

# The Relationship Between Obsessive Compulsive Disorder and Mental Contamination (MC): Psychometric Properties of Vancouver Obsessive Compulsive Inventory-MC Scale and Thought-Action Fusion-Contamination Scale

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## ABSTRACT

The relationship between obsessive compulsive disorder and mental contamination (MC): psychometric properties of Vancouver Obsessive Compulsive Inventory-MC Scale and Thought-Action Fusion-Contamination Scale

**Objective:** Mental contamination is defined as feelings of internal dirtiness in absence of actual contact with a dirty physical object or a person. Mental contamination is considered to play an important role in maintenance and persistence of obsessive compulsive disorder (OCD). This study aimed to examine psychometric properties of the Turkish version of two objective measures of mental contamination: Vancouver Obsessive Compulsive Inventory-Mental Contamination Scale (VOCI-MC) and Thought-Action Fusion-Contamination Scale (TAF-CS).

**Method:** The participants were 255 university students (183 females and 70 males) with the age range of 18-28 years. The participants were asked to fill out the questionnaire set consisted of VOI-MC, TAF-CS, Thought-Action Fusion Scale (TAFS), Disgust Scale-Revised, Trait Anger Expression Inventory and Obsessive Compulsive Inventory-Revised (OCI-R).

**Results:** Reliability analyses indicated that internal consistency of VOI-MC and TAF-CS were 0.93 and 0.92, and test-retest reliabilities were 0.79 and 0.61, respectively. Consistent with the original study, the results of explanatory and confirmatory factor analysis indicated that both scales had one factor structure. Convergent and divergent validity analyses revealed that both scales were positively correlated with OCI-R total scores and its subscales as well as TAF total score and its subscales; but this relationship was significantly less strong for Trait Anger and Disgust Sensitivity. While VOI-MC significantly predicted OCD symptomatology, TAF-CS had no predictive power in this regard.

**Conclusions:** The results support that psychometric properties of the Turkish versions of the scales meet acceptable standards for validity and reliability, and therefore can be used among Turkish population.

**Keywords:** Obsessive compulsive disorder, reliability, validity

## ÖZET

Zihinsel kirlenmenin (ZK) obsesif-kompulsif bozukluk ile ilişkisi: Vancouver Obsesif-Kompulsif Envanteri-ZK ve Düşünce-Eylem Kaynaşması-Kirlenme Ölçeklerinin psikometrik özellikleri

**Amaç:** Zihinsel kirlenme, bireyin kirli bir nesne veya kişiyle fiziksel olarak doğrudan temas etmemesine rağmen, içsel bir kirlenme hissi yaşamaya olarak kavramlaştırılmakta ve obsesif-kompulsif bozukluğun (OKB) şiddetlenmesinde ve devam etmesinde önemli bir rol oynadığı belirtilmektedir. Bu çalışmada, OKB ile ilişkili bir kavram olan zihinsel kirlenme olgusunu objektif olarak değerlendiren iki ölçüm aracı olan Vancouver Obsesif-Kompulsif Envanteri-Zihinsel Kirlenme (VOKE-ZK) ve Düşünce-Eylem Kaynaşması-Kirlenme Ölçeklerinin (DEK-KÖ) Türkçeye uyarlanarak psikometrik özelliklerinin incelenmesi amaçlanmıştır.

**Yöntem:** Araştırmanın örneklemini 183'ü kadın 70'i erkek, yaş aralığı 18-28 arasında bulunan 255 üniversite öğrencisi oluşturmuştur. Katılımcılardan VOKE-ZK, DEK-KÖ, Düşünce-Eylem Kaynaşması Ölçeği (DEKÖ), Tiksinme Ölçeği/Revize Edilmiş (TÖR), Sürekli Öfke-Öfke İfade Tarzları Ölçeği (SÖ-ÖİTÖ), Obsesif-Kompulsif Envanteri-Gözden Geçirilmiş Kısa Formu'ndan (OKE-GGKF) oluşan ölçek setini doldurmaları istenmiştir.

**Bulgular:** Yapılan güvenilirlik analizleri doğrultusunda VOKE-ZK'nin iç tutarlık katsayısı 0.93, test-tekrar test güvenilirliği 0.79 olarak; DEK-KÖ'nün ise iç tutarlık katsayısı 0.92, test-tekrar test güvenilirliği 0.61 olarak tespit edilmiştir. Açıklayıcı ve doğrulayıcı faktör analiz sonuçları, orijinal çalışma ile tutarlı olarak, her iki ölçeğin de tek faktör yapısına sahip olduğuna işaret etmiştir. Ölçeklerin birleşen ve ayrı ayrı geçerlik analiz bulgularına bakıldığında her iki ölçüm aracının da OKE-GGKF toplam ve alt ölçekleriyle, aynı zamanda DEKÖ toplam ve alt ölçekleriyle pozitif yönde ilişkili bulunduğu görülmüştür; sürekli öfke ve tiksinme hassasiyeti ile olan ilişkilerinin anlamlı olarak daha düşük olduğu belirlenmiştir. VOKE-ZK'nin OKB'nin belirtilerini anlamlı olarak yordarken, DEK-KÖ'nün yordayıcı gücünün olmadığı görülmüştür.

**Sonuç:** Analiz sonuçları, ölçeklerin Türkçe formlarının istenir geçerlik ve güvenilirlik değerleri ile ülkemizde kullanılmaya olanak verecek psikometrik özelliklere sahip olduğunu göstermektedir.

**Anahtar kelimeler:** Obsesif-kompulsif bozukluk, güvenilirlik, geçerlilik



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Date of receipt / Geliş tarihi:  
March 27, 2016 / 27 Mart 2016

Date of the first revision letter /  
İlk düzeltme öneri tarihi:  
May 15, 2016 / 15 Mayıs 2016

Date of acceptance / Kabul tarihi:  
July 7, 2016 / 7 Temmuz 2016

This study was supported in part by the Turkish Academy of Sciences (TUBA) under the Program for Awarding Outstanding Young Scientists (GEBİP-2013).

## INTRODUCTION

Studies which have investigated the phenomenology of obsessive compulsive disorder (OCD) have noted that symptoms are very heterogeneous and individualized having patterns of obsessions with contamination, hoarding, religiousness, symmetry, and somatic content; and main compulsions of washing, checking, counting, ordering, and hoarding (1). According to the prevalence studies, the second most common type of obsessions and compulsions comprise those of contamination related themes in 38-45% of the cases with OCD (2,3). While the content of fear of contamination might change, it might appear after a physical contact with a dirty/dangerous object or person. The fear of contamination is described as quite complex, intense, easily triggered, rapidly spreading, not easily subsided, and difficult to control (4). However, Rachman (5) indicated that feeling of contamination might arise without any physical contact with an object or subject, and he proposed the concept of mental contamination. According to Rachman (5), mental contamination refers to feelings of internal dirtiness even though the person has no physical contact with a contaminant.

Although contact contamination and mental contamination are similar concepts, it is emphasized that there are basic differences between the two. For example, while contact contamination requires tangible objects or people that are assumed to be dirty, in mental contamination direct contact is not a necessary condition. Contact contamination, fear of contamination generally originates from dirty or dangerous objects or places; but in case of the mental contamination, the source of contamination is generally the people or the thoughts that are considered as dirty, dangerous or harmful. In both forms of contamination, individuals feel very strong urge to wash/clean themselves. In case of contact contamination, since the source of the contamination is usually the hands, the individual focuses on this particular part of the body for the removal of the contaminant although the washing behavior is only effective for a short period of time (6). Due to the

nature of mental contamination, it does not require any contact, feelings of dirtiness are described as an internal dirtiness without any focus, and is generally spreading all over the body. Therefore, washing behavior is generally inadequate in overcoming these feelings, and individuals with these feelings develop frequently other behavioral patterns besides hand-washing behavior (6). Furthermore, it has been predicted that mental contamination may be associated with some negative feelings. In a qualitative study, it was found that all of the individuals with mental contamination reported negative feelings such as uncomfortableness, anxiety, anger, shame, disgust, distress, and irritability (6). Different from the ones having feelings of contact contamination, individuals who experience mental contamination have tendencies to attribute this feeling of dirtiness to one's moral character such as being a bad, worthless, and immoral person. These kinds of moral evaluations are not generally observed in contact contamination cases.

In light of these findings, the number of studies attempting to better understand the nature of mental contamination has risen in recent years. When we examined the first studies of mental contamination, Fairbrother and Rachman's study was remarkable. They examined mental contamination in female subjects who had previous sexual abuse history. In their study, it was found that even remembering and talking about the sexual abuse created the feelings of dirtiness, urge to wash, and even caused washing behavior. Following this study, the phenomenon of mental contamination has been examined through experiments performed on scenarios in which people are asked to imagine to be kissed without their consents. Fairbrother et al. (8) triggered mental contamination in female university students by making them listen to a voice record about a non-consensual kissing case. Consequently, different variables such as attractiveness (9), immoral behavior (10), physical dirtiness (11), and betrayal were added on these scenarios, and the factors affecting mental contamination were investigated. Radomsky and Elliott (13) performed a study in which they let participants listen conditions by manipulating

responsibility (the condition that participant did not give consent to be kissed), personal violation (the condition that the participants were kissed by force) and morality (the condition that the kisser was an immoral individual) components into different scenarios, so as to determine their effects on mental contamination. Consistent with expectations, kissing scenarios triggered mental contamination in participants and caused negative feelings. Elliott and Radomsky (11) investigated associations of mental contamination feelings when non-consensual kissing condition was performed by a physically dirty person. According to obtained results, it was shown that non-consensual kissing by a physically dirty person caused higher mental contamination than the condition that the kissing person was clean, and also the condition of consensual kissing by a dirty/clean person. In light of these findings, the need for self-report instruments to measure mental contamination has increased over time.

Vancouver Obsessive Compulsive Inventory-Mental Contamination Scale (VOCI-MC) is one of the first scales developed to evaluate mental contamination based on Rachman's (4) mental contamination theory. Since mental contamination is associated with moral judgements and the thoughts about internal dirtiness, then thought action fusion, the condition in which the person equates his/her thoughts to actually performing them, might play an important role in mental contamination. Therefore, thought-action fusion in association to mental contamination requires further investigation (14). Thought-Action Fusion-Contamination Scale (TAF-CS) is a measure for fusion of contamination related thoughts, behaviors and feelings, and it is based on thought-action fusion concept which has been proposed by Shafran et al. (14). In a study evaluating psychometric characteristics of VOCI-MC and TAF-CS (14), internal consistency coefficients of both measures were evaluated in different samples including an OCD group with contamination fears, an OCD group without contamination fears, an anxiety group, and a student group. The psychometric properties were at the satisfactory levels.

In summary, mental contamination seems to be a

closely related concept to urges to wash and washing behavior in OCD. As washing behavior has a maintaining role in OCD symptoms, it is important that mental contamination should be understood better so as to increase our theoretical and practical understanding of OCD symptoms. There is no study performed about mental contamination and its role in OCD in our country yet. Therefore, it is believed that the Turkish versions of standardized measures which evaluate mental contamination objectively and effectively is very important to increase the number of such studies. In line with this requirement, the current study presents the Turkish adaptations of VOCI-MC and TAF-CS with their psychometric evaluations.

## METHOD

The sample of the present study was composed of 225 university students who were not diagnosed with any psychiatric diagnosis aging between 18-28 years old (females=183, males=70). Of participants, 97.6% (n=249) told that they were single, 0.8% (n=2) were married, and 0.4% (n=1) was divorced.

Two of the participants did not give information about their genders, and 3 did not give information about their marital status. All of the participants reported that they spent all of their life in Turkey.

## Measures

**Vancouver Obsessive-Compulsive Inventory-Mental Contamination Scale (VOCI-MC):** VOCI-MC is a 5-point Likert scale type measurement tool which evaluates symptoms of mental contamination between 0-4 scores and, contains 20 items (16). It was reported that Cronbach's alpha internal consistency coefficients were between 0.97 and 0.93 in different sample groups (15). Correlations between two measures (Contamination Sensitivity Scale and Thought-Action Fusion Contamination Scale) which were related to mental contamination, and Vancouver Obsessive Compulsive Inventory (VOCI) and contamination subscale of this inventory

were examined to evaluate convergent validity of the scale. The results indicated that the scale was significantly and positively related to these scales. In order to evaluate divergent validity, correlation of the scale with Beck Depression Inventory (BDI) (17) and VOICI-contamination subscale was examined. As expected, the correlation of the scale with VOICI-contamination subscale was significantly higher than its correlation with depression. In order to evaluate concurrent validity, VOICI-MC scores of OCD patients with contamination symptoms were compared with the patients without contamination symptoms by ANOVA analysis, and it was found that two groups were significantly different from each other. For predictive validity of the scale, hierarchical regression analysis was performed by defining OCD symptom level as a dependent variable, and it was observed that the scale could continue to explain variation of OCD symptoms. Depending on these findings, it was reported that convergent, concurrent, divergent, and predictive validity of the scale were at the desired level (15). Psychometric properties of the Turkish version of the scale will be evaluated in the present study.

**Thought-Action Fusion- Contamination Scale (TAF-CS):** TAF-CS is a scale developed to measure feelings and behaviors related to beliefs for thought-action about contamination/getting dirty by Rachman (18). TAF-CS is a measuring tool of 5-point Likert type (0=I disagree, 4=I totally agree) with 9 items. Internal consistency coefficients of the scale are 0.96 for OCD groups with and without contamination symptoms, 0.95 for anxiety group, and 0.93 for the student group. To evaluate convergent validity of the scale, its correlation with VOICI-Contamination subscale was investigated, and it was found that there was a significant positive correlation with university student sample. However, no significant correlation was determined with groups diagnosed with anxiety and OCD. To evaluate divergent validity of the scale, correlation of the scale with BDI, and VOICI-contamination subscale was examined. As expected, the correlation between the scale and

VOICI-contamination subscale was significantly higher than the correlation with BDI. To determine concurrent validity, TAF-CS scores of OCD with and without contamination symptoms were compared, and it was observed that the scale could only distinguish between clinical and non-clinical samples. Depending on these findings, it was reported that convergent and divergent validity of the scale was at the satisfactory level (15). Psychometric properties of the Turkish version of the scale will be evaluated in the present study.

**Thought-Action Fusion Scale (TAFS):** TAFS is a self-reporting, 5-point Likert type scale with 19 items, and was developed by Shafran et al. (14). Previously TAFS was used as three dimensions, then it was reported that two dimensions, TAFS-Likelihood, and TAFS-Moral, were suitable, and TAFS was used in two dimensions in later studies. Psychometric characteristics of the scale were re-evaluated in the study conducted by Rassin et al. (19), and it was indicated that it had the satisfactory level of internal consistency (for total and subscales of TAF  $\alpha > 0.75$ ), but correlations of test-retest were relatively low (total=0.52, likelihood=0.51, self=0.53, others=0.47, moral=0.54). In our country Yorulmaz et al. (20) adapted the scale into Turkish, and psychometric properties of TAFS were evaluated. It was reported that Cronbach's alpha reliability coefficient of TAF-Likelihood subscale, which was composed of 7 items was 0.92, and TAF-Moral subscale, which was composed of 12 items was 0.88. Performed validity analyses indicated that two factor structure of the scale had also acceptable validity values for the Turkish sample.

**Obsessive-Compulsive Inventory Revised (OCI-R):** Obsessive-Compulsive Inventory-Revised (OCI-R) is a self-reporting, 5-point Likert type scale, which was developed because of disadvantages of 84-item Obsessive Compulsive Inventory (21) in practice, and improved to 18 items by Foa et al. (22). It measures basic symptoms and mental neutralization of OCD. In the study performed by

Abramowitz and Deacon (23), it was reported that internal consistency coefficients of OCI-R (Cronbach's  $\alpha=0.86$ ), and its subscales (0.83-0.92) had the required consistency. Yorulmaz et al. (24) adapted the scale into Turkish and evaluated its psychometric properties. It was determined that factorial structure of the scale was consistent with the original study. According to reliability analysis, total scale and other subscales had satisfactory levels of internal consistency coefficients, except checking and neutralization ( $\alpha=0.64$  and  $0.64$ ) (for total scale  $\alpha=0.90$ , for subscales  $\alpha=0.73-0.84$ ). Besides the scale was a reliable measure, it was found that the scale had satisfactory criterion-related, convergent, and divergent validity values.

**The Disgust Scale-Revised (DS-R) Form:** Disgust Scale was developed by Haidt et al. (25), and it measures propensity of disgust in various stimuli. The scale has been used previously in different forms, but the latest version which was 5-point Likert type for all 27 items was revised by Olatunji et al. (26). The scale has three subscales; core disgust, animal reminder, and contamination. Cronbach's alpha reliability coefficient of the scale ranges between 0.34 and 0.64 for all subscales (25). The scale was adapted into Turkish by Inozu and Eremsoy (27). According to reliability analysis, it was reported that internal consistency coefficient of total scale was 0.87, and test-retest reliability was 0.88. Additionally, it was determined that its three factor structure was consistent with its original form. In validity analyses, there were signs indicating that the scale had convergent, divergent, and criteria validities. According to obtained results, it was reported that the scale was a reliable and valid measure of disgust propensity for our country.

**Trait Anger-Anger Expression Style Scale (TA-AESS):** TA-AESS is a measuring tool with 44 items which is divided into two such as Trait Anger and Anger Expression Style, and developed by Spielberger (28). In the present study, Trait Anger Scale (TAS) which had 10 items, and measured only continuous anger level, was used. The scale was

adapted into Turkish by Ozer (29). In reliability-validity analyses, it was found that internal consistency coefficient of the scale was 0.79, and it was reported that the scale was reliable. It was reported that factorial structure of the scale was consistent with original factor structure, and the scale was valid.

## Procedure

### Translation of Scales

Both scales were translated into Turkish independently by three clinical psychologists who had advanced knowledge in both languages (Turkish-English), and were specialized in OCD. Alternative translations of the scales made by independent translators were compared with the original items and evaluated by the research team, and the best translations reflecting the original item content were selected by the referee agreement. After this procedure, the first Turkish version of scales were obtained. The original English version and the first Turkish version of scales were given to 5 participants who had advanced knowledge in both languages, and were out of this field, and they were requested to score them. Additionally participants were also report whether they understood the same content while they were filling up the English and Turkish versions of the forms, and if it was required, they should correct the statements. After evaluation of the scales, the final versions were prepared, and they were sent to back-translation from Turkish to English to a specialist who had advanced knowledge in both languages, and was not included in the research team. The back-translation version was sent to abroad to researchers who developed these scales, and their approvals were obtained. Finally, scales were prepared to be used.

### Data Collection

The study has been approved by a research ethics committee of Dogus University. Only voluntary participants were included into the present study. The study was announced to students before the courses

that permission was already obtained, and volunteering students received the questionnaire set, and the students were requested to fill them up in the classroom. The questionnaire set was counterbalanced and took approximately 20-25 minutes to fill in. After filling out the questionnaire, participants received a course credit as an incentive for their participation.

## RESULTS

Internal consistency (Cronbach's alpha) coefficients of VOICI-MC and TAF-CS were found as 0.93 and 0.92, respectively. For TAF-CS, intercorrelation of scale items was ranged between 0.61-0.85; correlation coefficients for VOICI-MC ranged between 0.50 and 0.76. Guttman split-half reliability coefficients were determined as 0.88 for TAF-CS, and 0.90 for VOICI-MC. When split-half reliability was examined, the reliability coefficients for the first part of TAF-CS which contained 5 items was 0.86, and the second part which contained 4 items was 0.89. In addition, the reliability coefficients of the first part of VOICI-MC, containing 10 items, was 0.86, whereas the second part was 0.89. Test-retest reliability which was performed four weeks apart, indicated 0.62 for TAF-CS, and 0.79 for VOICI-MC. These values indicated that both scales had acceptable reliability coefficients.

### Validity

#### Construct Validity

As VOICI-MC and TAF-CS scales were accepted as having a single factorial structure in the original study, an exploratory factor analysis was performed primarily to examine the factor structure in our country, then a confirmatory factor analysis was used to confirm the obtained factor structure (LISREL 8.71).

#### Exploratory Factor Analysis

To evaluate the structural validity of VOICI-MC, Principal Component Analysis with 'Varimax rotation

was performed. KMO index, which is an index for sampling adequacy for exploratory factor analysis, was 0.93; whereas another marker, Barlett's Chi-square score was 4591.39 ( $p < 0.001$ ). These results showed that the data properties were ideal for exploratory factor analysis. There were three values greater than eigenvalue of the scale ( $>1$ ). Three factors reflected by these three values explained 58.77% of total variation. However, scree-plot curve indicated a two-factorial structure. When the item distribution according to Varimax rotation has done, it was observed that 16 items loaded both in the first and second factors with more than 0.30 factor load, and only four items (items: 5,15,11, and 7) loaded on the second factor.

A content examination of the four items was made and it was observed that the items in the two factors are theoretically not distinct from each other. Therefore, it was decided that the scale should be used as single factorial, which was also consistent with the original form. A single factorial structure explained 46.63% of the total variance with item loadings ranging from 0.44 to 0.80.

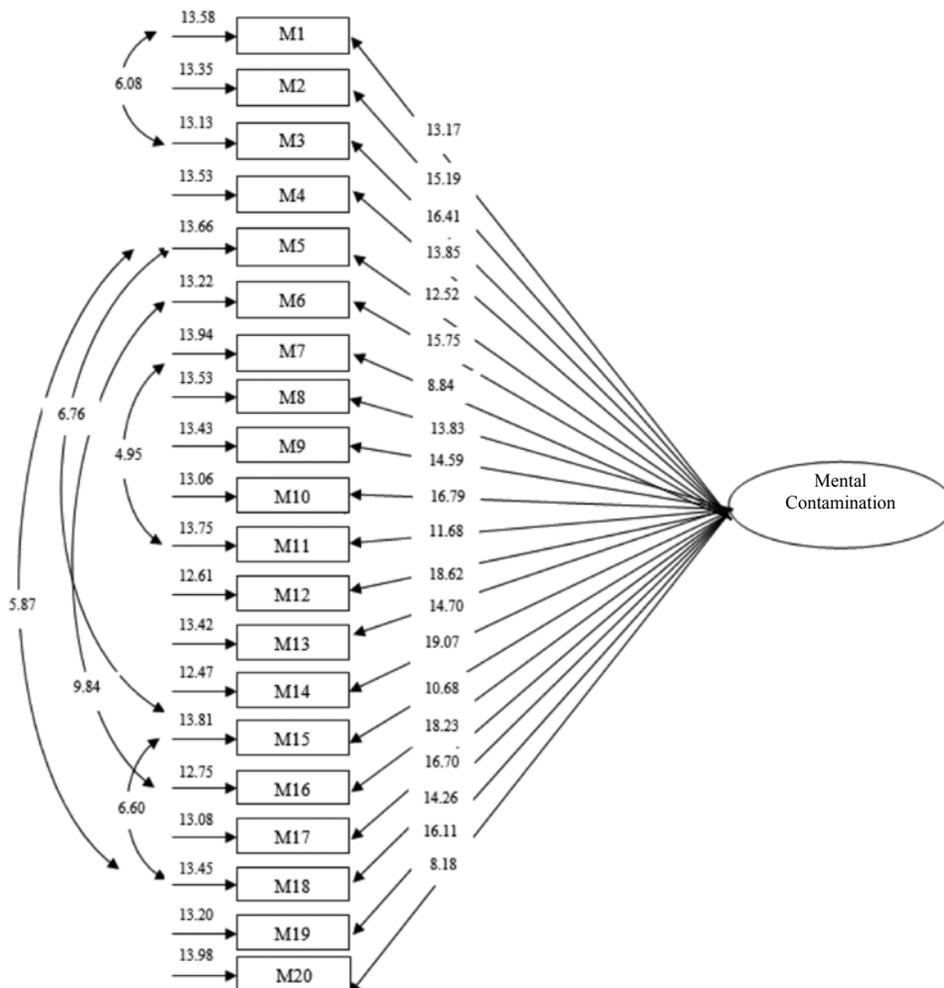
When the same analyses were used to evaluate TAF-CS factorial structure, it was determined that KMO was 0.087, and Barlett's Chi-square score was 2163.87 ( $p < 0.001$ ). These values indicated that data were sufficient for factor analysis. Two values were defined with eigenvalues of the scale as  $>1$ . Two factors which were reflected by these values explained 67.18% of total variance. However, when item distribution of two factorial structure of the scale was examined by using Varimax rotation, only two items (items 7 and 9) were loaded on the second factor with more than 0.30 factor load. When content of these two items examined, it was observed that its content could not be differentiated from the first factor. Consistent with these findings, scree-plot curve indicated a single factor structure. Therefore, it was decided to use the form as a single factor which was also consistent with the original form. A single factorial structure explained 65.47% of the total variance with item loadings ranging from 0.67 to 0.86.

### Confirmation of Unidimensional Structure of VOICI-MC and TAF-CS

Confirmatory Factorial Analysis (CFA) was performed to test unidimensional factor structure of the scales by using LISREL 8.71 package program (30). In CFA or in model tests, Chi-square should be insignificant to show that the model is acceptable. However, Chi-square value is very sensitive to the sample size. Therefore, if the sample size is large, df ratios of Chi-square (2, 3, and even 5) indicate that the model is acceptable. Besides, it is expected that CFI, GFI, AGF and NNFI values are 0.90 and above, whereas RMSEA value is below 0.08 (31-34).

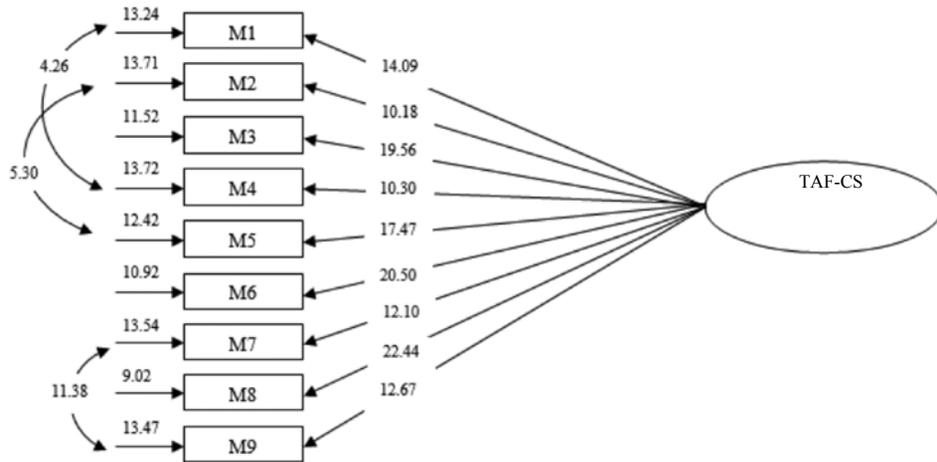
First, the single factor structure of VOICI-MC scale

was examined. Model fit indices obtained by covariation matrices ( $\chi^2/df=6.20$ , AGFI=0.71, GFI=0.83, CFI=0.81, NFI=0.79, RMSEA=0.14,  $p<0.001$ ) indicated that some modifications should be performed. According to suggested modification indices, the error terms belong to item pairs of 6-16, 5-18, 15-18, 7-11, 1-3 of the scale were covaried. After errors were covaried, the model was tested again ( $\chi^2/df=3.51$ , AGFI=0.84, GFI=0.87, CFI=0.90, NFI=0.87, RMSEA=0.079,  $p<0.001$ ), and it was determined that added relations improved the model ( $\chi^2_{\text{difference}}(6)=478.04$ ,  $p<0.001$ ). Although fit indices were slightly below the expected value, df ratio of Chi-square was determined as 3.51, and this value indicated that the model was at the acceptable level.



**Figure 1: Confirmatory factor analysis results of VOICI-MC.**

Note: All unstandardized factor loads are significant at  $p<0.05$ .



**Figure 2: Confirmatory factor analysis results of TAF-CS**  
 Note: All unstandardized factor loads are significant at  $p < 0.05$ .

The obtained fit indices confirmed a single factorial structure of TAF-CS ( $\chi^2/df=14.02$ , AGFI=0.74, GFI=0.79, CFI=0.81, NFI=0.79, RMSEA=0.18,  $p < 0.001$ ).

According to proposed modification indices (7-9, 4-1, 2-5), errors between these very similar items were covaried, and then the model was tested again ( $\chi^2/df=3.38$ , AGFI=0.91, GFI=0.95, CFI=0.95, NFI=0.95, RMSEA=0.085,  $p < 0.001$ ), and it was observed that added relations improved the model ( $\chi^2_{\text{difference}}(2)=281.23$ ,  $p < 0.001$ ). Obtained fit indices showed that the model was acceptable.

### Convergent Validity Analyses

To evaluate the convergent validity of the scales, correlations between both the new measuring tools and the total and subscale scores of TAFS, DS-R, TAS, OCI-R were examined. As it is shown in Table 1, there were significant positive correlations between both VOICI-MC, TAF-CS scales, and OCI-R total and its

subscales, which were showing OCD symptoms, and also total and subscales of TAFS. Taken together, these results supported the convergent validity of the scales.

### Divergent Validity

To test the divergent validity of VOICI-MC and TAF-CS, the correlations of these two measures with OCI-R Total (except Washing/Cleaning subscale) and Washing/Cleaning subscale scores were investigated. The results showed that the correlations significantly different from the correlations of trait anger and disgust sensitivity. When the obtained data were reviewed, positive correlations were determined between VOICI-MC and OCI-R Total (except Washing/Cleaning) ( $r(254)=0.57$ ,  $p < 0.001$ ), and Washing/Cleaning subscale ( $r(254)=0.61$ ,  $p < 0.001$ ). Similarly, it was determined that VOICI-MC had a significant positive relationship with TAS ( $r(254)=0.21$ ,  $p < 0.001$ ). However, the correlations between VOICI-MC and

**Table 1: Scores and correlations of TAF, OCI, DS, and CAS of VOICI-MC and TAF-CS**

	TAF Morality	TAF Likelihood	OCI Checking	OCI Neutralization	OCI Hoarding	OCI Obsession	OCI Washing	OCI Ordering	OCI Total	OCI Total (Except Washing)	DS-R Total	TAS Total
<b>VOICI MC</b>	0.47**	0.46**	0.44**	0.43**	0.40**	0.35**	0.60**	0.61**	0.41**	0.61**	0.57**	0.18**
<b>TAF CS</b>	0.64**	0.64**	0.58**	0.38**	0.37**	0.33**	0.43**	0.45**	0.39**	0.52**	0.50**	0.17**

VOICI-MC: Vancouver Obsessive-Compulsive Inventory-Mental Contamination, TAF-CS: Thought-Action Fusion Contamination Scale, TAF: Thought-Action Fusion, OCI: Obsessive-Compulsive Inventory, DS-R: Disgust Scale-Revise, TAS: Trait Anger Scale. \* $p < 0.05$ , \*\* $p < 0.01$

OCI-R Total ( $Z=6.15$ ,  $p<0.01$ ) and Washing/Cleaning subscale scores ( $Z=6.52$ ,  $p<0.01$ ) were significantly higher than the correlation with trait anger subscale. Similarly, the correlations between VOICI-MC and OCI-R Total (except Washing/Cleaning) and Washing/Cleaning subscale were significantly higher than the correlation with disgust scores ( $Z=5.67$ ,  $p<0.001$ ;  $Z=6.66$ ,  $p<0.001$ , respectively).

Similar results were obtained when correlations were examined between TAF-CS and OCI-R Total (except Washing/Cleaning) and Washing/Cleaning subscale, anger and disgust scores. It was found that there was a significant positive correlation between TAF-CS and OCI-R Total (except Washing/Cleaning) ( $r(252)=0.50$ ,  $p<0.001$ ) and Washing/Cleaning scores ( $r(252)=0.45$ ,  $p<0.001$ ). It was also found that TAF-CS had a significant positive correlation with anger ( $r(252)=0.25$ ,  $p<0.001$ ). However, correlations between TAF-CS and OCI-R Total ( $Z=4.21$ ,  $p<0.01$ ) and Washing/Cleaning symptom subscale scores ( $Z=3.10$ ,  $p<0.01$ ) were significantly higher than the correlation with trait anger scale. Similarly, there was a significant difference between TAF-CS and OCI-R Total (except Washing/Cleaning) and Washing/Cleaning subscale scores ( $Z=4.66$ ,  $p<0.01$ ;  $Z=4.07$ ,  $p<0.01$ , respectively), than the correlation with TAF-CS and disgust scores ( $r(251)=0.17$ ,  $p<0.001$ ). These values indicated that both scales had divergent validity.

To further evaluate the divergent validity of scales, participants who scored below 25<sup>th</sup> percentile and above 75<sup>th</sup> percentile on the OCI-R Total (except Washing/Cleaning subscale) score, were classified into two groups as OCD high ( $n=69$ ;  $>32$  points) and OCD low ( $n=69$ ;  $<16$  points). One-way ANOVA was performed for VOICI-MC total scale score. The results indicated that VOICI-MC significantly differentiated the group with high OCD symptoms scores from the one with low OCD symptoms scores ( $F_{1,136}=89.14$ ,  $p<0.001$ ,  $\eta^2_{\text{partial}}=0.40$ ). The VOICI-MC scores in the high OCD group ( $M=24.34$ ,  $SD=15.81$ ) were significantly higher than the low OCD group ( $M=5.51$ ,  $SD=4.98$ ). The same analyses were performed to evaluate for divergent

validity of TAF-CS. One-way ANOVA was performed for TAF-CS total scale score, and it was found that TAF-CS scores in high OCD group ( $M=13.63$ ,  $SD=9.33$ ) were significantly higher than the scores in low OCD group ( $M=3.45$ ,  $SD=4.14$ ) ( $F_{1,135}=68.44$ ,  $p<0.001$ ,  $\eta^2_{\text{partial}}=0.34$ ). These results showed that both VOICI-MC and TAF-CS scales differentiated groups with high OCD scores and low OCD scores significantly; indicating that the scales had divergent validity.

### Predictive Validity

Hierarchical regression analysis was performed to evaluate the degree to which the new measuring tools predicted OCD symptoms. As a dependent variable, new OCI total score, which was formed by subtracting Washing/Cleaning subscale from OCI-R total score, was taken. In the first stage, control variables of age, gender and disgust sensitivity were included in the analysis. In the first stage of the analysis, the control variables explained 9% of the variance, and caused a significant increase in the explained variance ( $\Delta F[3,243]=8.75$ ,  $p<0.001$ ). When standardized regression coefficient was investigated to determine which of variables included in the analysis caused a significant change, age ( $\beta=-0.17$ ,  $t=-2.70$ ,  $pr=-0.17$ ,  $p<0.05$ ) and disgust sensitivity ( $\beta=0.28$ ,  $t=4.36$ ,  $pr=0.25$ ,  $p<0.001$ ) significantly predicted OCD symptoms. In the second stage, TAF-Likelihood and TAF-Moral subscales which were among OCD beliefs were included in the model. These variables caused 21% and 30% of increases in the explained variance, respectively ( $\Delta F[2,241]=37.01$ ,  $p<0.001$ ). When it was investigated which variable caused significant change, it was found that only TAF-Moral dimension significantly predicted OCD symptoms ( $\beta=0.46$ ,  $t=4.12$ ,  $pr=0.26$ ,  $p<0.001$ ). In the third stage, OCI-R Washing/Cleaning subscale was added into the analysis ( $\beta=0.60$ ,  $t=12.11$ ,  $pr=0.61$ ,  $p<0.001$ ) and this variable caused 26% increase in the explained variance ( $\Delta F[1,240]=146.54$ ,  $p<0.001$ ). In the fourth and last stage, VOICI-MC and TAF-CS were added in the model. Addition of these two measures in the

**Table 2: Hierarchical regression analysis results of OCD symptoms of VOCI-MC and TAF-CS.**

	<b>B (p)</b>	<b>SE B</b>	<b>β</b>	<b>R<sub>2</sub> adj</b>	<b>ΔR<sub>2</sub></b>	<b>ΔF (p)</b>
<i>Stage 1</i>				0.09	0.10	8.75 (<0.001)
<b>Age</b>	-0.947 (<0.05)	0.35	-0.17			
<b>Gender</b>	-2.668 (0.11)	1.64	-0.11			
<b>DS-R</b>	4.63 (<0.001)	1.06	0.28			
<i>Stage 2</i>				0.30	0.21	37.01 (<0.001)
<b>TAF-Morality</b>	0.52 (<0.001)	0.13	0.46			
<b>TAF-Likelihood</b>	0.10 (0.62)	0.19	0.05			
<i>Stage 3</i>				0.56	0.26	146.54 (<0.001)
<b>OCI-Washing</b>	2.25 (<0.001)	0.19	0.60			
<i>Stage 4</i>				0.58	0.02	4.95 (<0.05)
<b>VOCI-MC</b>	0.12 (<0.05)	0.05	0.14			
<b>TAF-CS</b>	0.12 (0.14)	0.08	0.09			

DS-R: Disgust Scale-Revised, VOCI-MC: Vancouver Obsessive-Compulsive Inventory-Mental Contamination, TAF-CS: Thought-Action Fusion Contamination Scale

model caused a 2% of increase in the variance, and explained variance was increased to 58% ( $\Delta F[2,238]=4.95$ ,  $p<0.05$ ). In the last stage, only VOCI-MC predicted significantly OCD symptoms ( $\beta=0.14$ ,  $t=2.44$ ,  $pr=0.16$ ,  $p<0.05$ ).

## DISCUSSION

In the present study, the aim was to analyze the psychometric properties of two new instruments that were developed to measure a new concept called mental contamination in a Turkish sample.

Reliability analysis showed that internal consistency coefficients were parallel with obtained data in the original study (14). In addition to internal consistency coefficients, test-retest reliabilities of the scales examined. Although four weeks' interval between the two testing was relatively lower, the scores obtained from the two scales showed consistency over time and similar scores were obtained at different time intervals. Hence, the results supported reliability of the Turkish adaptation of the scales.

Consistent with the original study, validity values of the single structured VOCI-MC and TAF-CS scales were examined through construct, convergent, and divergent validity analyses. The convergent validity is examined through other OCD related variables. The results showed that both the mental contamination scale and the thought-action fusion mental contamination scale together with its subscales and

total scale scores were significantly positively related to other OCD related variables. Another important finding supporting the convergent validity of the scales was that both scales showed the most powerful relationship with Washing/Cleaning subscale among OCD symptoms. Another finding which supported the association of mental contamination with OCD symptomatology was obtained in hierarchical regression analysis which was performed to evaluate predictive validity. Regression analysis results indicated that the control variables were still significant on OCD symptom levels despite inclusion of VOCI-MC at the last step in the analysis after effects of TAF-Moral, TAF-Likelihood, and OCI-R Washing/Cleaning subscale scores were controlled. All of these findings were consistent with the literature findings indicating that mental contamination was related to OCD (35,36). Coughtrey et al. (35) performed a study on 177 patients diagnosed with OCD, and they reported that 10% of the patients complained about mental contamination without any physical contact; 15% complained about contamination with only physical contact; and 36% complained about both mental and contact related contamination. Depending on their results Coughtrey et al. (10) underlined that there was an overlap between mental contamination and contact related contamination, but despite this overlap mental contamination had a different structure. Consistent with these findings in the

present study, mental contamination still continued to significantly predict the OCD symptoms when contamination symptoms of OCD were controlled. Moreover, VOCI-MC scores predicted significantly OCI-R total scores after controlling Washing/Cleaning subscale scores, therefore mental contamination was not only related to washing/cleaning symptoms of OCD, but they were also relate to other OCD symptoms. As mental contamination feeling had no specific point in the body, and it was defined as an internal feeling of dirtiness, these findings were supportive for additional neutralization behaviors in addition to hand washing in individuals having these feelings (6). Consistent with the original study findings (14), when psychometric characteristics of both scales were examined, there was no significant correlation between TAF-CS and OCD symptoms. It was shown that thought-action fusion was not specific for OCD, it played an important role in other anxiety disorders (37). Findings from this study were consistent with the results of the original study, and the same condition was valid for mental contamination and thought-action fusion. Similarly, it seemed to support the idea that the thought-action fusion was not specific for OCD.

The divergent validity of the scales was examined by comparing OCI-Total (exception of Washing/Cleaning) and Washing/Cleaning score correlations to trait anger and disgust sensitivity. The findings were consistent with the expectations, indicating that both two scales had divergent validity. VOCI-MC and TAF-CS scores differentiate significantly between low and high OCD symptom groups, and it was a supportive sign for divergent validity of the scales. Moreover, it seemed to be also consistent with theoretical perspective proposing that mental contamination and related thought-action fusion beliefs should be related to other symptoms of OCD (38,4).

Although the basic underlined feeling in OCD is anxiety according to classical cognitive behavioral theories of OCD (39-42), the recent studies suggested that other feelings such as guilt (43,44), anger (45), and disgust (46-48) might also play important roles in exacerbation of symptoms. Therefore updated

models of OCD should be restructured in a way that they should also cover these other feelings. Results of the present study were consistent with this suggestion, and it was shown that both mental contamination and thought-action fusion beliefs related to mental contamination were significantly and positively related to feelings of anger and disgust. Therefore, it is believed that the clinicians who deal with the disorder treatment in daily practice should also consider additional feelings such as anger, guilt, and disgust.

It is believed that the adaptations of these two new scales into Turkish, which objectively measure mental contamination by providing comparable results to the original forms, will contribute to the field by giving rise to investigations about this new concept. However, there are important limitations in interpretation of the study results. Firstly, mental contamination case was investigated among university students who had no diagnoses. Therefore, presence of a non-clinical group with a limited age range limits the generalizability of the results. Although it is a common method to use university students and adult samples in OCD research (49), using a clinical sample diagnosed with OCD and mental contamination, would increase the external validity of the findings. Another important limitation of the study is that the results are based on self-report ratings. Therefore, the results do not indicate a causal relationship, but only indicate a reciprocal relationship between the variables. To increase our understanding about the nature and cognitive components of mental contamination, the use of experimental methods in future studies is important.

In conclusion, the present study indicates that two measures, VOCI-MC and TAF-C scales, which have been developed for better understanding the nature and cognitive components of mental contamination have sufficient reliability and validity to be used in Turkish samples. It is also believed that cultural adaptation of these two new measures, will increase our understanding about OCD, by stimulating interest for future studies in this field. Mental contamination is thought to be a missed symptom group (4) among

clinicians. Therefore, an interest in the research realm would also help to increase clinicians' familiarity with the concept and result in better conceptualization of OCD and treatment interventions. Future studies are needed to explore whether contact related contamination and mental contamination load up to the same factors; on which aspects they differ from each other; and the specific role of mental contamination in OCD symptomatology.

Contribution Categories	Name of Author
Development of study idea	M.I., F.O.U.
Methodological design of the study	M.I., F.O.U.
Data acquisition and process	F.O.U.
Data analysis and interpretation	M.I., I.B.
Literature review	I.B.
Manuscript writing	M.I., I.B.
Manuscript review and revision	M.I., I.B.

**Conflict of Interest:** Authors declared no conflict of interest.

**Financial Disclosure:** Authors declared no financial support.

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