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Relationship between body mass index and moral disapproval rating for ethical violations

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ABSTRACT

Evidence documents a direct relationship between disgust processing and Body Mass Index (BMI). People with high BMI tend to have a lower disgust sensitivity (DS) threshold, while this trait is more accentuated in people with low BMI. Here we provide new insights to this issue by exploring the relationship between BMI and the experience of moral disgust. Results document a significant negative correlation between BMI and moral disapproval rating (MDR) for ethical violations, in that the higher the BMI the lower the MDR. In concordance with previous investigations, we also found that BMI correlates with DS, as measured with a standard test, in that the higher the BMI the lower the DS. Overall, the main result of this paper, which might have direct implication for research in social justice, highlights the relevance of BMI, as an individual variable, in predicting ethical behavior.

1. Introduction

Research on eating habits has provided evidence of a direct link between disgust sensitivity (DS) and Body Mass Index (BMI). People with very low BMI such as patients affected by Anorexia Nervosa are characterized by high DS for food, self-disgust and disgust for human body products (e.g., Troop et al., 2000; Vicario & Crescentini, 2012; Vicario, 2013a, 2013b; Hildebrandt et al., 2015; Vicario, 2015). This eating disorder is also associated with increased disgust in domains related to weight management, suggesting that disgust-related emotional responses may be a defensive mechanism to support the avoidance of high calorie foods (Vicario, 2013b).

Abnormal disgust processing has been reported also in people with high BMI (Houben & Havermans, 2012; Watkins et al., 2015). In particular, Houben and Havermans (2012) suggested that core disgust might be reduced in this population, which may explain, at least in part, their predisposition to overeat.

DS is also relevant for explaining and predicting moral decision making. This premise derives from the suggestion that the original disgust system may have gradually expanded to include moral disgust to protect the organism from both physical and moral impurity (Haidt, McCauley, & Rozin, 1994; McNally, 2002). Several works provide support for this suggestion. For example, Jones and Fitness (2008) showed that DS predicts hypothesized outcomes in the moral domain such as guilty verdicts in mock juries. Moreover, higher moral disapproval ratings (MDRs) for stories describing ethical violations have been reported in people drinking bitter (i.e., disgusting) liquids, compared to people drinking sweet juice or water (Eskine, Kacinik, & Prinz, 2011). Similar results linking disgust with morality have been reported with other experimental paradigms (see for instance Wheatley & Haidt, 2005; Schnall, Haidt, Clore, & Jordan, 2008).

Overall, the literature discussed above acknowledges the predictive role of BMI in subjective DS and, at the same time, suggests that sensory and moral disgust might share, at least in part, similar cognitive and neural mechanisms. Nevertheless, no study has directly investigated whether BMI predicts the subjective sensitivity to moral transgression. Here we addressed this issue by testing the existence of any link between BMI and MDR for stories of ethical violations.

We analysed MDR severity in the judgment of moral dilemmas and DS in a sample of 86 participants which BMI ranged from moderate obesity (i.e., BMI > 30) to severe under-weight (i.e., <16). Our hypothesis predicted a negative correlation between BMI and MDR severity in the judgment of ethical violations. This prediction has been elaborated according to previous evidence (further investigated in the current research) documenting negative correlation between BMI and DS (Houben & Havermans, 2012), as well as the evidence of high disapproval rating for morally relevant topics in people with high DS (e.g., see Jones & Fitness, 2008).

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2. Method

2.1. Participants

After completing the Council on Nutrition Appetite Questionnaire (CNAQ) (Wilson et al., 2005), to exclude participants affected by eating disorders, 86 students (26 males, age: M = 20.1, SD = 2.57) completed this study in return for £6 or for course credits. The BMI mean was 22.30 (SD = 3.73). Seventeen participants (8 males) had a high BMI (M = 28.21, SD = 2.29). Eleven participants (3 males) had a low BMI (M = 17.22, SD = 0.91). All participants had normal or corrected-to-normal visual acuity and gave their written informed consent prior to their inclusion in the study and were naïve to its purpose. Specific information concerning the motivation of the study was provided only after the subjects completed all the experimental sessions. The study was approved by the ethics board of the School of Psychology and was conducted in agreement with the principles of the 1964 Helsinki.

2.2. Materials and measures

Participants reported their weight and height to calculate their BMI, which is the ratio of weight to squared height (kg/m^2). Moral disgust was measured by using 12 (moral) and 12 (non-moral control) dilemmas adapted into short vignettes by Harrison et al. (2012) from the study of Greene, Sommerville, Nystrom, Darley, and Cohen (2001). An example of moral and non-moral stories follows: **Non-moral story**: "*Mr. Jones is going away for the weekend. He is driving his car and comes to a fork in the road. The right turn leads to a seaside town, with a superb beach. The left turn leads to a mountain town, with beautiful views. After thinking for a moment, he decides to take the right way and spend a couple of days by the sea*"; **Moral story**: *"During the Second World War in Poland Mrs. Jones and her children, a girl and a boy, are imprisoned in a concentration camp. Once they are there, a guard tells Mrs. Jones that she must choose one of her children to live. The other will die in the gas chambers. If she does not choose either of them, both will be killed*".

The full set of vignettes made by Harrison et al. (2012) can be visualized from this website: *http://www.psychiatry.unimelb.edu.au/centres-units/mnc/research/affective_neuropsychiatry.html*.

These dilemmas are considered to be particularly emotionally engaging because they prompt one to endorse actions that directly imply bodily harm to a victim (or set of victims) in which utilitarian judgements tend to violate conventional moral social standards (Harrison et al., 2012). Dilemmas were divided in two blocks (i.e., A and B blocks) of 12 vignettes (i.e., 12 moral dilemmas and 12 non-moral dilemmas) and were administered in a counterbalanced order. Participants provided their MDR using a 10 cm Visual Analogic Scale (VAS), with anchor points labelled *'Not at all'* to *'Extremely'* disapproving. We also tested DS by using the 25-item Disgust Scale-Revised (DS-R; Haidt et al., 1994).

2.2.1. Data analysis

t-Test and Pearson correlation analyses were performed to detect any relationship between the considered variables (i.e., MDR, DS and BMI). The STATISTICA soft version 8 has been used for implementing such analyses. Moreover, we performed the Sobel test to investigate the mediation role (Preacher & Hayes, 2004) played by DS in explaining the relationship between MDR and BMI.

3. Results

Overall, participants had a DS-R mean score of 14.48 (SD = 4.27). We documented: i) higher DS (M = 16.40) in the female group, compared to the male group (M = 12.36), [$t(84) = 3.17$, $p = 0.002$]; ii) higher MDR (M = 7.96) for ethical violations in the female group, compared to male group (M = 6.60), ($t(84) = 2.83$, $p = 0.005$). By contrast, there were no gender differences for non-moral stories ($p > 0.17$).

Correlation analyses corroborate previous evidence documenting a link between DS and BMI. Specifically, we found a negative relationship between DS and BMI ($r = -0.42$, $p < 0.001$). Moreover, there was a positive correlation between DS and MDR and between BMI and MDR for ethical violations. No significant correlations have been reported for non-moral – control - stories. See Table 1 for details.

Because both BMI/SD and SD/MDR relationships were significant, we investigated the role played by DS in mediating the relationship between BMI and MDR for ethical violations. Sobel test results confirmed the mediation role of DS in explaining the relationship between BMI and MDR for ethical violations ($p = 0.033$). See Fig. 1 for details about the proposed model.

4. Discussion

The main goal of this study was addressing the hypothesis that BMI might be related with MDR severity for ethical violation, given the significant relationship between BMI and DS documented in previous works (e.g., Troop et al., 2000; Houben & Havermans, 2012; Watkins et al., 2015), and the relationship between DS and moral sensitivity (e.g., Jones & Fitness, 2008). In accordance with previous studies (e.g., Houben & Havermans, 2012), our results show that BMI negatively correlates with the participants DS. We also corroborated previous evidence (e.g., Jones & Fitness, 2008) linking DS with morality, by documenting a positive correlation between these two measures. Finally, we found higher DS and MDR severity for ethical violations in the group of females, compared to males, as reported in previous studies (e.g., Druschel & Sherman, 1999; Fumagalli et al., 2010). The higher DS and MDR severity score of female participants might be explained, at least in part, in relation to their menstrual cycle, which might modulate both DS and moral disgust. In particular, there is evidence of increased DS (e.g., Fleischman & Fessler, 2011) and moral disgust severity (e.g., Lieberman, Pillsworth, & Haselton, 2011) during the ovulatory cycle. According to this literature, one could explain the higher DS and MDR severity score of our female participants by assuming that the majority of them has been tested during the fertility period. However, this hypothesis remains rather speculative, as we did not provide a control for it.

Focusing on the link between BMI and moral judgment, according to our initial prediction we found a negative correlation between BMI and MDR showing that the higher the MDR severity for ethical violations the lower the BMI.

Overall, in the current research we show, for the first time, that an individual variable such as the BMI has a relationship with MDR for ethical violations. The mediation analysis suggests that this link might relate with DS of participants. This result fits the Houben and Havermans (2012) suggestion, proposing that DS might explain predisposition to overeat which, in turn, may significantly increment the BMI.

From a neural perspective, the negative correlation between BMI and MDR for ethical violations might be explained by referring to the role of insula, a key region of interest in the experience of moral disgust (Hutcherson, Montaser-Kouhsari, Woodward, & Rangel, 2015; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). This suggestion is supported by the study of Batterink, Yokum, and Stice (2010) which documented a positive correlation between BMI and anterior insula activity, although in response to food images (Batterink et al., 2010). Moreover, the authors reported a negative correlation between BMI and several other important neural regions for moral decision making such as the

Table 1
The table summarizes correlations obtained by combining DS and BMI scores with MDR scores provided by participants during the judgment of for moral and non-moral vignettes. * indicates significant results.

	DS and MDR	*BMI and MDR*
Moral vignettes	$r = 0.21$, $p = 0.046$*	$r = -0.22$, $p = 0.038$*
Non-moral vignettes	$r = -0.01$, $p = 0.922$	$r = 0.05$ $p = 0.621$