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Articles

Does Fasting Make Us All Equal? Evidence on the Influence of Appetite on Implicit Sexual Prejudice

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Abstract

Background: Interoception has long been linked to various aspects of social cognition, including morality, altruism, and empathy. This study extends the literature by examining whether interoception also influences automatic evaluative reactions that reveal prejudice. We hypothesized that individuals' interoceptive awareness and their appetitive states would impact their implicit biases, particularly regarding prejudices related to race, weight, and sexual orientation.

Method: We administered three Implicit Association Tests (IATs) targeting prejudices related to race, weight, and sexual orientation to a group of 40 participants (23.94 years, SD = 7.25). To explore the relationship between interoception and IAT performance, we manipulated appetite and assessed interoceptive awareness using the Multidimensional Assessment of Interoceptive Awareness.

Results: Our findings reveal an interaction between religiosity and appetite in predicting implicit prejudice toward sexual orientation. Consistent with existing literature, religious individuals demonstrated higher levels of racial prejudice compared to non-religious individuals. However, this difference was attenuated when participants were tested under fasting conditions (i.e., when they were hungry). Furthermore, both disgust sensitivity and interoceptive sensitivity were found to predict implicit prejudice, with their influence varying depending on the specific type of prejudice.

Conclusions: Our study contributes to the field by demonstrating that prejudice can emerge from the interplay between individual characteristics and motivational states. Clinically, these findings suggest that enhancing interoceptive awareness and addressing motivational states could be potential strategies not only to support individual psychological health but also to reduce vulnerability to prejudicial attitudes.

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1. Introduction

The causes of prejudice remain a topic of ongoing debate (Kteily & Brandt, 2025; Pincus, 2019). Prejudice refers to an unfavorable or hostile attitude toward individuals or groups (Pettigrew & Tropp, 2018), typically directed at those who belong to an outgroup, or a group different from one's own (Lai et al., 2013). It can manifest both implicitly, without conscious awareness (Gawronski & Payne, 2010; Nosek et al., 2011, 2012), and explicitly, in a self-conscious manner, reflecting controlled cognitive processes (Coffey et al., 2018; Lee et al., 2023). Addressing implicit prejudice is crucial because it can persist even when explicit prejudice is suppressed, particularly when the target group is protected by legal or moral norms (Dovidio & Gaertner, 2004). This is especially relevant in the case of racism, where overt expressions are considered non-normative in many societies, yet subtle, unconscious biases persist and contribute to social inequalities, such as limited economic opportunities (Dovidio & Gaertner, 2004).

Negative emotions, motivations, and beliefs are key factors in the development of implicit prejudice (e.g., Khalsa et al., 2008). For instance, Kossowska et al. (2008) demonstrated that anger increases right-wing authoritarianism (RWA)–based prejudice, while fear enhances social dominance orientation (SDO)–based prejudice when directed at low-status outgroups. Additionally, sadness was found to amplify both RWA and SDO–based prejudice when directed at high-status outgroups. Tsang and Rowatt (2007) further showed that negative attitudes toward homosexual individuals, as measured by the Implicit Association Test (IAT; Greenwald et al., 1998, 2003), were predicted by intrinsic religious orientation, a form of religiosity characterized by personal, intrinsic motivation (Janssen & Scheepers, 2019; Johnson et al., 2012). Furthermore, appetitive and motivation-related processes—such as positive attitudes and approach-related behavioral tendencies—are often directed toward ingroup members (Amodio, 2014) and can also play a role in shaping prejudice-based responses.

This connection is supported by the growing body of literature examining the impact of hunger on morality, which has direct relevance to prejudice. Hunger has been shown to influence attitudes toward minorities (e.g., Barnett et al., 2018) and can amplify overt prejudice (e.g., Monroe & Plant, 2019). For example, Ainsworth and Maner (2014) found that hunger increased overt prejudice toward obese individuals, as measured by the seven-item dislike subscale of the Anti-Fat Attitudes Scale (Crandall, 1994). Another study by Gailliot (2013) linked hunger to explicit prejudice, interpreting it as a form of diminished self-control. Specifically, Gailliot found that self-reported hunger was negatively correlated with the attribution of positive traits (e.g., "intelligent," "careful") to a Black suspect, but not to a White suspect, in a crime scenario.

Finally, there is evidence that interoception, or the sensitivity to detect internal body signals, has long been linked to several individual traits and social attitudes including political orientation (Ruisch et al., 2022; See also Lucifora and Vicario, 2024, for a different result), sexual orientation

(Giunta et al., 2025; Vicario et al., 2024) and other variables relevant to prejudice, such as morality (Angioletti et al., 2022), altruism (Piech et al., 2017), and empathy (Heydrich et al., 2021). For instance, Piech et al. (2017) found that interoceptive sensitivity predicted altruistic behavior, as measured by monetary generosity task. Additionally, self-reported empathy was associated with the amplitude of heartbeat-evoked potentials, reflecting the neural response to heartbeats (Fukushima et al., 2011). These findings suggest that interoception plays a crucial role in shaping social cognitive processes that are closely linked to prejudice.

These insights carry important clinical implications. Disruptions in appetite regulation, interoceptive processing, and heightened disgust sensitivity—hallmark features in disorders such as anorexia nervosa, bulimia nervosa, and certain anxiety-related conditions—may not only compromise physical and emotional well-being but could also affect social cognition (e.g., Tauro et al., 2022), potentially heightening vulnerability to prejudice and rigid ingroup-outgroup biases. Elevated disgust sensitivity, which can be considered as a transdiagnostic index of mental illness (Culicetto et al., 2023), has been linked to stronger moral disapproval (Vicario & Rafal, 2017; Vicario et al., 2022), greater rejection of perceived outgroups (Inbar et al., 2009; Taylor, 2007), suggesting a pathway through which bodily and emotional dysregulation may exacerbate implicit biases. Furthermore, the connection between intrinsic religiosity, motivational states, and prejudicial attitudes offers a framework for understanding how emotional dysregulation may contribute to ideological extremism, an increasingly urgent clinical and societal concern.

Overall, the distinct bodies of literature reviewed above suggest that emotions, beliefs, and motivational/internal states can significantly influence social cognition processes related to prejudice, including overt prejudice. In the current study, we sought to explore how these various factors interact to predict implicit prejudice toward minorities. Building on the idea that prejudices are unconscious social preferences (Lai et al., 2013), we utilized Implicit Association Tests (IATs; Greenwald et al., 1998, 2003) to examine the interplay between religiosity and appetite on prejudice at the implicit level—where individuals are unable to consciously control biases, which may be influenced by social desirability. Consistent with prior research (Cottrell et al., 2010; Cottrell & Neuberg, 2005; Crawford et al., 2014; Kiss et al., 2022), we also investigated the predictive role of disgust sensitivity on implicit prejudice. Additionally, we explored the relationship between implicit prejudice and interoceptive awareness, given its relevance in social cognition.

Consistent with evidence indicating a negative relationship between implicit prejudice and moral disapproval (Sawaoka et al., 2014), and findings that suggest appetite diminishes moral disapproval of ethical violations (Kerry et al., 2019; Vicario et al., 2018), we hypothesize that implicit prejudice will be, overall, lower in the hungry condition compared to the sated condition.

2. Method

2.1 Participants

Our study included a total of 40 participants, ranging in aged 20 to 60 years. However, 3 participants did not complete the test, resulting in a final sample of 37 participants (23 females and 14 males), with a mean age of 23.94 years (SD = 7.25). The majority of participants were students at the University of Messina, recruited through both online presentations of the experiment and offline recruitment via social networks, such as Instagram and Facebook. Participation in the study was voluntary, and participants were not informed about the specific purpose of the research beforehand. Informed consent was obtained from all participants, and the study protocol was approved by the local ethics committee (Department of Cognitive Sciences Ethics Committee), under approval number COSPECS_10_2021. Anonymity was ensured for all participants.

2.2 Materials and Procedure

Participants were asked to attend the laboratory twice, 24 hours apart, between 8.00am and 11.00am. They were all tested in both fasting and satiety conditions, depending on the day: 18 participants started on the first day, the first session after at least 12 h of sleep but before having eaten any snack (fasting session). On the following day, at the same time as the first day, those participants took part in the second session after at least 12 h of sleep (snack session) but immediately after having eaten a snack (some ice cream or a croissant). For 19 participants such order was reversed (they started with the satiety condition, in which the researcher offered a snack inside the laboratory before the start of the test and surveys). Participants were explicitly requested to eat the snack until they felt satisfied. This way, it was possible to counterbalance the order of fasting/snack sessions among participants. Participants were explicitly requested to eat the snack until they felt satisfied.

During the first day, in both conditions, the researcher recorded participants' height and weight to derive the BMI for each participant, then asked the participants to mark their hunger rating on the VAS scale. In line with previous studies (Vicario et al., 2018, 2019), participants provided their self-reported interoceptive state of appetite through a Hunger Rating (HR) that required bisecting a 10 cm Visual Analogue Scale (VAS), with anchors points labelled '*Not at all*' to '*Extremely*' hungry. VAS lines were presented in a paper document.

Participants completed a series of questionnaires before taking the IAT test on the computer. All data were recorded through surveys. First, we collected the subjects' personal information, like age, gender, nationality, religiosity, and sexual orientation (the latter variable will not be considered in the present study given that the majority of participants, 34 out of 37, reported being heterosexual). For religiosity, participants were asked to state if they "believe in God" or

"do not believe in God". For sexual orientation, we used categories such as "gay", "bisexual" and "heterosexual".

2.3 Instruments

2.3.1 Multidimensional Assessment of Interoceptive Awareness

To investigate the role of interoception sensitivity on prejudice, we recorded the participants' ability to perceive stimuli coming from their body using the Italian version (Calì et al., 2015) of the Multidimensional Assessment of Interoceptive Awareness (MAIA) test (Mehling et al., 2012), which is composed of 32 items on a Likert Scale form 0 (*never*) to 5 (*always*) and it is divided into 8 sub-scales related to body awareness, which are: (i) Noticing, awareness of unpleasant, pleasant, and neutral bodily sensations; (ii) Not-Distracting, difficulty ignoring or distracting from feelings of pain or discomfort; (iii) Not-Worrying, do not worry about sensations of pain or discomfort; (iv) Attention Regulation, attention to bodily sensations; (v) Emotional Awareness, awareness of the connection between bodily sensations and emotional states; (vi) Self-Regulation, regulate emotional suffering by paying attention to bodily sensations; (vii) Body Listening, active body listening; (viii) Trusting, body as safe and reliable. These subscales represent the 5 dimensions of interoceptive awareness (Mehling et al., 2012) which are: 1. Awareness of body sensation (subscale 1); 2. Emotional reaction and attentional response to sensations (subscale 2 and subscale 3); 3. Ability to regulate attention (subscale 4); 4. Awareness of mind-body integration (subscale 5, subscale 6, subscale 7); 5. Trust (subscale 8). The table 1 provides detailed description of Cronbach's Alpha of both the original and the Italian version of the scale.

Table 1. Cronbach's Alpha for the height subscales of the original and the Italian version of MAIA

Multidimensional Assessment of Interoceptive Awareness subscales	**Cronbach's Alpha (Original - Mehling et al., 2012)**	**Cronbach's Alpha (Italian Version - Calì et al., 2015)**
Noticing	0.69	0.66
Not-Distracting	0.66	0.68
Not-Worrying	0.67	0.70
Attention Regulation	0.87	0.79
Emotional Awareness	0.82	0.83
Self-Regulation	0.83	0.81
Body Listening	0.82	0.80
Trusting	0.79	0.78

2.3.2 Disgust Scale

We utilized the Disgust Scale developed by Haidt et al. (1994) to measure individual differences in disgust sensitivity among participants. This scale comprises a total of 32 items, divided into two distinct sections to capture various aspects of disgust responses. The first section includes 16 items in which participants indicate whether they feel disgusted by specific scenarios or stimuli by marking "true" or "false." These items are designed to assess the presence or absence of disgust reactions to a range of situations, allowing us to gauge the threshold of disgust sensitivity among individuals.

The second section consists of 16 additional items that require participants to rate their degree of disgust on a scale from 0 to 2. In this format, a rating of 0 indicates no disgust, 1 signifies mild disgust and 2 represents strong disgust. This part of the scale provides a more nuanced measurement of the intensity of disgust responses, which can be particularly useful for understanding individual variability in disgust sensitivity. As the Italian version of the scale was not available, we administered a translated version of the original scale to our participants. This translation aimed to maintain the integrity and meaning of the items, ensuring that the assessment of disgust sensitivity would be both accurate and relevant for our study population. For detailed information regarding the reliability of the scale, including the Cronbach's alpha values, please refer to Table 2. By employing the Disgust Scale in this manner, we sought to obtain a comprehensive understanding of how individual differences in disgust might relate to implicit prejudice and other psychological variables in our research.

Table 2. Cronbach's Alpha for the seven subscales of the original version of the Disgust Sensitivity scale

Disgust sensitivity subscales	Cronbach's Alpha (Haidt et al., 1994)
Food	0.34
Animals	0.47
Body Products	0.55
Sex	0.51
Body Envelope Violations	0.60
Death	0.59
Hygiene	0.46

2.3.3 Implicit Association Test

To administer the IAT, we used iatgen, which is a Qualtrics-survey software tool that implements the IAT (Carpenter et al., 2019). We created three IATs (i.e., a "sexuality IAT", a "race IAT", and "weight IAT") to test participants' implicit attitudes towards three different stigmatized social groups. We used words as stimuli for both attributes and targets. The positive and negative attributes related to the "good" and "bad" categories were either drawn from the literature (McConnell & Leibold, 2001; Galdi & Arcuri, 2012; Nosek et al., 2005, 2007a, 2007b) or created so that they could be easily associated with the attribute category. To ensure consistency with the attributes, we used words as stimuli also for Targets A (i.e., the majority, unprejudiced social categories: "heterosexual", "slim", "White") and Targets B (i.e., the minority, prejudiced social categories: "homosexual", "obese", "Black"). Similarly to the attribute words, target words were either drawn from the literature (Chambliss et al., 2004) or newly introduced so that they could be easily associated with the target category. Table 3 shows the selected words for the category labels and the attribute and target categories in the original Italian version and translated in English.

Table 3. The Words Used for Attributes and Targets in the Sexuality, Race, and Weight IATs in the Original Italian (in Italics) and translated in English (in Brackets)

Category Labels	**Stimuli to Be Categorized**			
Positive Attribute – *buono* (good)	*Felicità* (happiness)	*Amore* (love)	*Piacere* (pleasure)	Pace (peace)
Negative Attribute – *cattivo* (bad)	*Dolore* (pain)	*Male* (evil)	*Agonia* (agony)	Terribile (awful)
Target A – *eterosessuale* (heterosexual)	*Eterosessuale* (heterosexual)	*Donna eterosessuale* (heterosexual woman)	*Uomo eterosessuale* (heterosexual man)	Persone eterosessuali (heterosexual people)
Target B – *omosessuale* (homosexual)	*Omosessuale* (homosexual)	*Gay* (gay)	*Uomo gay* (gay man)	Donna lesbica (lesbian woman)
Target A – *bianco* (White)	*Bianco* (White)	*Caucasico* (Caucasian)	*Giorgio* (George)	Mario (Mario)
Target B – *nero* (Black)	*Nero* (Black)	*Africano* (African)	*Zulu* (Zulu)	Jamal (Jamal)
Target A – *magro* (slim)	*Magro* (slim)	*Snello* (thin)	*Esile* (slender)	*Scheletrico* (skeletal)
Target B – *obeso* (obese)	*Corpulento* (fat)	*Obeso* (obese)	*Robusto* (robust)	*Paffuto* (plump)

For both session 1 and session 2 of the experiment, the 3 IATs were administered one after the other with a few minutes of rest in between.

To avoid any possible carryover effect from one IAT to the others, they were presented in a different order for each participant on each day. For example, participant #1 performed the test following the order "sexuality IAT", "weight IAT" and "race IAT" on day 1; the order was reversed for day 2, that is "race IAT", "weight IAT" and "sexuality IAT". A different presentation order was generated for participant #2 on day 1, that is, "sexuality IAT", "race IAT" and "weight IAT", and also in this case the order was reversed for the day 2 session.

2.4 Data Analysis

We performed a repeated measures ANOVA with IAT *D* scores associated with the race, weight, sexual orientation (produced by iatgen's automated tool see Carpenter et al., 2019; Greenwald et al., 2003 for the algorithm) as dependent variables, the self-reported interoceptive state (fasting, snack), the religiosity (religious, no-religious) as categorical predictors. All post-hoc comparisons were performed via *Duncan test*, and, for all statistical analyses, a *p*-value of ≤ 0.05 was significant. We also performed separated correlation analyses between *D* scores and other parameters such MAIA, and DS scores. Since our study examined three stimulus categories (race, weight, and sex), we decided to adjust the results for multiple comparisons. Therefore, the p-value threshold was set to 0.05/3 = 0.016. Data analysis was performed using Statistica software, version 8.0, Stat Soft, Inc., Tulsa, USA.

3. Results

We found a main effect of the ***Type of Prejudice*** [$F(2, 70)=26.43$, $p<0.001$, $\eta^2=0.430$, *Observed power*= 0.999], with lower D scores in the sexual orientation category (M=0.167), compared to weight (M=0.530) and race (M0.676) categories. This result indicates that participants exhibited significantly less implicit prejudice toward sexual orientation compared to weight and racial prejudices, suggesting that sexual orientation bias may be less ingrained or socially accepted within this sample. Moreover, we found a significant ***Type of Prejudice*** *x* ***Appetite*** *x* ***Religiosity*** interaction term [$F(2, 70)=4.217$, $p=0.018$, $\eta^2=0.107$, *Observed power*= 0.722]. Post-hoc comparison documents a significant difference between religious (M=0.387) and no-religious (M=-0.072,) individuals in the snack condition for the sexual orientation category ($p=0.003$, see **figure 1** for more details). This interaction suggests that religiosity influences the relationship between appetite and prejudice, indicating that religious individuals may exhibit increased biases associated with sexual orientation when they are in a state of heightened appetite. No significant results were found for ***Religiosity*** [$F(1, 35)=1.97$, $p=0.168$, $\eta^2=0.053$, *Observed power*= 0.277], ***Type of Prejudice*** x ***Religiosity*** [$F(2, 70)=2.238$, $p=0.114$, $\eta^2=0.160$,

Observed power= 0.441], ***Appetite*** [F(1, 35)=0.424, p=0.518, η^2=0.011, *Observed power*= 0.097], and ***Type of Prejudice*** x ***Appetite*** [F(2, 70)=0.319, p=0.733, η^2=0.008, *Observed power*= 0.097].

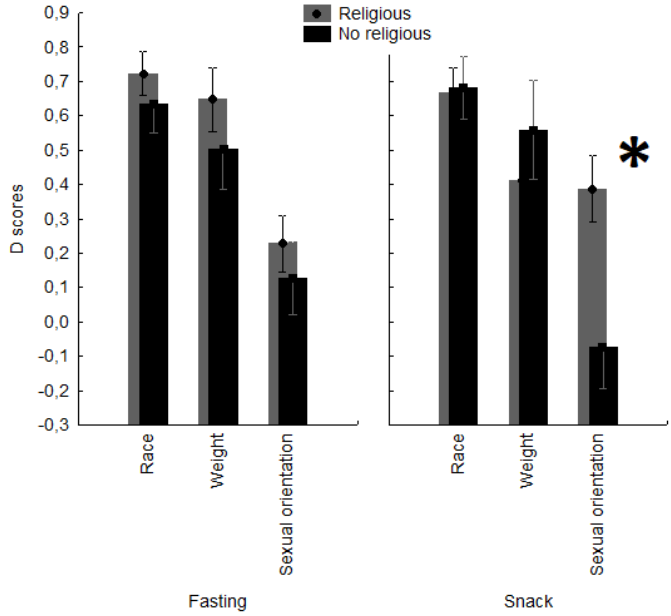

Figure 1. The figure illustrates higher prejudice (indicated by higher D scores) in religious individuals compared to non-religious individuals tested in the snack condition. * Denotes a statistically significant p-value. Vertical bars represent the standard error of the mean.

Table 4. Correlations between MAIA scores and Race, Weight, and Sexual Implicit Prejudice (D Scores) in each Group (Overall, Believers, Non-Believers). The awareness subscale is derived by combining the scores of *emotional awareness*, *self-regulation* and *body listening* subscales of MAIA

	MAIA (Noticing)		**MAIA (Attention)**		**MAIA (Trusting)**		**AWARENESS (B-M Integration)**		**AVERAGE (Emotion Reaction)**	
Overall	*r*	*p-level*	*r*	*p-level*	*r*	*p-level*	*r*	*p-level*	*r*	*p-level*
Race	-0.2075	0.2178	-0.132	0.4361	0.3836	0.0191	0.2941	0.0772	-0.1943	0.2492
Weight	-0.1279	0.4506	-0.108	0.5246	-0.0218	0.8981	-0.2786	0.095	-0.2107	0.2107
Sexual orientation	-0.1252	0.4602	-0.0542	0.7502	-0.0194	0.9092	0.0182	0.9147	0.1398	0.4091
Religious										
Race	-0.236	0.2783	-0.2863	0.1853	0.3841	0.0704	0.2383	0.2735	0.2036	0.3514
Weight	-0.2228	0.3069	-0.2217	0.3093	-0.2585	0.2337	-0.4339	0.0386	-0.2969	0.169
Sexual orientation	-0.1663	0.4482	-0.1666	0.4473	-0.1108	0.6148	-0.1054	0.6322	0.1388	0.5276
No religious										
Race	-0.1596	0.5858	0.2216	0.4464	0.364	0.200	0.39	0.168	0.1603	0.584
Weight	0.0341	0.9078	0.2152	0.46	0.5913	0.026	0.0692	0.8142	0.0775	0.7924
Sexual orientation	0.0359	0.9029	0.1032	0.7526	-0.0049	0.9868	0.0137	0.963	0.1361	0.6428

Regarding the relationship between interoception, measured via MAIA, and implicit prejudice (measured via d score), we only found an overall positive correlation trend, for the race category, between D scores and the *trusting* sub-scale scores (r=0.383, p=0.019). This indicates that higher trusting score were associated with higher implicit racial prejudice. No other significant correlations were observed (see table 4). Regarding the relationship between disgust sensitivity and implicit prejudice, we found two significant negative associations for the weight category, observed in the overall sample, with the effect driven by the religious subgroup. This suggests that in these individuals, prejudice for obese individuals reduces with the increase in disgust sensitivity. No significant correlation was found among non-religious individuals (see Table 5).

Table 5. Correlations between Disgust Sensitivity and Implicit Prejudice (D Scores) for Race, Weight, and Sexual orientation in each Group (Overall, religious, non-religious). * Indicates significant results

	Race		**Weight**		**Sexual Orientation**	
	r	*p*	R	*p*	*r*	*p*
Overall	-0.0737	0.6645	-0.3908	0.0168*	-0.0951	0.5757
Religious	0.0510	0.8174	-0.6122	0.0019*	-0.0911	0.6792
No-religious	-0.3062	0.2870	0.0656	0.8236	-0.0755	0.7975

No correlations were found between subjective appetite and implicit prejudice for all categories (Table 6). This indicates that there is no consistent linear relationship between these two variables, highlight the importance of examining interaction effects or considering mediating variables that could clarify the relationship between appetite and implicit prejudice.

Table 6. Correlations between Appetite and Implicit Prejudice (D Scores) for Race, Weight, and Sexual orientation in each Group (Overall, religious, non-religious).

	Race		**Weight**		**Sexual orientation**	
	R	*p*	*R*	*p*	*R*	*p*
Overall	0.1342	0.4284	0.0401	0.8137	0.0184	0.9139
Believers	0.1527	0.4866	0.0659	0.7651	-0.2175	0.3188
Non-Believers	0.0316	0.9146	-0.0198	0.9466	0.2842	0.3248

4. Discussion

To our knowledge, this study represents the first to document the intricate interplay between religiosity and appetite in shaping implicit prejudice toward minority groups.

The primary finding reveals that the interaction between appetite and religiosity significantly predicts implicit prejudice against homosexuality. Specifically, in the snack condition, religious individuals exhibit higher levels of implicit prejudice compared to their non-religious

counterparts. However, this difference is not observed in the fasting condition, suggesting that appetite states may modulate the expression of implicit biases among religious individuals.

The evidence of a relationship between religiosity and negative attitudes towards gay men and lesbian women is well established in the literature (e.g., Herek & McLemore, 2013; Olson et al., 2006; Whitley, 2009). Our results are in line with previous works documenting greater prejudice against gay men and lesbian women in God believers compared to non-believers (Hunsberger & Jackson, 2005; Roggemans et al., 2015; Whitley, 2009).

Building on existing literature, we also show that appetite moderates the relationship between religiosity and implicit sexual prejudice. In the snack (satiation) condition, religious individuals exhibited higher levels of implicit sexual prejudice compared to non-religious individuals. However, no group differences in implicit prejudice were observed in the fasting (hungry) condition, suggesting that hunger reduces the difference between the two groups in their implicit bias toward homosexuality. Interestingly, an exploratory t-test analysis revealed that appetite specifically influences the implicit prejudice of non-religious individuals. For this group, sexual bias was significantly higher in the fasting condition compared to the snack condition ($p = .041$), indicating that hunger may exacerbate implicit biases among non-believers.

A possible explanation for this finding is that hunger may amplify intergroup bias. Previous research suggests that gay individuals can evoke health-related contamination threats and threats to traditional values and morality (e.g., Brambilla & Butz, 2013; Cottrell & Neuberg, 2005; Inbar et al., 2009). Hunger, by increasing the accessibility of negative constructs (e.g., Gailliot, 2013), may heighten the perception of these threats. Consequently, greater appetite may lead to increased implicit sexual prejudice. General support for this perspective comes from a recent investigation by Krosch et al. (2017), which demonstrated that the psychological perception of scarcity can elicit racial bias in the allocation of economic resources. This finding aligns with the notion that resource-related threats, such as hunger, may exacerbate intergroup prejudice.

While we did not observe an effect of appetite on racial bias—possibly due to the already elevated levels of implicit racial prejudice expressed by our participants—the findings of Krosch et al. (2017) suggest that a similar mechanism could be at play in the context of sexual prejudice and perceived symbolic threat. Alternatively, and not mutually exclusively, the influence of hunger on prejudice might be explained by literature on ego-depletion and its effects on intergroup bias (for an opinion article see Inzlicht et al., 2014). For instance, Govorun and Payne (2006) demonstrated that ego-depletion increases stereotypical responses, but only among participants with strong automatic stereotype activation. In addition, Gailliot (2013) identified a link between hunger and reduced self-control, evidenced by an increase in explicit racial prejudice. Furthermore, research by Lucifora et al. (2021) suggests that impaired inhibitory

control is associated with decreased discomfort and greater acceptability of ethical violations. These findings collectively highlight how diminished self-regulation, potentially exacerbated by hunger, may contribute to increased prejudice and moral leniency.

Further relevant data to discuss emerge from the correlation analyses. We found an overall positive correlation trend between the trusting sub-scale of the Multidimensional Assessment of Interoceptive Awareness (MAIA) and the respective d-scores for the race category. This suggests that racial prejudice may be mediated by the extent to which individuals experience their bodies as safe and trustworthy. Experiencing one's body as safe and trustworthy reflects robust body-listening skills (Mehling et al., 2009), which may play a critical role in shaping implicit attitudes. A possible, albeit speculative, hypothesis to explain this relationship is that higher trusting scores may predict implicit racial prejudice because stronger body-listening skills could enhance implicit self-awareness of one's own body (e.g., white skin color) and its contrast with the target's body (e.g., black skin color).

A key distinction between our study and previous research is that we observed a reversed effect of disgust sensitivity on prejudice exclusively in religious individuals, with no such effects found in non-religious participants. Moreover, our investigation employed the Implicit Association Test (IAT) to examine the relationship between disgust sensitivity and weight prejudice, allowing us to assess automatic forms of prejudice that are less influenced by social desirability biases. One potential, albeit speculative, interpretation of the lower prejudice observed in religious individuals with high disgust sensitivity may relate to the established link between heightened disgust sensitivity and more rigid religious behaviors (e.g., Inozu et al., 2014). According to Christian doctrine, which emphasizes mercy, greater religious rigidity may foster increased acceptance of obese individuals, who might be viewed not as objects of mockery but as individuals deserving of protection. This interpretation aligns with previous research and theoretical suggestions in the field (e.g., Cline & Ferraro, 2006).

This interpretation also aligns with the complexity of weight prejudice, which can manifest in more subtle forms (Brochu et al., 2011). Religious individuals in our study displayed a pattern of responses consistent with the dissociation between explicit and implicit prejudice, a characteristic of subtle forms of prejudice. Specifically, a reverse pattern of the traditional compensatory effect was observed, where favorable explicit evaluations counterbalance automatic negative attitudes (Dunton & Fazio, 1997). In our study, explicit negativity—expressed through religious individuals' high disgust sensitivity, which might have been seen as more socially acceptable to overtly express than implicit weight prejudice—appears to have been countered by more favorable automatic evaluations of obese individuals. The enhanced control over implicit reactions observed in religious individuals, as opposed to non-religious individuals,

may be attributed to the stricter religious discipline often practiced by religious individuals. This suggests that religiosity plays a key moderating role in shaping automatic responses. This interpretation is consistent with existing literature indicating that individuals with high motivation, such as those with strong religious convictions, can exert influence over their automatic reactions (Blair, 2002).

These findings carry important clinical implications. The observed modulation of sexual prejudice by appetite states highlights how physiological needs can dynamically influence intergroup attitudes, particularly among religious individuals. This suggests that disruptions in appetite regulation, as seen in clinical conditions like eating disorders (Cuccolo et al., 2022; Curis et al., 2023; Fernandez-Rodriguez et al., 2023; Iasonidou et al., 2023; Orrù et al., 2021; Pace et al., 2024; Riva et al., 2024; Silvestro et al., 2025), could exacerbate implicit biases in vulnerable populations. Moreover, the association between trusting interoceptive awareness and racial prejudice points to the relevance of bodily self-perception processes in shaping social cognition (Tonelli & de Siqueira,2022), implying that therapeutic interventions aimed at fostering adaptive interoceptive skills may help reduce implicit racial biases. Finally, the complex relationship between disgust sensitivity, religiosity, and weight prejudice suggests that interventions targeting disgust regulation, which is also altered in eating disorders (e.g., Houben & Havermans, 2012; Vicario, 2013), particularly in individuals with strong religious convictions, could help mitigate subtle forms of bias. Together, these findings suggest that enhancing interoceptive awareness and emotional regulation may not only support individual psychological health but also reduce vulnerability to prejudicial attitudes.

5. Strengths and limitations

Overall, our findings extend current research by demonstrating that both interoceptive states of hunger (i.e., appetite) and interoceptive awareness can influence social cognition at the implicit level, mirroring the effects observed at the explicit level (Brown et al., 2020; Fraser & Nettle, 2020; Kerry et al., 2019; Vicario et al., 2018; Xie et al., 2020). As a further strength, our study contributes new insights to the literature linking prejudice and racism with embodiment processes (Groom et al., 2009) and builds on prior work that connects interoception to social cognition (Gao et al., 2019; von Mohr et al., 2023). Nevertheless, further research is needed to address some limitations of the current study. One limitation is the relatively low sample size, which may account for the lack of effects observed in the race category and the failure to replicate some previously reported findings, such as the influence of disgust sensitivity on implicit prejudice toward gay individuals (Inbar et al., 2009). A similar explanation might account for the absence of effects in the other categories of implicit prejudice examined in our study. However, the observed power associated with the interaction term between the variables of

interest suggests a relatively low risk of committing Type II errors. Notably, although we did not perform a formal power analysis our effect sizes align with those reported in prior studies (e.g., Vicario et al., 2018), indicating consistency with established research. However, we must also consider the potential limitations this may impose on the interpretation of our results, particularly considering the relatively low sample size, which could obscure effects that might otherwise be detected in larger datasets. This nuanced understanding of effect sizes and power reinforces the necessity for cautious interpretation of our findings while acknowledging the possibility of unobserved effects due to sample constraints. Yet, as noted by Prof. Robert D. Rafal in a recent interview on the importance of preliminary reports and negative results for scientific progress (Vicario, 2024), the opportunity to present findings — even in preliminary form — can be particularly valuable for identifying promising hypotheses to explore more systematically.

6. Conclusions

In this study, we examined the influence of several variables—religiosity, appetite, disgust sensitivity, and interoceptive awareness—on implicit prejudice toward various minority groups. While religiosity emerged as the primary predictor of prejudice, consistent with existing literature (e.g., Herek & McLemore, 2013), we further demonstrated that appetite, disgust sensitivity, and interoception can moderate this relationship in both religious and non-religious individuals, depending on the type of prejudice. Specifically, disgust sensitivity appears to be a significant predictor of weight prejudice in religious individuals, while interoceptive awareness is a key predictor of implicit racial prejudice across all individuals and implicit obesity prejudice in religious individuals. Additionally, appetite was found to moderate the influence of religiosity on implicit sexual prejudice. In interpreting these findings, we were mindful of the principle of parsimony (Myles & Johnson, 2023), favoring explanations that accounted for the data most simply and directly. Given the complexity of the observed interactions, parsimony guided our selection of religiosity as the primary explanatory variable, with the moderating effects of appetite, disgust sensitivity, and interoception providing nuanced but still economical extensions to this core relationship.

Clinically, the modulation of these biases by appetite states highlights the need for a deeper understanding of how disruptions in appetite regulation, as seen in clinical conditions like eating disorders, may exacerbate implicit biases in vulnerable populations. By recognizing the role of interoceptive awareness and disgust sensitivity, especially among individuals with strong religious beliefs, we identify potential therapeutic avenues for reducing prejudicial attitudes. Interventions focused on enhancing interoceptive skills and emotional regulation may not only benefit individual psychological well-being but also contribute to a more inclusive and

empathetic society. Therefore, addressing these physiological and psychological dimensions could play a vital role in mitigating both explicit and implicit biases, flooring the way for more effective clinical practices and social interventions.

Ethical approval: the study protocol was approved by the local ethics committee of the University of Messina, Department of Cognitive, Psychological, Educational and Cultural Studies, under approval number COSPECS_10_2021.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

Data are available at the following URL: (2) Gut and prejudice | Request PDF (researchgate.net)

Conflict of interest statement

The authors report there are no competing interests to declare.

Author Contributions

Conceptualization: C.L., C.M.V.; Methodology: C.L., G.G., C.M.V.; Formal analysis: C.M.V.; M.M.; Investigation: C.L., C.M.V.; Writing original draft preparation: C.L.C.M.V., M.M., G.M., G.C., P.M., G.G., S.M.; Writing review and editing: C.L., C.M.V., M.M., G.M., G.C., P.M., G.G., S.M..; Supervision: C.M.V. All authors have read and agreed to the published version of the manuscript.

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