did not contain zero, indicating that the conditional effect was significant at different levels of disgust sensitivity, IMM = -0.15, *SE*=0.06, 95% CI [-0.26, -0.04]. The conditional indirect effect of biologization was bigger and significant at high, β = -0.42, *SE*=0.10, 95% CI [-0.62, -0.21], and medium, β = -0.27, *SE*=0.09, 95% CI [-0.45, -0.10], levels of sensitivity to disgust. The conditional indirect effect was not significant at low levels of disgust sensitivity, β = -0.12, *SE*=0.11, 95% CI [-0.34, 0.08]. These results supported H5a.

The same model with interpersonal exclusion as the outcome variable instead of indirect aggression was not significant (see Table 2, Panel B), as indicated by the non-significant interaction effect biologization × disgust sensitivity in predicting interpersonal exclusion and the non-significant index of moderated mediation, IMM = -0.07, *SE*=0.07, 95% CI [-0.21, 0.05]. Therefore, H5b was not supported.

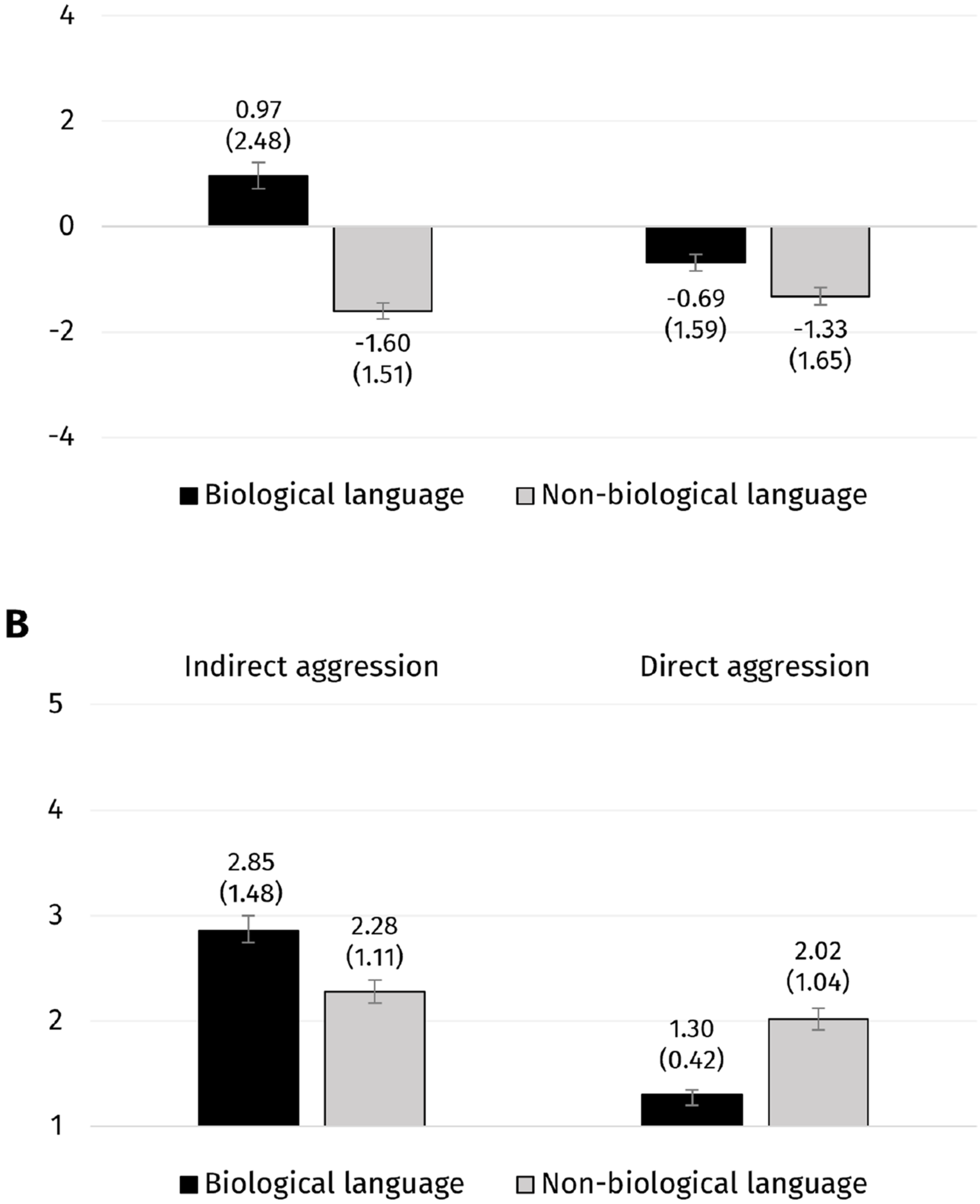

Fig. 3 Means and standard deviations (in parentheses) for dehumanizing perceptions (**A**) and aggressive intentions (**B**) as a function of the experimental manipulation (Study 2)

Discussion

In line with Study 1, we found that describing others with biological (vs. negative but non-dehumanizing) metaphors leads to higher levels of biologization (H1), indirect aggression (H2), and interpersonal exclusion (H3). Importantly, we provided the first evidence of the key role played by disgust sensitivity in these associations. The indirect effect of biological language on indirect aggression via biologization is bigger and significant for participants with high and medium levels of disgust sensitivity; the effect is not significant for respondents with lower sensitivity to disgust (H5a). Contrary to H5b, the moderating role of disgust sensitivity is not significant for the indirect link between biological language and interpersonal exclusion.

Study 3

In Study 3, we sought to provide further support for the effect of biological language on indirect aggression and interpersonal exclusion by examining the accessibility of aggressive thoughts. To do so, we replicated Study 2 and included in the questionnaire the Word Completion Task (adapted from Anderson et al., 2004; WCT), a measure consisting of a list of word fragments in which participants are asked to quickly fill in the blanks to complete each word. In our case, half of the fragments were able to be completed to form either Italian indirect aggression or non-aggressive words (e.g., "_ _ITARE" could become "EVITARE" [avoid] or "IMITARE" [imitate]), while the other half could be completed to form either Italian direct aggression or non-aggressive

Table 2 Regressions of the experimental condition on indirect aggression (Panel A) and interpersonal exclusion (Panel B) via biologization when disgust sensitivity is the moderator (Study 2)

Panel A

			95% CI		
	β(SE)	t	Lower	Upper	p
Prediction of biologization					
Experimental condition	-1.06 (0.12)	-8.94	-1.30	-0.83	< .001
Prediction of indirect aggression					
Experimental condition	0.03 (0.14)	0.22	-0.24	0.30	.825
Biologization	0.26 (0.08)	3.36	0.11	0.41	< .001
Disgust sensitivity	0.37 (0.07)	5.45	0.23	0.50	< .001
Biologization × Disgust sensitivity	0.14 (0.06)	2.39	0.02	0.25	.018
Low disgust sensitivity	0.12 (0.09)	1.24	-0.07	0.30	.218
Medium disgust sensitivity	0.26 (0.08)	3.36	0.11	0.41	.001
High disgust sensitivity	0.39 (0.10)	4.08	0.20	0.58	< .001

Panel B

			95% CI		
	β(SE)	t	Lower	Upper	p
Experimental condition	-0.05 (0.16)	-0.30	-0.36	0.26	.762
Biologization	0.17 (0.09)	1.93	-0.004	0.34	.055
Disgust sensitivity	0.25 (0.08)	3.24	0.10	0.40	.001
Biologization × Disgust sensitivity	0.06 (0.07)	0.98	-0.07	0.19	.328

The values reported in the table are standardized

words (e.g., “CON_US_ONE” could become “CONTUSIONE” [bruise] or “CONFUSIONE” [confusion]; see the “Coding Scheme” document on OSF for the complete list of the words).

We retested H1, H2, and H3. Then, according to the literature mentioned above on the GAM (e.g., Pond et al., 2012) and indirect aggression (e.g., Valtorta et al., 2024), we assumed that the participants who read the text with biological language would report more accessibility of indirect (vs. direct) aggression thoughts (H6). Also, we predicted that this variable could serve as a second-level mediator of two moderated mediation models in which the indirect effect of biological language via biologization and indirect aggression thoughts on indirect aggression (H7a) and interpersonal exclusion (H7b) was moderated by disgust sensitivity.

Method

Participants and procedure

Full details of this study were preregistered (https://osf.io/euyr8/). Data were collected after preregistration using the Qualtrics platform. Since, to our knowledge, there are no tools to adequately estimate the sample size for the moderated mediation model tested in this study (see Fig. 1C), we performed a Monte Carlo power analysis for indirect effects considering a model with two serial mediators (Schoemann et al., 2017). The results indicated that at least 245 participants are needed to reach a power of 0.80 (alpha = 0.05; bootstrapping = 5,000; r = .30). We collected a sample of 266 Italian respondents. Among these, 125 participants were collected with a snowball sampling strategy, while 141 respondents were collected through Prolific Academic. These participants were paid £1,30 for a 13-minute questionnaire. We excluded those who failed the attention check item ($n = 18$; ten in the biological language condition, eight in the non-biological language condition). The final sample comprises 248 respondents (59% women, 39% men, 2% other; M_{age} = 30.28, $SD = 10.35$; age range: 18–62).

We adopted the same procedure used in Study 2, except for the measure of accessibility of aggressive thoughts (i.e., the WCT adapted from Anderson et al., 2004) that we included before the scale of aggressive intentions. Thus, at the beginning of the study, participants were asked to answer the DSQ we used in Study 2 to measure disgust sensitivity ($\chi^2[275] = 618$, $p < .001$; RMSEA = 0.071, 95% CI [0.062, 0.080]; CFI = 0.809; TLI = 0.792; SRMR = 0.063; $\alpha = 0.90$). Then, they were randomly presented with one of the two scenarios (biological language vs. non-biological language) adopted in the previous studies, and they were asked to answer the scale measuring dehumanizing perceptions (see Study 1 and Study 2, $\chi^2[51] = 134$, $p < .001$; RMSEA = 0.081, 95% CI [0.061, 0.101]; CFI = 0.966; TLI = 0.956; SRMR = 0.042; $\alpha_{humans} = 0.93$; $\alpha_{viruses} = 0.95$; $\alpha_{animals} = 0.83$).

At this point, participants were instructed to perform the WCT. They were presented with a list of 14-word fragments and asked to fill in the missing letters to form a word. They were given 15 s to fulfill each word. The word fragments were presented in randomized order; half of them could be completed to form either indirect aggression or non-aggressive words, while the other half could be completed to form either direct aggression or non-aggressive words. Accessibility of aggressive thoughts was computed as the proportion of word completions that were aggressive in terms of indirect and direct aggression, that is, we took the number of aggressive responses divided by the total number of word fragments completed (for a similar procedure, see Anderson et al., 2004).

Participants were then asked to complete the scale of aggressive intentions ($\chi^2[169]=494$, $p < .001$; RMSEA = 0.087, 95% CI [0.077, 0.099]; CFI = 0.949; TLI = 0.943; SRMR = 0.033; $\alpha_{\text{indirect}}=0.97$; $\alpha_{\text{direct}}=0.97$), the measure of interpersonal exclusion ($r[246] = 0.56$, $p < .001$), and the attention check item used in the previous studies. Finally, participants indicated their demographic information, were thanked and fully debriefed.

Results

To test H1, H2, and H3, we conducted the same analyses performed in the previous studies.[5] Levene's test was not significant for animalization ($p = .196$), biologization ($p = .287$), and interpersonal exclusion ($p = .784$). The test emerged as significant for indirect ($p < .001$) and direct ($p = .002$) aggression. Since our sample sizes were roughly equal (i.e., $n=122$ for the biological language condition and $n=126$ for the non-biological language condition), we proceeded with our analyses.

Dehumanizing perceptions

Descriptive statistics for the ratings of virus-, animal-, and human-like perceptions indicated that the participants exposed to biological language rated Vabals as more virus-like ($M=3.96$, $SD=1.04$) and less human-like ($M=2.41$, $SD=1.16$) compared to those in the non-biological language condition ($M=2.19$, $SD=1.16$ for virus-like and $M=3.84$, $SD=0.92$ for human-like), while animal-like ratings remained comparable across conditions ($M=2.19$, $SD=0.92$ for the biological and $M=2.28$, $SD=1.02$ for the non-biological language condition). These results confirm that the experimental manipulation primarily influenced biologization (for additional analyses with these scores, see the "Supplementary Material" document on OSF), setting the stage for interpreting the analyses based on difference scores.

We confirmed the results of Study 1 and Study 2 (see Table 3). As for dehumanizing perceptions, we found a main effect of condition ($M=0.66$, $SD=1.60$ for the biological language condition; $M = -1.60$, $SD=1.60$ for the non-biological language condition) and type of dehumanization ($M = -0.08$, $SD=2.44$ for biologization; $M = -0.90$, $SD=1.68$ for animalization). Crucially, we found evidence of the significant interaction effect condition × type of dehumanization. As shown in Fig. 4A, the participants in the biological (vs. non-biological) language condition perceived Vabals as more similar to viruses than animals, providing support for H1.

Aggressive intentions

Regarding aggressive tendencies, we found a significant main effect of condition ($M=2.11$, $SD=0.78$ for the biological language condition; $M=1.83$, $SD=0.80$ for the non-biological language condition) and a significant main effect of type of aggressive intentions ($M=2.39$, $SD=1.13$ for indirect aggression; $M=1.54$, $SD=0.84$ for direct aggression). Also, we found a significant interaction effect condition × type of aggressive intentions (see Table 3), indicating that the participants who read the text describing the target with biological (vs. negative but non-dehumanizing) metaphors reported more indirect than direct aggression (see Fig. 4B), thus confirming H2.

Interpersonal exclusion

We confirmed that using biological (vs. negative but non-dehumanizing) language led to greater interpersonal exclusion, $F(1, 246)=8.32$, $p = .004$, $\eta_p^2=0.03$, 95% CI [0.003, 0.09] (see the "SEBT Results" document on OSF for the Qualtrics Heat Maps). In line with H3, the participants in the biological language condition ($M=316.89$, $SD=68.21$) placed themselves further away from the target on the bench than those in the non-biological language condition ($M=292.54$, $SD=64.71$). The same was confirmed by excluding the respondents ($n=13$) who clicked slightly outside the bench on Qualtrics, demonstrating that the participants who read the text describing Vabals with biological metaphors ($M=306.46$, $SD=59.63$) reported higher exclusion than those who read the negative but non-dehumanizing

---

[5] In the preregistrations of all three studies, we mistakenly indicated that we would conduct MANOVAs to test the effect of the experimental manipulation on dehumanizingperceptions (Study 1, Study 2, and Study 3), aggressive intentions (Study 1, Study 2, and Study 3), and accessibility of aggressive thoughts (Study 3). However, since ourhypotheses (as reported in the preregistrations) also involved within-subject comparisons among these variables (i.e., biologization vs. animalization for dehumanizingperceptions; indirect vs. direct aggression for aggressive intentions; indirect vs. direct aggression thoughts for accessibility of aggressive thoughts), we performed repeatedmeasures ANOVAs with the experimental manipulation as between-subjects factor.

Table 3 Repeated measures ANOVAs for dehumanizing perceptions and aggressive intentions (Study 3)

Dehumanizing perceptions					95 % CI	
	F	df	*p*	η_p^2	Lower	Upper
Main effect of condition	124.68	246	< .001	.34	0.24	0.42
Main effect of type of dehumanization	130.80	246	< .001	.35	0.26	0.43
Interaction effect	160.09	246	< .001	.39	0.30	0.47
Simple effects					95% CI	
	F	df	*p*	η_p^2	Lower	Upper
Effect of type of dehumanization						
Biological language	285.54	246	< .001	.54	0.46	0.60
Non-biological language	0.75	246	.387	.003	0.00	0.03
Effect of condition						
Biologization	186.65	246	< .001	.43	0.34	0.51
Animalization	46.51	246	< .001	.16	0.08	0.24
Aggressive intentions					95% CI	
	F	df	*p*	η_p^2	Lower	Upper
Main effect of condition	8.20	246	.005	.03	0.003	0.09
Main effect of type of aggressive intentions	164.30	246	< .001	.40	0.31	0.48
Interaction effect	54.49	246	< .001	.18	0.10	0.26
Simple effects					95% CI	
	F	df	*p*	η_p^2	Lower	Upper
Effect of type of aggressive intentions						
Biological language	200.77	246	< .001	.45	0.36	0.52
Non-biological language	15.02	246	< .001	.06	0.01	0.12
Effect of condition						
Indirect aggression	33.89	246	< .001	.12	0.05	0.20
Direct aggression	3.87	246	.050	.02	0.00	0.06

scenario ($M=289.78$, $SD=62.98$), $F(1, 233)=4.32$, p = .039, $\eta_p^2=0.02$, 95% CI [0.00, 0.07].

Accessibility of aggressive thoughts

We performed a 2 (condition: biological language vs. non-biological language) × 2 (type of aggressive thoughts: indirect, direct) repeated measures ANOVA to analyze the effect of the experimental condition on accessibility of aggressive thoughts, namely the proportion of aggressive words – in terms of indirect and direct aggression – completed by participants in the WCT.[6] Levene's test was not significant for either indirect (p = .068) or direct (p = .279) aggression.

We found a non-significant main effect of condition, $F(1, 246)=1.13$, p = .288, $\eta_p^2=0.01$, 95% CI [0.00, 0.04] ($M=0.47$, $SD=0.18$ for the biological language condition; $M=0.44$, $SD=0.17$ for the non-biological language condition) nor a significant main effect of type of aggressive thoughts, $F(1, 246)=0.30$, p = .588, $\eta_p^2=0.001$, 95% CI [0.00, 0.02] ($M=0.45$, $SD=0.23$ for indirect aggression; $M=0.46$, $SD=0.23$ for direct aggression).

We found a significant interaction effect condition × type of aggressive thoughts, $F(1, 246)=15.11$, $p < .001$, $\eta_p^2=0.06$, 95% CI [0.01, 0.12]. When participants were presented with the biologized scenario, they completed more indirect (vs. neutral) ($M=0.50$, $SD=0.24$) than direct (vs. neutral) ($M=0.44$, $SD=0.22$) aggression words, $F(1, 246)=5.51$, p = .020, $\eta_p^2=0.02$, 95% CI [0.00, 0.07]. A significant result also emerged for the non-biological language

---

[6] In the preregistrations of all three studies, we mistakenly indicated that we would conduct MANOVAs to test the effect of the experimental manipulation on dehumanizingperceptions (Study 1, Study 2, and Study 3), aggressive intentions (Study 1, Study 2, and Study 3), and accessibility of aggressive thoughts (Study 3). However, since ourhypotheses (as reported in the preregistrations) also involved within-subject comparisons among these variables (i.e., biologization vs. animalization for dehumanizingperceptions; indirect vs. direct aggression for aggressive intentions; indirect vs. direct aggression thoughts for accessibility of aggressive thoughts), we performed repeatedmeasures ANOVAs with the experimental manipulation as between-subjects factor.

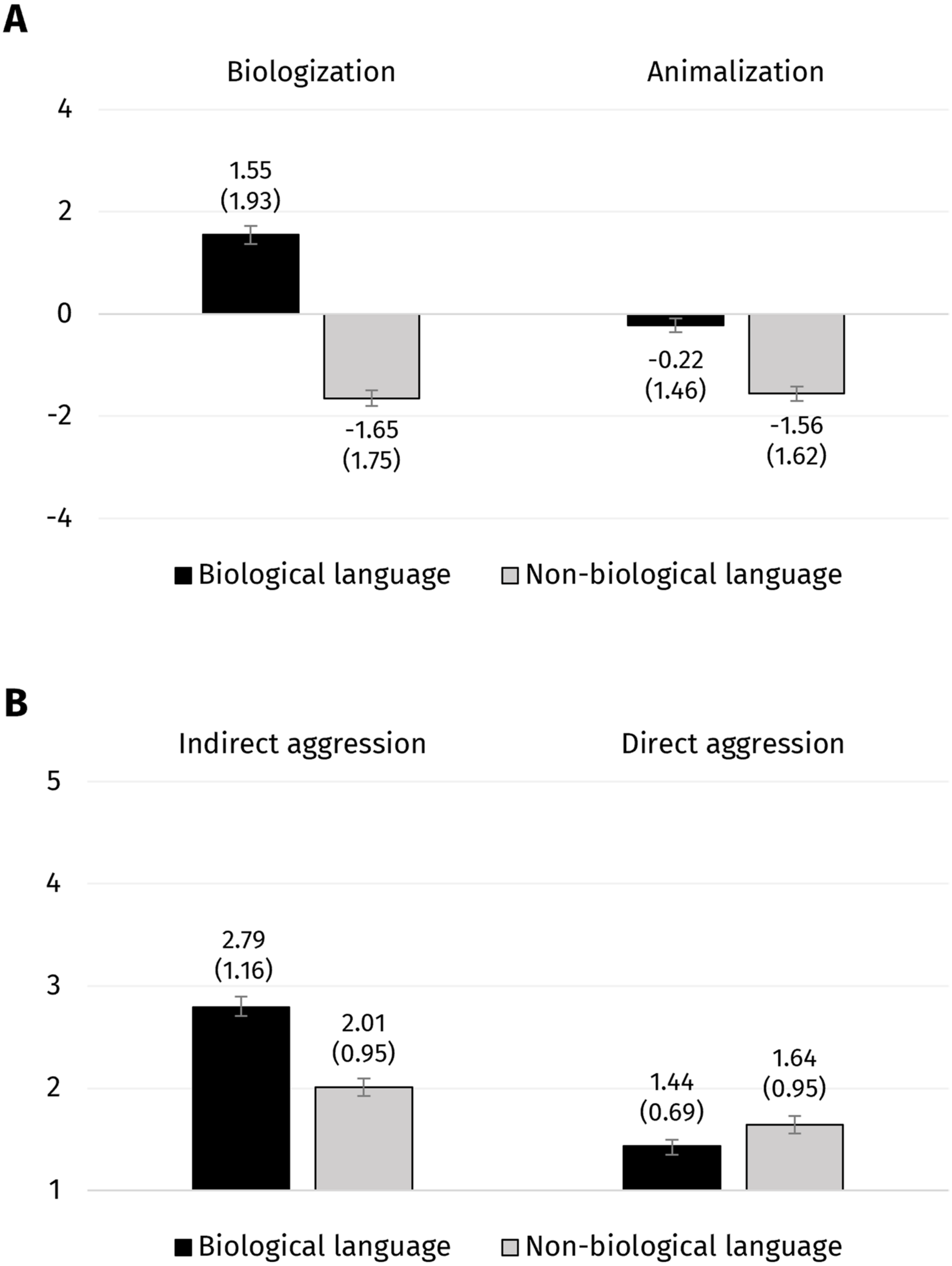

Fig. 4 Means and standard deviations (in parentheses) for dehumanizing perceptions (**A**) and aggressive intentions (**B**) as a function of the experimental manipulation (Study 3)

condition, $F(1, 246)=9.98$, $p = .002$, $\eta_p^2=0.04$, 95% CI [0.01, 0.10]. The participants who read the text with non-biological language completed more direct (vs. neutral) ($M=0.48$, $SD=0.24$) than indirect (vs. neutral) ($M=0.40$, $SD=0.21$) aggression words.

Crucially, we found that when participants completed indirect aggression words, the effect of condition was significant, $F(1, 246)=11.03$, $p = .001$, $\eta_p^2=0.04$, 95% CI [0.01, 0.10], revealing that those in the biological language condition completed more indirect (vs- neutral) aggression words than the participants in the non-biological language condition. The effect of condition was not significant when participants completed direct aggression words, $F(1, 246)=2.93$, $p = .088$, $\eta_p^2=0.01$, 95% CI [0.00, 0.05]. These results supported H6.

The role of accessibility of aggressive thoughts

To test H7a and H7b, we tested two moderated mediation models using Hayes' (2018) PROCESS macro (Model 91) and the bootstrapping method (5,000 resamples; see Fig. 1C). In both models, we considered the experimental condition as the independent variable, coded as 1=biological language condition, 2=non-biological language condition. Accordingly, negative regression coefficients indicate higher scores for the biological language condition. Biologization was entered as the first-level mediator, accessibility of indirect aggression thoughts as the second-level mediator, and disgust sensitivity as the moderator of the link between biologization and accessibility of indirect aggression thoughts. Indirect aggression and interpersonal exclusion were separately entered as outcome variables.

As reported in Table 4 (Panel A), reading a text containing biological metaphors predicted biologization that, in turn, was positively related to accessibility of aggressive thoughts in terms of indirect aggression. Importantly, biologization × disgust sensitivity interaction significantly predicted accessibility of aggressive thoughts. High biologization accompanied by high and medium disgust sensitivity was associated with increased indirect aggression cognitions when compared with low disgust sensitivity (for the slopes, see the "Supplementary Material" document on OSF). Then, higher levels of indirect aggression cognitions were linked with greater indirect aggression. The 95% confidence interval for the index of moderated mediation did not contain zero, indicating that the conditional effect was significant at different levels of disgust sensitivity, IMM = -0.02, *SE* = 0.01, 95% CI [-0.06, -0.01]. The conditional indirect effect of biologization and accessibility of indirect aggression thoughts was bigger and significant at high, β = -0.05, *SE* = 0.03, 95% CI [-0.12, -0.01], and medium, β = -0.03, *SE* = 0.02, 95% CI [-0.08, -0.01], levels of sensitivity to disgust. The conditional indirect effect was not significant at low levels of disgust sensitivity, β = -0.01, *SE* = 0.02, 95% CI [-0.05, 0.03]. We thus confirmed H7a.

The same model with interpersonal exclusion as the outcome variable instead of indirect aggression was not significant (see Table 4, Panel B), as indicated by the non-significant link between accessibility of indirect aggression thoughts and interpersonal exclusion and the non-significant index of moderated mediation, IMM = -0.01, *SE* = 0.01, 95% CI [-0.04, 0.01]. Therefore, H7b was not supported.

Discussion

Through Study 3, we confirmed the effect of biological language on biologization (H1), indirect aggression (H2), and interpersonal exclusion (H3). Importantly, we demonstrated that using biological (vs. negative but non-dehumanizing) metaphors to describe others leads to higher accessibility of indirect aggression thoughts in people's minds (H6). We also provided further evidence of the key role that disgust sensitivity plays in these associations. Reading a text containing

Table 4 Regressions of the experimental condition on indirect aggression (Panel A) and interpersonal exclusion (Panel B) via biologization and accessibility of aggressive thoughts when disgust sensitivity is the moderator (Study 3)

Panel A

	β (*SE*)	*t*	95% CI Lower	Upper	*p*
Prediction of biologization					
Experimental condition	-1.31 (0.10)	-13.66	-1.50	-1.12	<.001
Prediction of accessibility of indirect aggression thoughts					
Experimental condition	-0.05 (0.16)	-0.31	-0.36	0.26	.757
Biologization	0.20 (0.08)	2.31	0.03	0.36	.022
Disgust sensitivity	0.14 (0.07)	2.18	0.01	0.27	.030
Biologization × Disgust sensitivity	0.14 (0.06)	2.33	0.02	0.26	.021
Low disgust sensitivity	0.06 (0.11)	0.51	-0.16	0.27	.607
Medium disgust sensitivity	0.20 (0.08)	2.31	0.03	0.36	.022
High disgust sensitivity	0.34 (0.10)	3.34	0.14	0.53	.001
Prediction of indirect aggression					
Experimental condition	0.07 (0.14)	0.48	-0.21	0.34	.635
Biologization	0.54 (0.07)	7.56	0.40	0.68	<.001
Indirect aggression thoughts	0.12 (0.06)	2.26	0.02	0.23	.025

Panel B

	β (*SE*)	*t*	95% CI Lower	Upper	*p*
Prediction of interpersonal exclusion					
Experimental condition	0.11 (0.16)	0.69	-0.20	0.43	.489
Biologization	0.34 (0.08)	4.15	0.18	0.50	<.001
Indirect aggression thoughts	0.06 (0.06)	0.94	-0.07	0.18	.346

The values reported in the table are standardized disease-related expressions leads to greater intentions aimed at indirect harm via biologization and aggressive cognitions concerning exclusion. Crucially, this serial mediating effect is bigger and significant for participants with high and medium levels of disgust sensitivity; the effect is not significant for respondents with lower sensitivity to disgust (H7a). Contrary to H7b, but in line with Study 2, the moderating role of disgust sensitivity is not significant for interpersonal exclusion.

Mini meta-analysis

To further examine the association between biologization and indirect (vs. direct) aggression, we performed a mini meta-analysis with the data of our studies (for a similar procedure, see Goh et al., 2016). We computed Pearson's correlation to test the association between biologization and indirect aggression ($r_{\text{Study1}}[199] = 0.63$; $r_{\text{Study2}}[202] = 0.45$; $r_{\text{Study3}}[246] = 0.56$, all $ps < 0.001$). We performed the same analysis to test the link between biologization and direct aggression ($r_{\text{Study1}}[199]=0.07, p=.345$; $r_{\text{Study2}}[202]=-0.05$, $p = .517$; $r_{\text{Study3}}[246] = 0.16, p = .014$). We used fixed effects in which the mean effect size (i.e., mean correlation) was weighted by sample size. All correlations were Fisher's z transformed for analyses and converted back to Pearson's correlations for presentation. We found that, across the studies, biologization was consistently and strongly related to indirect aggression ($Mr = 0.55$, $p < .001$, two-tailed), but not with direct aggression ($Mr = 0.07$, $p = .112$, two-tailed).

General discussion

The literature on biological dehumanization has primarily focused on its antecedents and correlational data (e.g., see Valtorta et al., 2024), but experimental research on its effects remains limited. To address this gap, we conducted three pre-registered experiments testing whether disease metaphors lead to indirect aggression and interpersonal exclusion, while also exploring the role of disgust sensitivity and aggressive-thought accessibility.

Biological dehumanization and indirect aggression

Our results consistently showed that using disease metaphors (vs. negative but non-dehumanizing language) to describe others increases indirect (vs. direct) aggression and interpersonal exclusion directed toward the target, net of participants' gender and age (for more details on the analyses with gender and age as covariates, see the "Supplementary Material" document on OSF). Moreover, across all studies, these effects were explained by the biologization of the target group. Notably, when testing alternative models including animalization instead of biologization as the mediator, no significant indirect effects emerged (see the "Supplementary Material" document on OSF), underscoring the specific role of biological perceptions in promoting indirect aggression and exclusionary intentions.

Previous research has highlighted that animalistic metaphors are precursors to direct aggression. For instance, blatant animalistic dehumanization correlates with violent behaviors in conflicts (Kteily et al., 2015) and denying human uniqueness to women predicts coercive behaviors (Bevens & Loughnan, 2019). Our findings add a piece to this puzzle by showing that biological dehumanization is associated with subtle (but not direct) harm, as confirmed by a mini meta-analysis of our data. Importantly, we found these results by analyzing biological metaphors alongside negative language. This comparison provides valuable insights into how such rhetoric influences social perceptions and aggression in ways that were not fully understood before. Also, it is worth noting that although our findings clearly indicate that biological metaphors primarily elicit indirect forms of aggression, the non-biological language condition appeared to elicit relatively more direct aggression. This suggests that, while not dehumanizing, general negativity may influence the form of aggressive responses, highlighting the relevance of valence in shaping whether aggression is expressed indirectly or directly.

The role of disgust sensitivity

Studies 2 and 3 examined the role of disgust sensitivity. As hypothesized, biological language increases indirect aggression via biologization (Study 2) and accessibility of aggressive thoughts (Study 3), with stronger effects for individuals with medium and high disgust sensitivity. Previous research has demonstrated that high levels of disgust sensitivity are often associated with stronger aversive reactions to outgroups and individuals perceived as violating social or moral norms (e.g., Hodson & Costello, 2007; Navarrete & Fessler, 2006). This heightened sensitivity can increase social distancing, stigmatization, and support for exclusionary practices (e.g., Terrizzi et al., 2023). In the context of the present research, individuals with high and medium levels of disgust sensitivity reacted more negatively to biological language, interpreting it as a justification for indirect aggression. The current findings integrate the literature on disgust and social perceptions, providing further evidence of the link between disgust and isolating intentions and demonstrating that biological rhetoric plays a relevant role in this dynamic. By examining these mechanisms through multiple experimental studies, our work offers novel insights into the ways in which disgust sensitivity can amplify the tested effects, which had not been fully addressed in prior research.

Conceptually, the stronger indirect aggression responses among participants with medium and high disgust sensitivity suggest that disease-related language resonates differently depending on individuals' predisposition to perceive contamination threats. Importantly, the measure adopted in the present research captures a global sensitivity encompassing multiple disgust-eliciting domains, including reactions to contamination, bodily processes, decay, and reminders of animality. Rather than pointing to a single, narrowly defined facet of disgust, the observed moderating effects may therefore reflect a broader dispositional sensitivity to impurity and contamination-related cues. In individuals higher in disgust sensitivity, this activation may make indirect, socially mediated forms of aggression appear as justified or even protective reactions. This pattern indicates that disgust sensitivity operates as a psychological amplifier that channels dehumanizing perceptions into subtle, exclusionary behaviors rather than overt hostility. These findings refine the understanding of the behavioral immune system by showing that its activation can extend beyond avoidance to encompass socially strategic responses, such as indirect aggression, which maintain symbolic boundaries while limiting direct conflict.

It is important to note that the moderated mediations we tested in Study 2 and Study 3 emerged as significant only when the outcome variable was indirect aggression. The moderated effects were not significant for interpersonal exclusion assessed through the SEBT. A possible explanation for this unexpected result relates to the nature of the behaviors captured by the two measures. The indirect aggression scale includes various socially mediated, subtle behaviors such as social exclusion or manipulative acts (e.g., using private in-jokes to exclude Vabals, omitting them from conversations). By contrast, the SEBT explicitly measures physical distancing, asking participants to indicate their position on a bench, which reflects a more concrete, less deliberated form of exclusion. Although both measures target avoidance-related behaviors, they differ in cognitive and motivational complexity. Social exclusion and manipulative actions, captured by the indirect aggression scale, are often associated with strategic and deliberate mechanisms, including manipulation and pursuit of self-interest (e.g., Huang et al., 2023). Mere exclusion, in contrast, appears more instinctive and automatic, aligning with avoidance tendencies rather than calculated social strategies (e.g., Miller et al., 2012; Neuberg et al., 2011). Accordingly, our findings indicate that disease-related metaphors effectively trigger a desire for physical distancing when the moderating role of disgust sensitivity is not considered, as shown by significant indirect effects of the experimental manipulation on interpersonal exclusion via biologization (for more details on this additional analysis, see the "Supplementary Material" document on OSF). Instead, the amplification by disgust sensitivity is more evident for indirect, socially mediated aggression. This distinction highlights the value of using multiple measures to capture different expressions of exclusion and indirect aggression.

Implications for theories of pathogen avoidance and aggression

The present findings are particularly salient also because of their contribution to the behavioral immune system literature. In line with this theoretical framework, when perceptual cues and representations indicating that pathogens may be present (also in figurative ways) are salient, these stimuli trigger adaptive psychological responses (e.g., aversive emotions and the activation of specific kinds of cognitive knowledge structures in working memory) that facilitate intentions aimed at isolating the potential sources of contagion (see Murray & Schaller, 2016). As far as we know, our research provides the first experimental evidence of this process by suggesting that disease-related metaphors to describe others affect behavioral intentions, cognitive schemas, and accessibility of specific thoughts. This result also contributes to the literature on the GAM by demonstrating how figurative language can act as a situational factor that significantly influences cognitive processes such as the activation of schemas related to indirect aggression and exclusion. Previous research within the GAM has largely focused on direct, overt stimuli such as media violence or immediate interpersonal conflicts as triggers for aggression (e.g., Anderson & Bushman, 2018; Gilbert et al., 2017). Our research highlights the subtler yet potent influence of metaphorical language in shaping social perceptions and intentions, particularly through the lens of disgust sensitivity.

Limitations and future directions

Despite the relevance of our research, a few limitations should be noted. To manipulate biological language, we used a fictitious population described as inhabitants of a distant galaxy. While this approach reduces social desirability bias, it does not fully capture the complexity of real-world intergroup dynamics and may not fully align with traditional definitions of dehumanization, which involve the denial of humanity to human groups. Nonetheless, we portrayed Vabals with human-like features and social structures (e.g., a society with a president), which likely led participants to perceive them as analogous to humans. This interpretation is supported by our results, which indicate that, except for the biological language condition, participants generally viewed Vabals as more human-like than virus- or animal-like. Although this suggests that the use of a fictitious group did not severely compromise the validity of our findings, future research should explore whether these effects hold when studying real social groups that are often targets of dehumanization, such as immigrants, homeless individuals, or people with mental illness (Boysen et al., 2023; da Silva et al., 2025). These populations are frequently subjected to strong social stigma and are sometimes portrayed as contaminated or threatening (Harris & Fiske, 2006; Fiske, 2012). Investigating how biologization interacts with these pre-existing stereotypes could clarify whether biological language adds a distinct disease-related layer that amplifies indirect aggression, social distancing, and exclusionary behaviors, thereby enhancing the ecological validity and applied relevance of future studies.

Furthermore, after the experimental manipulation, we focused on biologization and animalization, as these are the only two forms of dehumanization that draw from the living sub-human domain. In contrast, other forms, such as mechanistic dehumanization or objectification, are based on nonliving entities (e.g., machines or tools, respectively; Volpato & Andrighetto, 2015). For this reason, we did not include other dehumanizing perceptions in our studies. Future research could nonetheless explore how alternative non-human metaphors differentially shape perceptions and behavioral intentions.

Moreover, although our analysis confirmed that the biological language condition effectively elicited higher biologization compared to the non-biological language condition, we did not include additional pretests assessing general negativity, arousal, or perceived threat. This represents a limitation, as such factors may also influence aggressive responses. Future research should therefore include measures of general valence and perceived threat to better disentangle the specific effects of biological framing from those attributable to overall negativity. In addition, incorporating a neutral or baseline condition would allow for a clearer assessment of the unique contribution of biological metaphors beyond general evaluative tone or threat cues.

Another methodological consideration concerns the measurement of disgust sensitivity. In the present research, we relied on a global index of this construct. However, because disgust can be differentiated into distinct domains, future research could benefit from employing domain-specific measures – particularly those tapping pathogen-avoidance tendencies – to more precisely examine the mechanisms implied by the behavioral immune system framework.

Finally, challenges in estimating sample size for Studies 2 and 3 suggest the need for replication with larger samples. This would enhance the robustness and generalizability of our results, providing a stronger foundation for understanding biologization and its consequences.

Conclusions

The present research highlights the effect of biological language on social cognitions and intentions, challenging the notion that "words are just words." Disease-related metaphors do not merely convey information but actively shape our cognitive schemas and behavioral intentions toward others. Our results are particularly relevant for the field of communication, emphasizing that the words we choose can have significant consequences. For communicators, such as journalists, educators, and policymakers, understanding the impact of metaphorical language is crucial in crafting messages that promote empathy and inclusivity rather than division and exclusion. By recognizing the power of language and metaphors to shape social realities, we can work toward more mindful and responsible communication practices that contribute to a more equitable and respectful society.

Acknowledgements The authors are grateful to Giulia Zanichelli, Angelica Torchio, and Melissa Agosta for their help with the data collections.

Author Contribution Roberta Rosa Valtorta, Cristina Baldissarri, and Chiara Volpato contributed to the conception and design of the studies. Data collection for all studies was supervised by Roberta Rosa Valtorta and Cristina Baldissarri. Roberta Rosa Valtorta conducted the data analyses, interpreted the results, drafted and revised the manuscript. All authors reviewed and approved the final version of the manuscript prior to submission.

Funding Open access funding provided by Università degli Studi di Milano - Bicocca within the CRUI-CARE Agreement. Study 3 was partially funded through a grant to the second author from the University of Milano-Bicocca (2020-CONT-0412). The funder had no role in the decision to publish or in the preparation of the research.

Data availability and Preregistrations All the measures and data relevant to the three studies are available through the project's OSF webpage: https://osf.io/ywm9d/.
All the studies were preregistered (Study 1: https://osf.io/7db6y/; Study 2: https://osf.io/97x64/; Study 3: https://osf.io/euyr8/).

Declarations

Ethical Approval All the studies were conducted after receiving ethical approval from the Commission of the Department of Psychology for minimal risk studies at the University of Milano-Bicocca (Approval No. RM-2022-497).

Consent to Publish Participation was voluntary, and informed consent was obtained before each data collection. All participants also provided consent for their anonymized data and information to be published.

Conflict of interest The authors declare that there is no conflict of interest.

References

Ackerman, J. M., Hill, S. E., & Murray, D. R. (2018). The behavioral immune system: Current concerns and future directions. *Social and Personality Psychology Compass*, *12,* Article e12371. https://doi.org/10.1111/spc3.12371

Allen, J. J., Anderson, C. A., & Bushman, B. J. (2018). The General Aggression Model. *Current Opinion in Psychology*, *19*, 75–80. https://doi.org/10.1016/j.copsyc.2017.03.034

Anderson, C. A., & Bushman, B. J. (2018). Media violence and the general aggression model. *Journal of Social Issues*, *74*, 386–413. https://doi.org/10.1111/josi.12275

Anderson, C. A., Carnagey, N. L., Flanagan, M., Benjamin, A. J., Eubanks, J., & Valentine, J. C. (2004). Violent video games: Specific effects of violent content on aggressive thoughts and behavior. *Advances in Experimental Social Psychology*, *36*, 200–251. https://doi.org/10.1016/S0065-2601(04)36004-1

Andrighetto, L., Baldissarri, C., & Volpato, C. (2017). Still) modern times: Objectification at work. *European Journal of Social Psychology*, *47*, 25–35. https://doi.org/10.1002/ejsp.2190

Bevens, C. L., & Loughnan, S. (2019). Insights into men's sexual aggression toward women: Dehumanization and objectification. *Sex Roles*, *81*, 713–730. https://doi.org/10.1007/s11199-019-01024-0

Boysen, G. A., Chicosky, R. L., & Delmore, E. E. (2023). Dehumanization of mental illness and the stereotype content model. *Stigma and Health*, *8*, 150–158. https://doi.org/10.1037/sah0000256

Brown, M., Keefer, L. A., Sacco, D. F., & Bermond, A. (2019). Is the cure a wall? Behavioral immune system responses to a disease metaphor for immigration. *Evolutionary Psychological Science*, *5*, 343–356. https://doi.org/10.1007/s40806-019-00191-3

Buckels, E. E., & Trapnell, P. D. (2013). Disgust facilitates outgroup dehumanization. *Group Processes & Intergroup Relations*, *16*, 771–780. https://doi.org/10.1177/1368430212471738

Capozza, D., & Volpato, C. (2004). *Le intuizioni psicosociali di Hitler: Un'analisi del Mein Kampf [Hitler's psychosocial intuitions: An analysis of the Mein Kampf]*. Pàtron Editore.

Chapman, H. A., & Anderson, A. K. (2014). Trait physical disgust is related to moral judgments outside of the purity domain. *Emotion*, *14*, 341–348. https://doi.org/10.1037/a0035120

Cisler, J. M., Olatunji, B. O., & Lohr, J. M. (2009). Disgust, fear, and the anxiety disorders: A critical review. *Clinical Psychology Review*, *29*, 34–46. https://doi.org/10.1016/j.cpr.2008.09.007

Cisneros, J. D. (2008). Contaminated communities: The metaphor of immigrant as pollutant in media representations of immigration. *Rhetoric & Public Affairs*, *11*, 569–601. https://doi.org/10.1353/rap.0.0068

Curtis, V., De Barra, M., & Aunger, R. (2011). Disgust as an adaptive system for disease avoidance behaviour. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *366*, 389–401. https://doi.org/10.1098/rstb.2010.0117

da Silva, D. C., Martins, A. C., & Garcia-Marques, T. (2025). Perceiving a depressive target: Infrahumanization at emotional and culture levels. *Stigma and Health*, *10*, 63–72. https://doi.org/10.1037/sah0000469

De Leonardis, F. (2008). War as a medicine: The medical metaphor in contemporary Italian political language. *Social Semiotics*, *18*, 33–45. https://doi.org/10.1080/10350330701838894

Deacon, B., & Olatunji, B. O. (2007). Specificity of disgust sensitivity in the prediction of behavioral avoidance in contamination fear. *Behaviour Research and Therapy*, *45*, 2110–2120. https://doi.org/10.1016/j.brat.2007.03.008

Faulkner, J., Schaller, M., Park, J. H., & Duncan, L. A. (2004). Evolved disease-avoidance mechanisms and contemporary xenophobic attitudes. *Group Processes & Intergroup Relations*, *7*, 333–353. https://doi.org/10.1177/1368430204046142

Feltri, V. (2017, September 6). Dopo la miseria portano le malattie [In addition to misery, they bring disease]. Libero.

Fiske, S. T. (2012). Managing ambivalent prejudices: smart-but-cold and warm-but-dumb stereotypes. *The Annals of the American Academy of Political and Social Science*, *639*, 33–48. https://doi.org/10.1177/0002716211418444

Forrest, S., Eatough, V., & Shevlin, M. (2005). Measuring adult indirect aggression: The development and psychometric assessment of the indirect aggression scales. *Aggressive Behavior*, *31*, 84–97. https://doi.org/10.1002/ab.20074

Giampietro, M., Ruggi, S., Caravita, S. C., Gatti, M., Colombo, L., & Gilli, G. M. (2019). A measure to assess individual differences for disgust sensitivity: An Italian version of the Disgust Scale-Revised. *Current Psychology*, *38*, 354–366. https://doi.org/10.1007/s12144-017-9604-x

Gilbert, F., Daffern, M., & Anderson, C. A. (2017). The General Aggression Model and its application to violent offender assessment and treatment. In P. Sturmey (Ed.), *The Wiley handbook of violence and aggression* (pp. 1–13). Wiley. https://doi.org/10.1002/9781119057574.whbva037

Goff, P. A., Eberhardt, J. L., Williams, M. J., & Jackson, M. C. (2008). Not yet human: Implicit knowledge, historical dehumanization, and contemporary consequences. *Journal of Personality and Social Psychology*, *94*, 292–306. https://doi.org/10.1037/0022-3514.94.2.292

Goh, J. X., Hall, J. A., & Rosenthal, R. (2016). Mini meta-analysis of your own studies: Some arguments on why and a primer on how. *Social and Personality Psychology Compass*, *10*, 535–549. https://doi.org/10.1111/spc3.12267

Haidt, J., McCauley, C., & Rozin, P. (1994). Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. *Personality and Individual Differences*, *16*, 701–713. https://doi.org/10.1016/0191-8869(94)90212-7

Harris, L. T., & Fiske, S. T. (2006). Dehumanizing the lowest of the low: Neuroimaging responses to extreme out-groups. *Psychological Science*, *17*, 847–853. https://doi.org/10.1111/j.1467-9280.2006.01793.x

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.).). The Guilford Press.

Hodson, G., & Costello, K. (2007). Interpersonal disgust, ideological orientations, and dehumanization as predictors of intergroup attitudes. *Psychological Science*, *18*, 691–698. https://doi.org/10.1111/j.1467-9280.2007.01962.x

Huang, J. Y., Gan, X., Jin, X., Rao, S., Guo, B., He, Z., & Wei, Z. (2023). The relationship between the Dark Triad and bullying among Chinese adolescents: The role of social exclusion and sense of control. *Frontiers in Psychology*, *14*, 1173860. https://doi.org/10.3389/fpsyg.2023.1173860

Kteily, N., Bruneau, E., Waytz, A., & Cotterill, S. (2015). The ascent of man: Theoretical and empirical evidence for blatant dehumanization. *Journal of Personality and Social Psychology*, *109*, 901–931. https://doi.org/10.1037/pspp0000048

Maass, A., Suitner, C., & Arcuri, L. (2014). The role of metaphors in intergroup relations. In M. Landau, M. D. Robinson, & B. P. Meier (Eds.), The power of metaphor: Examining its influence on social life (pp. 153–177). American Psychological Association. https://doi.org/10.1037/14278-008

Mazzoni, D., Marinucci, M., Monzani, D., & Pravettoni, G. (2021). The Social Exclusion Bench Tool (SEBT): A visual way of assessing interpersonal social exclusion. *MethodsX*, *8,* Article 101495. https://doi.org/10.1016/j.mex.2021.101495

Miller, S. L., Zielaskowski, K., Maner, J. K., & Plant, E. A. (2012). Self-protective motivation and avoidance of heuristically threatening outgroups. *Evolution and Human Behavior*, *33*, 726–735. https://doi.org/10.1016/j.evolhumbehav.2012.05.008

Murray, D. R., & Schaller, M. (2016). The behavioral immune system: Implications for social cognition, social interaction, and social influence. *Advances in Experimental Social Psychology*, *53*, 75–129. https://doi.org/10.1016/bs.aesp.2015.09.002

Musolff, A. (2007). What role do metaphors play in racial prejudice? The function of anti-Semitic imagery in Hitler's Mein Kampf. *Patterns of Prejudice*, *41*, 21–43. https://doi.org/10.1080/00313220601118744

Navarrete, C. D., & Fessler, D. M. (2006). Disease avoidance and ethnocentrism: The effects of disease vulnerability and disgust sensitivity on intergroup attitudes. *Evolution and Human Behavior*, *27*, 270–282. https://doi.org/10.1016/j.evolhumbehav.2005.12.001

Neuberg, S. L., & Cottrell, C. A. (2002). Intergroup emotions: A biocultural approach. In D. M. Mackie, & E. R. Smith (Eds.), *From prejudice to intergroup emotions: Differentiated reactions to social groups* (pp. 265–283). Psychology.

Neuberg, S. L., Kenrick, D. T., & Schaller, M. (2011). Human threat management systems: Self-protection and disease avoidance. *Neuroscience & Biobehavioral Reviews*, *35*, 1042–1051. https://doi.org/10.1016/j.neubiorev.2010.08.011

Pallant, J. (2020). *SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS*. McGraw-Hill Education.

Pecini, C., Ruzzante, D., Valtorta, R. R., Crapolicchio, E., Cocco, V. M., Andrighetto, L., & Di Bernardo, G. A. (2023). Why might women justify dating violence? The role of men's sexual objectification of their romantic partners within heterosexual relationships. *Journal of Interpersonal Violence*, *38*, 10664–10685. https://doi.org/10.1177/08862605231175515

Pond Jr., R. S., DeWall, C. N., Lambert, N. M., Deckman, T., Bonser, I. M., & Fincham, F. D. (2012). Repulsed by violence: Disgust sensitivity buffers trait, behavioral, and daily aggression. *Journal of Personality and Social Psychology*, *102*, 175–188. https://doi.org/10.1037/a0024296

Richardson, D. S., & Green, L. R. (2003). Defining direct and indirect aggression: The Richardson conflict response questionnaire. *International Review of Social Psychology*, *16*, 11–30.

Rozin, P., Haidt, J., & McCauley, C. (2009). *Disgust: The body and soul emotion in the 21st century*. American Psychological Association.

Rudman, L. A., & Mescher, K. (2012). Of animals and objects: Men's implicit dehumanization of women and likelihood of sexual aggression. *Personality and Social Psychology Bulletin*, *38*, 734–746. https://doi.org/10.1177/0146167212436401

Schaller, M., Murray, D. R., & Bangerter, A. (2015). Implications of the behavioural immune system for social behaviour and human health in the modern world. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *370*, 20140105. https://doi.org/10.1098/rstb.2014.0105

Schoemann, A. M., Boulton, A. J., & Short, S. D. (2017). Determining power and sample size for simple and complex mediation models. *Social Psychological and Personality Science*, *8*, 379–386. https://doi.org/10.1177/1948550617715068

Stevens, J. (1996). *Applied multivariate statistics for the social sciences* (3rd ed.). Erlbaum Associates.

Terrizzi Jr., J. A., PondJr, R. S., Shannon, T. C., Koopman, Z. K., & Reich, J. C. (2023). How does disgust regulate social rejection? A mini-review. *Frontiers in Psychology*, *14*, 1141100. https://doi.org/10.3389/fpsyg.2023.1141100

Tipler, C. N., & Ruscher, J. B. (2014). Agency's role in dehumanization: Non-human metaphors of out-groups. *Social and Personality Psychology Compass*, *8*, 214–228. https://doi.org/10.1111/spc3.12100

Tipler, C. N., & Ruscher, J. B. (2019). Dehumanizing representations of women: the shaping of hostile sexist attitudes through animalistic metaphors. *Journal of Gender Studies*, *28*, 109–118. https://doi.org/10.1080/09589236.2017.1411790

Tybur, J. M., Lieberman, D., & Griskevicius, V. (2009). Microbes, mating, and morality: individual differences in three functional domains of disgust. *Journal of Personality and Social Psychology*, *97*, 103–122. https://doi.org/10.1037/a0015474

Utych, S. M. (2018). How dehumanization influences attitudes toward immigrants. *Political Research Quarterly*, *71*, 440–452. https://doi.org/10.1177/1065912917744897

Valtorta, R. R. (2020). Quando le persone diventano virus: una rassegna sulla biologizzazione. [When people become viruses: A review on biologization]. In C. Volpato, & L. Andrighetto (Eds.), *Deumanizzazione/Dehumanization* (pp. 95–111). Cultural Disability Studies.

Valtorta, R. R., Baldissarri, C., Andrighetto, L., & Volpato, C. (2019). Dirty jobs and dehumanization of workers. *British Journal of Social Psychology*, *58*, 955–970. https://doi.org/10.1111/bjso.12315

Valtorta, R. R., Baldissarri, C., & Volpato, C. (2024). Investigating the link between biological dehumanization and indirect aggression. *Journal of Community & Applied Social Psychology*, *34*, Article e2761. https://doi.org/10.1002/casp.2761

van Leeuwen, F., Jaeger, B., & Tybur, J. M. (2023). A behavioural immune system perspective on disgust and social prejudice. *Nature Reviews Psychology*, *2*, 676–687. https://doi.org/10.1038/s44159-023-00226-4

Vasquez, E. A., Loughnan, S., Gootjes-Dreesbach, E., & Weger, U. (2014). The animal in you: Animalistic descriptions of a violent crime increase punishment of perpetrator. *Aggressive Behavior*, *40*, 337–344. https://doi.org/10.1002/ab.2

Volpato, C., & Andrighetto, L. (2015). Dehumanization. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (pp. 31–37). Elsevier.