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Relationship Between Disgust Propensity and Contamination Obsessive-Compulsive Symptoms: The Mediating Role of Information Processing Bias

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Abstract

Background: Early studies showed that disgust contributes to developing the contamination obsessive-compulsive disorder (C-OCD) and fear of contamination. Despite considering disgust to explain the fear of contamination as a symptom of C-OCD, there are few studies on the mediating role of information processing bias (IPB) in the relationship between disgust propensity (DP) and the fear of contamination.

Objectives: The current study aimed at exploring the mediating role of IPB between DP and fear of contamination.

Methods: The current descriptive-analytical study was conducted on 386 students selected by cluster sampling method. The employed tools were disgust propensity and sensitivity scale-revised (DPSS-R), the Padua inventory (PI), obsessive beliefs questionnaire (OBQ), and spatial cueing task. Data were analyzed with Amos-22 software. Bootstrap methods were used to analyze the mediating role.

Results: Results of the structural equation modeling (SEM) indicated that the proposed model had a good fitness [GFI (goodness of fit index), TLI (the Tucker-Lewis index), and CFI (comparative fit index) > 0.95 and RMSEA (root mean square error of approximation) = 0.03]. The results showed that the relationship between DP and fear of contamination was mediated by IPB.

Conclusions: Results indicated the impact of disgust propensity on fear of contamination through information processing. These findings emphasized that information processing is essential to explain C-OCD.

Keywords: Bias, Contamination, Disgust, Emotion, Fear, Mediator, Obsessive-Compulsive Disorder, Structural Equation Modeling

1. Background

Contamination obsessive-compulsive disorder (C-OCD) is one of the most common types of OCD (1). Rachman (2) considered it in related with fear of contamination. Rasmussen and Eisen (3) reported that 50% of individuals with OCD had a fear of contamination, while Rachman and Hodgosn (4) reported it as 55%.

Numerous studies with clinical and non-clinical samples suggested the role of disgust in developing and maintaining fear of contamination and C-OCD (5-7); therefore, individuals with C-OCD are prone to experience disgust (7-11), and when faced with disgusting situations, experience disgust more than others (12). Regarding the difference between disgust and fear, it is said that fear is defined as a defensive response to threat, while disgust is a hateful and aversion response to a possible contamination (13). Fear leads to escape from danger, while disgust leads to avoiding contamination (14). Another hypothesis about the difference between fear and disgust is that disgust is related to specific IPB that is different from fear (15).

The information processing bias is a cognitive vulnerability that causes disturbed cognitive processes and includes attention, memory, and appraisal/interprets bias (16). Davey et al. (17) found that disgust mood more than normal or positive mood leads to interpreting stimuli as threatening, which in turn leads to increased anxiety. They suggested that disgusting stimuli may cause the person to experience disgust. Following this experience, the person also interprets natural stimuli as threatening and becomes anxious (18). Researchers indicated that threat overestima-

tion had a strong relationship with C-OCD (19-21). Also, a study indicated that individuals with C-OCD had attention bias toward disgust stimuli (22). The attention bias toward disgust is different from attention bias toward fear (12). The disgust causes more difficulty in the disengagement of attention than fear. This problem is observed in individuals with high disgust propensity (DP). This difficulty may be a causal mechanism through which the individual's anxiety increases (18). Several studies also point out the fact that people with C-OCD have difficulty in disengagement of attention from stimuli related to their disorder (23, 24).

It seems that disgust emotion is an alarm that causes individuals to pay attention to the potentially harmful situations in order to protect themselves from contamination. This leads to increased the appraisal of contamination of the objects. This, in turn, may increase the implicit and explicit memory associated with these stimuli (24). The memory bias is another type of IPS. The research also confirmed this bias in patients with C-OCD (25-27). For example, Radomsky and Rachman (26) found that individuals with C-OCD had a better memory for contaminated objects than clean objects, while others showed no such bias. Charash and McKay (22) examined explicit memory bias to disgust stimuli in a student sample. The results indicated a positive correlation between disgust and remembered numbers of disgusting words. The disgusting words were remembered more easily than neutral words.

Although IPB attracts great interest, and researchers suggest it as a causal and mediating mechanism in relation to disgust and C-OCD, no study examined this role. The role that IPB actually plays in the relationship between DP and C-OCD symptoms remains unexplored. Also, no study on the IPB toward disgust, people with C-OCD, and fear of contamination was conducted in Iran so far. The results of the current study can provide information about the pathology of this disorder and be used in conceptualization, diagnosis, and treatment.

2. Objectives

The current study aimed at exploring the relationship between the DP, IPB (attention, memory, and appraisal/ interpret), and fear of contamination, and also determining the mediating role of IPB in relation to DP and fear of contamination.

3. Methods

3.1. Participants and Procedure

In the current descriptive-analytical study, a minimum sample size of 100 was suggested for the structural equation modeling (SEM), and accordingly, 200 was desirable, 300 good, 500 very good, and 1000 was great (28). Therefore, 400 students of Shahed University (a state university in Tehran, Iran) in the academic year of 2017 - 2018 were selected by cluster sampling method. Twenty-five classes were randomly selected among the Shahed University classes. Therefore, after getting permission from the professors, the researcher attended the classes and provided explanations about the confidentiality of student information. After agreement to participate in the study, students signed the informed consent form and completed the questionnaires.

The inclusion criteria consisted of being a student, age range of 18 - 35 years, and consent to participate in the study. Exclusion criteria were: scores $\geq$ 20 in the Beck depression inventory (BDI)-II, suicidal thoughts, blindness, history of drug abuse, or drug dependence. Of these 400 participants, six individuals did not meet the inclusion criteria (i.e., two individuals were not within the defined age range, and four refused to cooperate with the study), three individuals were ruled out based on the exclusion criteria, one due to blindness, two individuals had a BDI-II > 20, and five were excluded from the study for other reasons (not completing the questionnaires). In the end, data of 386 (281 female, 105 male) students were examined.

The mean $\pm$ standard deviation (SD) age of participants was 21 $\pm$ 3.21 years, ranged 18 - 30. The DP subscale of disgust propensity and sensitivity scale-revised (DPSS-R), the Padua inventory (PI) (contamination subscale), the responsibility/threat estimation subscale of obsessive beliefs questionnaire (RT-OBQ), and the spatial cueing task were used to collect data. Participants were presented with 20 images (10 neutral, 10 disgusting). Then, participants were asked to memorize the images and were given five minutes to recall the images. The reminded neutral images were subtracted from disgusting images. Higher values reflected greater memory bias toward disgust.

3.2. Measures

3.2.1. Disgust Propensity and Sensitivity Scale-Revised

This subscale consists of six items that assess prone and tendency of a person toward experiencing disgust. It is one of the two subscales of DPSS-R. The internal consistency of this subscale is reported 0.84 (29). The reliability and validity of the Persian version of DPSS-R was confirmed. Test-retest reliability for this subscale was 0.54 and alpha coefficient was 0.83. And also, the convergent validity of DPSS-R was 0.46 ($P < 0.001$) (30).

Contamination scale of PI consists of 10 items that examine contamination obsession and washing behaviors. The internal consistency was > 0.80 for the PI total and contamination scale (31). Goodarzi and Firoozabadi (32) showed that the Persian version of the PI had proper reliability and validity. Alpha coefficient was 0.94 for the PI to-

tal, and 0.87 for contamination subscale. Also convergence validity of the Persian version of PI was confirmed in their study. In the current study, the alpha coefficient was 0.83 for contamination subscale.

Obsessive beliefs questionnaire-44 was developed by the Obsessive Compulsive Cognitions Working Group (OCCWG) and assesses the beliefs related to OCD. It assesses (1) responsibility and threat estimation, (2) perfectionism and (3) the importance of the control of thoughts. Test-retest reliability for OBQ total was reported 0.95 and for responsibility and threat estimation subscale was 0.93 (33). Shams et al. (34) reported good reliability (α = 0.92, retest reliability = 0.82) and construct validity of the Persian version of OBQ. In the current study, responsibility and threat estimation subscale were used to assess appraisal bias and alpha coefficient was 0.81.

The Spatial cueing task is used to measure attention bias. In this task, there is a central fixation star. A cue (disgusting or neutral stimulus picture) is displayed in the right or left of a central fixation star for 500 msec. Then, it disappears, and either a '/' or 'X' probe is displayed on one of the two sides. The trails that the probe appeared opposite the cue were named invalid, while the valid trials were the probes appeared in the location of the cue (35). The participant should respond and press the key (i.e., '/' or 'X') corresponding to the correct stimuli as quickly as possible after detecting it. The system records the person's reaction time. Slower RTs on disgust invalid trials rather than neutral valid trials indicate the difficulty in disengaging attention from disgust and this index is used as an indicator of attention bias. The pictures used in this task were selected from the International Affective Pictures System (IAPS). The instruction of Lang et al. (36) was used for selection and cultural adaptation.

3.3. Statistical Analysis

The statistical analysis was performed with SPSS version 16 and AMOS version 22. The Shapiro-Wilk test was used to determine the normality of data. In order to analyze the mediated model and the direct and indirect effect of DP on C-OCD symptoms, SEM with Amos was employed. To test the fit of the model, the ratio χ^2/df and the following indices were used: CFI (comparative fit index), GFI (goodness of fit index), AGFI (adjusted goodness of fit index), TLI (the Tucker-Lewis index), and RMSEA (root mean square error of approximation). However, χ^2/df < 3, GFI, AGFI, TLI, CFI > 0.9, and RMSEA < 0.05 indicated the goodness fit of the model. The bootstrapping method was employed to test whether the mediated effect was significant. The P value < 0.05 was considered as a significant difference in the current study. The expected power was 0.80.

4. Results

The Shapiro-Wilk test indicated the normality of data (W = 0.98, P = 0.07). According to Table 1, DP was significantly associated with symptoms of C-OCD (r = 0.41, P < 0.001) and all types of IPB (r = 0.21 - 0.30, P < 0.001).

The hypothesis that the association between DP and C-OCD symptoms is mediated through a latent variable "IPB" was examined; it was composed of the attention (difficulty of disengagement attention), memory, and appraisal biases. First, a model of correlation between DP and C-OCD symptoms was tested. The obtained results showed that high levels of DP were significantly associated with increased C-OCD symptoms (β = 0.41, P < 0.001). Next, a model including the direct and indirect IPBs (a latent factor including attention, memory, and appraisal biases) was used and associations between DP and C-OCD symptoms were estimated. The analysis of this model by SEM had good indices of fitness: χ^2/df = 1.57, GFI = 0.95, TLI = 0.95, CFI = 0.96, and RMSEA = 0.03 (90% confidence interval (CI): 0.02 - 0.04). As observed in Figure 1, high level of DP was significantly associated with high levels of IPB (β = 0.54, P < 0.001). IPB was significantly associated with high levels of C-OCD symptoms (β = 1.03, P < 0.001). Furthermore, when IPB was included in the model, the significant correlation between DP and C-OCD symptoms decreased, and no significant difference was observed (β = -0.03, P = 0.71).

Finally, a bootstrapping method with 2000 resamples indicated that the indirect effect of DP C-OCD symptoms was significant through IPB [95%CI: 0.38 - 0.96, P < 0.001].

5. Discussion

The current study firstly aimed at investigating the correlation between DP, IPB, and fear of contamination. The obtained results showed a relationship between C-OCD symptoms (fear of contamination) and DP. This finding was consistent with those of previous studies describing C-OCD symptoms and disgust measures in adults (5, 7) and youth (6). The etiology and maintenance of C-OCD supported the role for disgust (13). According to the disease-avoidance model of disgust (37), theoretical models assume that DP may play a larger role in OCD rather than other disorders. Correlation between DP and OCD symptoms are commonly reported in the contamination subtype (19). Olatunji et al. (6) found the association between disgust proneness and OCD symptoms in a clinical sample of youth. They reported that the correlation between DP and OCD symptoms was not explained by negative effect.

Also, the current study results showed significant relationships between three types of information processing, fear of contamination, and DP. Attention bias had the most

Table 1. Descriptive Indices and the Correlations Between DP, Attention, Memory, and Appraisal Biases and Fear of Contamination

Variable	1	2	3	4	Mean ± SD
1. Fear of contamination	-	-	-	-	9.86 ± 4.72
2. Disgust propensity	0.41[a]		-	-	18.71 ± 4.41
3. Attention bias	0.72[a]	0.30[a]	-	-	66.80 ± 17.72
4. Memory bias	0.43[a]	0.21[a]	0.36[a]	-	2.53 ± 0.8
5. Appraisal bias	0.45[a]	0.27[a]	0.36[a]	0.17[a]	8.07 ± 2.91

[a] P < 0.001.

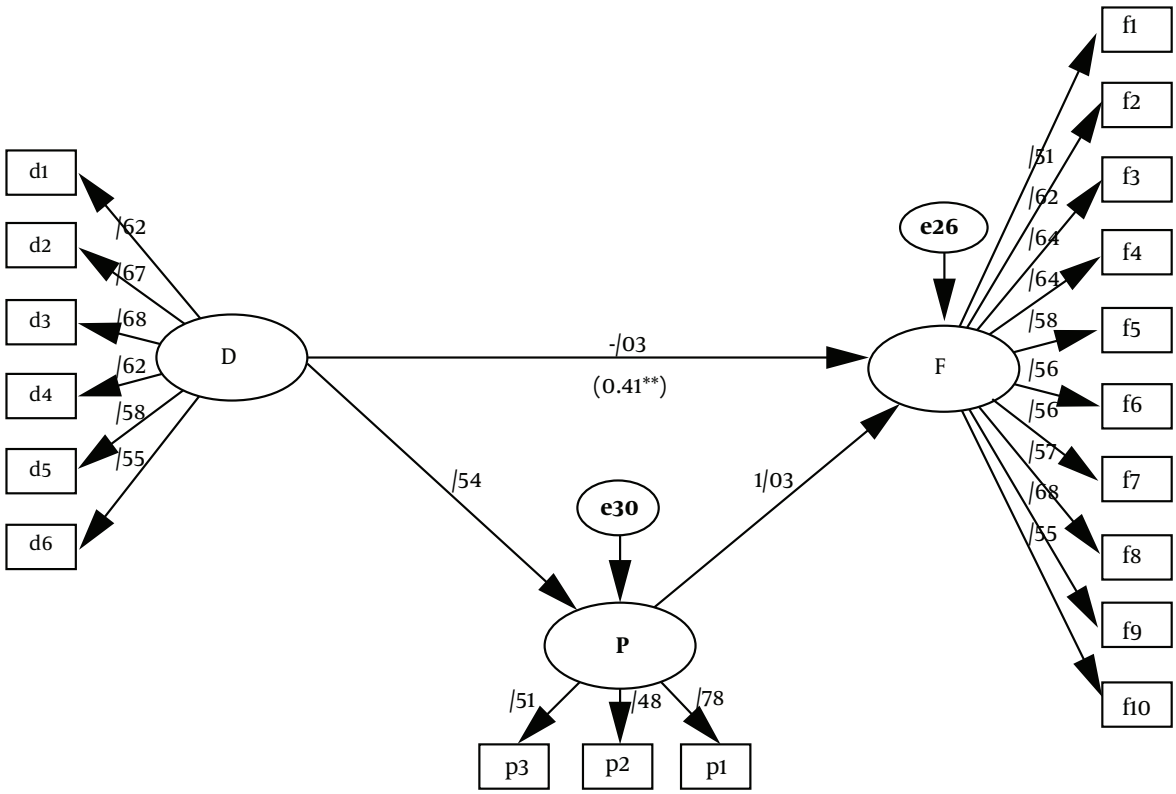

Figure 1. Results of structural equation modeling analysis of the direct and indirect effects of disgust processing and the mediating role of IPB on C-OCD symptoms. D, DP; P, IPB; F, C-OCD symptoms.

significant positive correlation with the fear of contamination (r = 0.72, P < 0.001). The path coefficient of the model also showed that latent variable (IPB) was significantly correlated with fear of contamination. These results were consistent with those of previous studies (20-22, 25, 27, 38) indicating that the individuals with C-OCD had attention bias toward disgust stimuli. Also, individuals with disgust have very difficulties in the disengagement attention toward disgusting stimuli. This leads to remembering more of these stimuli (24, 26) and increasing appraisal of contamination of the objects. The result of Charash and McKay (22) supported the memory bias toward disgust in OCD individuals. They indicated that disgusting words were remembered more easily than neutral words. As a result, it seems that IPB could be a risk factor to develop a fear of contamination.

Regarding the attention bias toward the disgusting things, Cisler et al. (39) suggested that difficulty in disengagement of attention is a reason to continue the disorder in people with a high propensity of disgust, since this

problem keeps such individuals in touch and paying attention to stimuli is associated with their disorder. Consequently, coping responses such as escape or avoidance are essential. Finally, these coping behaviors develop and maintain C-OCD. They suggested that attention bias can be a path through which the disgust influences the development and maintenance of C-OCD. Also, this bias leads to increasing the memory and remembering disgusting or contaminated stimuli, which can increase a person's fear of contamination. In line with the ideas of Cisler et al. and other researchers (22, 24, 26), the results of the current study also demonstrated that memory bias was positively associated with fear of contamination.

The results were also consistent with the opinion of the OCCWG (33), which posed overestimations of the threat as one of the cognitive biases associated with symptoms of C-OCD. According to Rachman (40), OCD is caused by a catastrophic misinterpretation of the importance of thoughts or images. As long as they continue, disorder remains stable.

Another objective of the current study was to explore the role of IPB in relation to DP and fear of contamination. As predicted, the obtained results showed that the relationship between DP and fear of contamination was mediated by IPB. This finding can be explained by the cognitive model of Brady et al. (41). According to this model, disgust response can be interpreted as a sign of danger or damage. In this case, the stimulus is not only disgusting, but it is also appraised as dangerous. Then, the person becomes vigilant and pays more attention to such things; consequently, the person remembers more information about it. As Mitt (42) stated, the individuals use their emotions in order to assess possible contamination. As already mentioned, it seems that disgust is an alarm that leads individuals paying attention to the potentially contaminated situations. This increases the appraisal of these objects contamination and follows the fear of contamination.

According to the obtained results, it seems that people that are prone to disgust are more likely to interpret this emotion as a sign of danger and overestimated possible contamination. Therefore, they are more sensitive to disgusting things and pay more attention to them. Consequently, they tend to remember more and avoid such things. Briefly, it is found that a DP leads to IPB and, in turn, leads to fear of contamination. This result may explain how DP, as a generalized vulnerability, confers risk for IPB toward contamination, which then operates as a specific vulnerability factor for C-OCD.

One of the limitations of the current study was its cross sectional design and the limited exploration of causal relationships between the variables. Although SEM is better than other traditional methods to test the causal relationships between variables, it also has limitations. Another limitation was the non-clinical sample that limited the generalizability. Consequently, it is suggested that researchers should design longitudinal studies in this regard. It was also suggested that researchers should plan a similar study on patients with contamination/washing OCD.

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