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A Structural Model of Relationship Between Disgust Propensity and Fear of Contamination: The Mediating Role of Mental Contamination

Zahra Zanjani [1,*], Hamid Yaghubi [2], Mohammadreza Shaeiri [2], Ladan Fata [3] and Mohammad Gholami Fesharaki [4]

[1]Department of Psychology, Medical Faculty, Kashan University of Medical Science, Kashan, IR Iran
[2]Department of Psychology, Humanities Faculty, Shahed University, Tehran, IR Iran
[3]Iran University of Medical Science, Tehran, IR Iran
[4]Biostatistic departmant,Faculty of Medical Science, Tarbiat Modares University, Tehran, IR Iran

[*]*Corresponding author*: Zahra Zanjani, PhD of Clinical Psychology, Assistant Professor, Department of Psychology, Medical Faculty, Kashan University of Medical Science, Kashan, IR Iran. P.O. Box: 8715988141, Tel: +031-55540021-5, Fax: +31-55541112, E-mail: zanjani-z@kaums.ac.ir, z_zanjani2005@yahoo.com

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Abstract

Background: Fear of contamination is one of the complex and powerful fears and is often seen in contamination/washing obsessive-compulsive disorder. Earlier researches have shown that this disorder is related to mental contamination and recent research showed that individuals with the fear of contamination are prone to experiencing disgust.
Objectives: This study aimed to investigate the mediating role of mental contamination between disgust propensity and fear of contamination.
Methods: The sample consisted of 391 students of Shahed University in Tehran city, Iran. The participants were selected by cluster sampling in November and December in 2015. The tools used were Disgust Propensity and Sensitivity Scale-Revised (DPSS-R), Vancouver Obsessional Compulsive Inventory-Mental Contamination Scale (VOCI-MC), and Padua Inventory (PI). The proposed model was examined by Structural Equation Modeling Modeling (SEM), using Amos-22 software. Baron and Kenny as well as bootstrap methods were used for the analysis of the role of mental contamination as a mediator in this relationship.
Results: Goodness of fit indexes indicated that the proposed model had a good fit (GFI = 0.92, AGFI = 0.90, TLI = 0.93, CFI = 0.94 (all > 0.90), and RMSEA = 0.04 (CI (90%) = 0.04-.05). The results showed that disgust propensity caused the fear of contamination both directly (β = 0.35; SE = 0.05) and indirectly (β = 0.16; SE = 0.03) through mental contamination.
Conclusion: The findings provided support for the proposed model and showed that disgust propensity played a role in increasing mental contamination which, in turn, leads to fear of contamination. As a result, it would seem that the assessment of disgust propensity and mental contamination is essential to treating the fear of contamination and washing behavior.

Keywords: Contamination, Disgust, Emotions, Equation Modeling Modeling, Fear, Mental Contamination, Obsessive-Compulsive Disorder, Student, Structural

1. Background

Obsessive-Compulsive disorder (OCD) is the fourth most common psychiatric disorder, which has a prevalence between 2%-3% in America's population (1) and 1.8% in Iran (2). The research found at least four subtypes for OCD, including (a) contamination/washing, (b) responsibility/checking, (c) obsessions without compulsions, and (d) symmetry/ordering (3).

Contamination OCD (C-OCD) is the second most common form of OCD in Western cultures (4) and is the most common type of OCD in Iran (5). The one of dominant characteristic of C-OCD is fear of contamination (FC). As a result, FC is clinically important. FC is easily triggered, extremely persistent, and universal. The research showed that the more the fear of contamination, the more the OCD. In other words, FC can predict the likelihood a person will have OCD. This fear is usually considered with physical and contact contamination (4). However, it is said that people may feel contamination without any contact with contamination, this type of contamination is called "mental contamination" (6). Mental Contamination (MC) includes internal feelings of dirtiness, urges to wash, external (e.g., anger) and internal (e.g., anxiety) negative emotions, and washing behavior (4).

The concept of "mental contamination" was first described by Rachman. He proposed that feelings of MC, similar to contact contamination, can be transferred to neutral things and then spread widely and quickly. MC compared to the contact contamination is more likely to spread, due

to its ability to spread without physical contact with the pollution, for example by memories and images (4).

The experimental studies demonstrated that the imagination of an unacceptable act and memories associated with infidelity and immorality can produce feelings of contamination and compulsive washing (7, 8). It is seen that 10% of patients with OCD symptoms reported MC without contact contamination, 15% reported contact contamination without MC, and 36% reported MC and contact contamination. The result of this study indicated that although MC overlaps with contact contamination, it has a distinct structure (9).

Conversely, studies regarding C-OCD and FC have also shown this disorder to be more related to disgust than fear or anxiety (10, 11). Disgust is a basic emotion that causes avoidance/withdrawal behaviors and protects the individual from the dirty stimuli (12). In recent years, research found that the disgust propensity (DP) contributed to the development of FC, C-OCD, and washing rituals in OCD (11, 13).

Despite the numerous attentions given to disgust in explaining FC and C-OCD, there exists little research about the role of disgust in MC. Although previous studies found the relationship between some of these variables, they were mainly correlation studies. Such statistical methods cannot identify and control indirect effects between variables while SEM analysis provides a more appropriate framework for mediation analyses.

Carraresi et al., (14) in a sample of C-OCD by SEM analysis (n = 16) found MC mediated the relation between DP and FC. Mellie et al., (13) repeated this study with 64 C-OCD. It is clear that the sample size of both studies was small, whereas, according to Loehlin (15), the minimum sample size required for using SEM is 100 and optimal sample size is 200 people.

2. Objectives

Given the importance of the DP and MC in FC and limitation of previous researches, in this study, a large sample size was used to explore the association between MC, DP, and FC in general population and also to investigate the mediating role of MC between DP and FC. FC is a dominant characteristic of C-OCD and can predict the likelihood a person will have OCD. Therefore, the study of the factors influencing the FC can help prevent OCD.

3. Materials and Methods

3.1. Participants

The sample consisted of 400 students of Shahed University that were selected by cluster sampling method. First, three faculties were selected from eight faculties of this university. Then, in each faculty, seven classes were selected and all students of these classes (except blind people and people with severe hearing impairment who announced their consent to participate in research were considered as sample. The sampling lasted from November to December in 2015. Participants completed Vancouver Obsessional Compulsive Inventory-Mental Contamination Scale (VOCI-MC), subscale disgust propensity of Disgust Propensity and Sensitivity Scale-Revised (DPSS-R), and Padua Inventory (PI-contamination scale). The final sample that completed the scales without skipping any process included 391 students (285 female, 106 male), aged between 17 and 40 years, with a mean age of 21 years (SD = 4.01).

3.2. Measures

3.2.1. The Padua Inventory (PI) Contamination Subscale

This scale is a self-report scale that included 10 items associated to contamination obsessions and washing compulsions. Studies reported good psychometric properties for it. Sanavio (16) reported good internal consistency for it (Cronbach's coefficients > 0.80). The correlations of the PI total with the other measure of OCD (Maudsley Obsessive-Compulsive Disorder Inventory and Leyton Obsessional Inventory) were high (from .65 to 0.75) and indicated convergent validity of scale (16). In addition, Olatunji et al., (17) reported the acceptable internal consistency for contamination subscale (Cronbach's coefficients = 0.72).

Psychometric properties of the Persian version of PI were demonstrated by Goodarzi and Firoozabadi (18). They found good reliability and validity for the PI. Alpha coefficient was 0.95 for total scale and 0.90 for the contamination scale. The test-retest correlation for a 4-week interval for total scale was 0.79 and for contamination subscale was 0.81. In the current study, alpha coefficient was 0.83 for contamination subscale.

3.2.2. The Disgust Propensity and Sensitivity Scale-Revised (DPSS-R) DPSS

DPSS is a 16-item scale designed to assess the general tendency to experience disgust (disgust propensity) and the overestimation of the negative effect of disgust (disgust sensitivity (19). The DPSS-R is a reduced-item version that involved 12 items (20). The disgust propensity subscale (6 items) of DPSS-R (12 items) was used for examining the DP. The DPSS-R total scale had good internal consistency (α = 0.93) (11). In addition, there were good internal consistency for the two factors of Disgust Propensity (α = 0.84) and Disgust Sensitivity (α = 0.83). The DPSS-R additionally possesses good convergent validity with other measures of anxiety symptoms such as Contamination Subscale of PI (r = 0.35, P < 0.05) and Injection Phobia Scale-Anxiety (r = 0.30, P < 0.05) (21).

This scale was translated into Persian and the psychometric properties and factor structure of the Farsi version was examined in a non-clinical sample of Iranian

university students by Zanjani, Yaghubi, Fata, Shaiiri, and Gholamifesharaki (22). Confirmatory factor analysis confirmed the 2-factor structure, and the scale showed good internal consistency (Cronbach's $\alpha = 0.83$), test-retest reliability for a 4-week time interval (r = 0.44), while internal consistency for disgust propensity subscale was 0.83 and test-retest reliability for this subscale was 0.54 ($P < 0.001$); the convergent validity with disgust scale-revised was .48. In the current study alpha coefficient for disgust propensity subscale was 0.83

3.2.3. Vancouver Obsessional Compulsive Inventory-Mental Contamination scale (VOCI-MC)

This scale that was developed by Rachman has 20-items. The reliability and validity of VOCI-MC reported well (23). Alpha coefficient was .85 and test-retest reliability was 0.88 ($P < 0.001$). It has also demonstrated construct validity (24). The reliability and validity of VOCI-MC Persian version were determined by Zanjani, Yaghubi, Shaiiri, Fata, and Gholamifesharaki (25). They reported good internal consistency (Cronbach's $\alpha = 0.91$), test-retest reliability for a 4-week time interval ($r = 0.80$, $P < 0.001$), and construct validity for this scale. In their study, exploratory factor analysis confirmed the 4-factor structure. In the current study, alpha coefficient was 0.80.

3.3. Statistical Analysis

To analyze data, SPSS-22 was used to characterize the sample demographic variables such as gender, age, means, and standard deviations for each measure. Correlations between variables were explored using Pearson coefficient. In order to analyze the proposed model and the role of MC as a mediator of the relation between DP and FC, SEM with Amos-22 software was employed. Fit indexes used to examine the model were relative χ^2 (χ^2/df), Goodness-of-Fit Index statistic (GFI), the Adjusted Goodness-of-Fit statistic (AGFI), the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). Relative χ^2 values of 3 or lower indicate well-fitting models (26). Values for AGFI, GFI, TLI, and CFI range between 0 and 1 and values of 0.90 or greater indicate well-fitting models (27). In addition, RMSEA values of 0.05 or lower (26) were considered as cut-offs for adequate model fit.

A combination of tests was used to examine the mediating effect of MC. First, this effect was examined via Baron and Kenny's approach (28). This approach requires that the following four conditions should be met: (1) the independent variable (DP) significantly predicts the dependent variable (FC); (2) the independent variable (DP) significantly predicts the mediating variable (MC); (3) the hypothesized mediating variable (MC) significantly predicts the dependent variable (FC), while the independent variable is controlled; and (4) the significant relationship between the independent variable and the dependent variable becomes non-significant or significantly reduced. Second, the Sobel's test was employed to examine the mediating effect of MC. Third; bootstrapping method was employed to test whether the mediated effect was significantly greater than zero.

4. Results

The mean, standard deviation for each study measure (DP subscale of DPSS-R, VOCI-MC, and PI-contamination) and correlation coefficient between them are presented in Table 1. As predicted, relationship between DP, MC, and FC was positive. In other words, the more the DP and MC in a person, the greater the likelihood of FC is.

We tested the hypothesis that the relation between DP and FC is mediated through MC. A model including the direct and indirect (through MC) effects of DP on FC was estimated. This model was found to fit the observed data adequately: χ^2/df = 1.92 (< 3), GFI = 0.92, AGFI = 0.90, TLI = 0.93, CFI = 0.94 (all > 0.90), and RMSEA = 0.04 (CI (90%) = 0.04 - 0.05).

As shown in Figure 1, the total effect (path c) of DP on FC was statistically significant ($\beta = 0.54$, $P < 0.001$). Similarly, DP was significantly positively associated with MC (path a: $\beta = 0.32$, $P < 0.001$), and MC was significantly positively associated with FC (path b: $\beta = 0.46$, $P < 0.001$). Moreover, path c'- the direct effect of DP on FC, controlling for MC- was also statistically significant ($\beta = 0.39$, $P < 0.001$).

Three statistical tests support that the effect of DP on FC is mediated by MC. First, Baron and Kenny's test supported mediation. Specifically, (1) DP significantly predicted FC (the dependent variable; $P < 0.001$); (2) DP significantly predicted MC (hypothesized mediating variable; $P < 0.001$); (3) the hypothesized mediating variable (MC) significantly predicted the dependent variable (FC; $P < 0.001$); and (4) the significant relationship between the independent variable (DP) and the dependent variable (FC) reduced from .54 to .39 once accounting for the hypothesized mediating variable (MC). Second, Soble's test confirmed the mediating role of MC ($Z = 4.17$; $P < 0.001$) (Figure 1). Third, the bootstrapping method also confirmed this role [CI (95%) = 0.08 - 0.19]. Results of SEM by bootstrapping method indicated that direct effect of DP on the FC was 0.35 and also DP had an indirect impact (via MC) on the FC ($\beta = 0.16$; SE = 0.03) (Figure 2).

5. Discussion

The main aim of this study was to investigate the mediating role of MC in the relationship between DP and FC. As predicted, the findings showed that MC mediates the relationship between DP and FC. This is consistent with previous findings in clinical samples with small sample size (11).

Table 1. Means, Standard Deviations, and Correlations Between Disgust Propensity, Mental Contamination and Fear of Contamination (N = 391)

Variable	Mean	SD	1	2
1. Fear of contamination	06.89	2.72		
2. Disgust propensity	18.71	4.41	0.41[a]	
3. Mental contamination	06.09	0.47	0.48[a]	0.27[a]

[a] P < 0.001

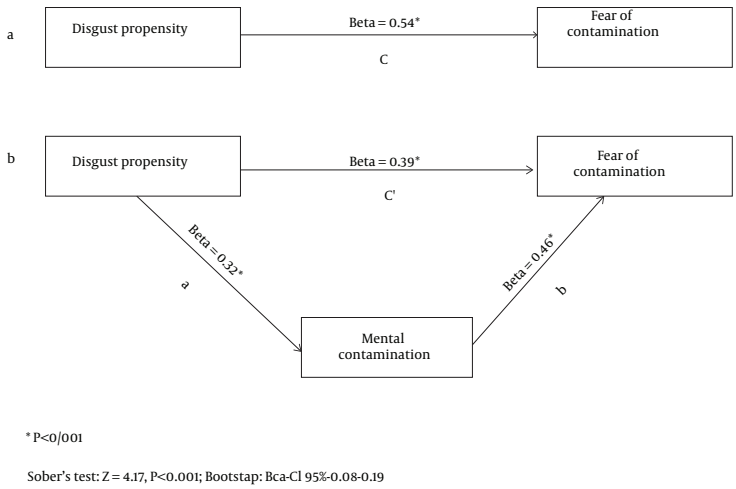

Figure 1. A diagram of the hypothesized mediation model for the effect of disgust propensity on fear of contamination through the mediator of mental contamination. A, the total effect of disgust propensity on the fear of contamination; B, the indirect effect of disgust propensity on the fear of contamination through increases in mental contamination path coefficients are displayed, with corresponding p value. Sobel's test: z = 4.17, P < 0.001; Bootstap: Bca- CI 95% = 0.08 - 0.19

The results indicated that there was significant positive correlation between DP and FC. In other words, when a person has more propensities to experience disgust, he is more likely to experience fear of contamination. This is consistent with previous findings (11, 13, 14). This finding showed that DP is important to the developing of FC.

It seems that individuals who have a high DP and were confronted with some events (e.g., immoral thoughts/ images/ impulses) are more likely to experience MC, which may give rise to increased disgust; this may cause increasing concerns about contamination. According to the literature (6, 9, 29), this concern and fear of contamination can maintain OCD symptoms by increasing maladaptive behaviors such as washing and avoidance. These findings provide a support for the Rachman's theory (4) regarding fear of contamination and the important role of MC in it.

According to results, MC partially (not fully) mediated the relationship between DP and FC. It seems that other mediators are involved in this relationship (such as disgust sensitivity, emotion regulation, and information processing bias). Additional research is needed to clarify these relationships. The most important limitation of this study is that the current study was a cross-sectional study, and were therefore, unable to examine the timing of the interaction. Longitudinal data were needed to examine the nature of the relationships between the variables. Another limitation was the presence of nonclinical samples that may limit the generalization of the current findings. Another limitation was the use of self-report measures to assess all constructs of interest as well as the specific self-report measures used to assess OCD.

In spite of these limitations, the finding of this study may have some implications. According to the literature, although psychological treatments for this disorder (ERP and CBT) have been reported effective (30, 31), the high drop-out rates (31) and lack of statistically reliable reductions in symptoms and moderate effectiveness (32) are considerable problems in treatment of OCD. Based on the findings of this study, a possible cause of this problem can be the role of disgust and MC in this disorder that is not targeted in the treatment of this disorder. The research found that disgust is less responsive to cognitive behavioral therapy (CBT), and also Exposure and Response Prevention (ERP) compared to the fear (33). Rachman (34) suggested that more cognitive techniques are required to treatment of patients with MC. He developed a protocol for

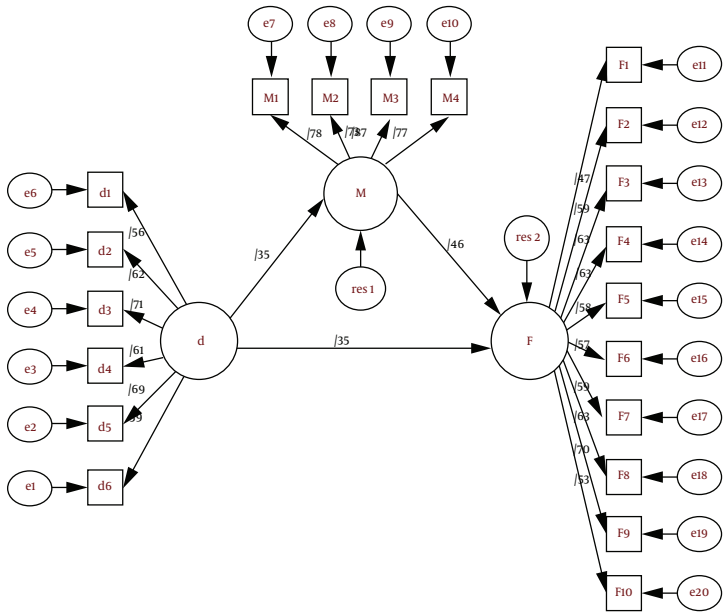

Figure 2. Results of structural equation modeling analysis of the direct and indirect impacts of disgust propensity the on fear of contamination. D, disgust propensity; M, mental contamination; F, fear of contamination. Bootstap: Bca-CI 95% = 0.08 - 0.19

the treatment of MC that was different from standard OCD treatment protocol. To summarize, the results of this study showed that if individuals who have a high DP experience MC, they are more likely to suffer from fear of contamination.

5.1. Conclusion

It is concluded that both DP and MC are contributed in the FC, which is the dominating feature in contamination OCD. As fear of contamination is a symptom of C-OCD, these data suggest that it is essential to assess MC and DP before designing plans for treatment of contamination-related OCD symptoms.

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Footnotes

Authors' Contribution: Dr. Zahra Zanjani, Dr. Hamid Yaghubi, and Dr. Ladan Fata performed the study conception. Dr Zahra Zanjani collected the clinical data, performed parts of statistical analysis, and drafted the manuscript. Dr. Mohammadreza Shaeiri participated in interpreting clinical data and revised the manuscript. Dr. Mohammad Gholami Fesharaki participated in statistical analysis. All authors read and approved the final manuscript.

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